GOVERNMENT OF JAMMU AND KASHMIR
JAMMU & KASHMIR SERVICES SELECTION BOARD

CPO Chowk Panjtirthi, Jammu/ Zamzam Complex Rambagh Srinagar.
www.jkssb.nic.in

Subject: Advance notice for conduct of OMR Based Written Examination for recruitment to different posts.

It is hereby notified for the information of candidates that J&K Services Selection Board (JKSSB) is scheduled to conduct the OMR based written test for various posts, tentatively as per the schedule given in **Annexure "A"**(tentative schedule) to this notice. The exact dates along with the schedule for downloading of Admit Cards shall be notified separately in due course of time.

The candidates who have applied for such posts whose examination may be scheduled on the same date and thereby experiencing clash of examination dates may represent before the Board within 03 working days of the issuance of this notice so that the changes (if any) are accordingly adjusted in the schedule. This is an advance notice for the information of concerned candidates.

The syllabus for examination to these posts is annexed herewith as **Annexure "A"** to **"BG"**.

03.01.2025

(Reyaz Ahmad Malik) JKAS
Controller of Examinations
J&K Services Selection Board

No. JKSSB-COE0EXAM/UT/10/2023-04 (7055504) Dated: 03-01-2025

Copy to the:

1) Commissioner/Secretary to the Government, General Administration Department, Civil Secretariat, J&K, Jammu/Srinagar.
2) Director Information & Public Relations, J&K Government with the request to get the said notification published in at least three leading local newspapers of Jammu/Srinagar for three consecutive days.
3) Member(s) ALL, J&K Services Selection Board.
4) Secretary, J&K Services Selection Board.
5) Deputy Controller of examinations J&K Services Selection Board
6) Administrative Officer, Services Selection Board, Jammu/Srinagar.
7) P.A. to Chairman, J&K Services Selection Board
8) In-charge Website, Services Selection Board, Jammu.
9) Office record.

Annexure "A" (Tentative Schedule)

S.No.	Department	Name of the post	Notification No.	Item No.	Syllabus	Tentative Date of Examination
1	Health & Medical Education	Junior Radiotherapy Technician	02 of 2021	168	**"A"**	02.02.2025
2	Health & Medical Education	Junior Radiotherapy Technician	02 of 2021	198		
3	Health & Medical Education	Senior Radiotherapy Tech	02 of 2021	199		
4	Health & Medical Education	Museum Curator	02 of 2021	195	**"B"**	02.02.2025
5	Health & Medical Education	Medical Physics Technician	02 of 2021	206	**"C"**	02.02.2025
6	Health & Medical Education	Clinical Psychologist	02 of 2021	207	**"D"**	02.02.2025
7	Health & Medical Education	Remedial Therapist	02 of 2021	208	**"E"**	02.02.2025
8	Health & Medical Education	Special Educator	02 of 2021	211		
9	Health & Medical Education	Sanitary Inspector	02 of 2021	307	**"F"**	02.02.2025
10	Health & Medical Education	Food Safety Officer	02 of 2021	414	**"G"**	02.02.2025
11	Health & Medical Education	Paramedical Assistant (Dermatology)	02 of 2021	172	**"H"**	02.02.2025
12	Health & Medical Education	Plumber	02 of 2021	316	**"I"**	02.02.2025
13	Health & Medical Education	Plumber	02 of 2021	333		
14	Health & Medical Education	Plumber	02 of 2021	356		
15	Health & Medical Education	Plumber	02 of 2021	379		
16	Health & Medical Education	Medical Record Keeper	02 of 2021	231	**"J"**	02.02.2025
17	Health & Medical Education	Refrigerator Mechanic	02 of 2021	260	**"K"**	02.02.2025
18	Health & Medical Education	Telephone Operator	02 of 2021	176		
19	Health & Medical Education	Junior Projectionist	02 of 2021	214		
20	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	244		
21	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	245		

22	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	246	**"L"**	02.02.2025
23	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	295		
24	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	296		
25	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	297		
26	Agriculture Production & Farmer's Welfare	Film Operator	07 of 2020	298		
27	Agriculture Production & Farmer's Welfare	Tracer	07 of 2020	243		
28	Information	Junior Culture Assistant	01 of 2021	127	**"M"**	02.02.2025
29	Information	Junior Culture Assistant		129		
30	Information	Junior Culture Assistant		134		
31	Information	Junior Culture Assistant		138		
32	Information	Junior Culture Assistant		139		
33	Information	Junior Culture Assistant		161		
34	Tourism	Rent Collector	04 of 2022	123	**"N"**	02.02.2025
35	ARI & training Department	Re-toucher Artist	02 of 2022	57		
36	ARI & training Department	Re-toucher Artist		58		
37	Animal/Sheep Husbandry & Fisheries Department.	Carpenter cum Mistri-II	04 of 2022	157		
38	Horticulture	Welder	01 of 2021	029		
39	Culture	Conservation Assistant	04 of 2020	055	**"O"**	02.02.2025
40	Culture	Modeller	04 of 2020	057	**"P"**	02.02.2025
41	Home	Assistant Secretary	06 of 2020	213	**"Q"**	02.02.2025
42	Home	Head Assistant	06 of 2020	214		
43	Higher Education	Tabla Assistant	06 of 2020	181	**"R"**	02.02.2025
44	Information	Public Address System Operator(PASO)	01 of 2021	118	**"S"**	02.02.2025

45	Skill Development	Jr. Programmer	07 of 2020	308	**"T"**	02.02.2025
46	Health & Medical Education	Rehabilitation Psychologist	02 of 2021	209	**"U"**	02.02.2025
47	Health & Medical Education	Laboratory Assistant	02 of 2021	417	**"V"**	02.02.2025
48	Health & Medical Education	Laboratory Assistant	02 of 2021	421		
49	Horticulture	Cleaner	01 of 2021	024	**"W"**	02.02.2025
50	Horticulture	Cleaner	01 of 2021	071		
51	Horticulture	Cleaner	01 of 2021	101		
52	Animal/Sheep Husbandry and Fisheries Department	Junior Librarian	04 of 2021	637	**"X"**	02.02.2025
53	Information	Electrician	01 of 2021	115	**"Y"**	02.02.2025
54	Health & Medical Education	Laboratory Technician	02 of 2021	416	**"Z"**	09.02.2025
55	Health & Medical Education	Laboratory Technician	02 of 2021	420		
56	Health & Medical Education	Assistant Food Analyst	03 of 2021	601	**"AA"**	09.02.2025
57	Health & Medical Education	Assistant Food Analyst	03 of 2021	602		
58	Health & Medical Education	Screen Technician	02 of 2021	309	**"AB"**	09.02.2025
59	Labour& Employment	Supervisior	04 of 2020	73		
60	Health & Medical Education	Animal Keeper	02 of 2021	412	**"AC"**	16.02.2025
61	Health & Medical Education	Medical Record Technician	02 of 2021	179	**"AD"**	16.02.2025
62	Health & Medical Education	Medical Record Technician	02 of 2021	225		
63	Rural Development and Panchayati Raj	Panchayat Secretary	01 of 2023	001	**"AE"**	16.02.2025
64	Rural Development and Panchayati Raj	Panchayat Secretary	01 of 2023	002		
65	Rural Development and Panchayati Raj	Panchayat Secretary	01 of 2023	003		

66	Rural Development and Panchayati Raj	Panchayat Secretary	01 of 2023	004		
67	Skill Development	Computer Instructor/ Operator	07 of 2020	309	**"AF"**	16.02.2025
68	Home Department	Electrician Grade-II	04 of 2022	80	**"AG"**	16.02.2025
69	Information	Film Production Assistant	01 of 2021	123	**"AH"**	16.02.2025
70	Higher Education	Junior Laboratory Technician	06 of 2020	182	**"AI"**	16.02.2025
71	Higher Education	Junior Laboratory Technician		193		
72	Higher Education	Assistant PTI	06 of 2020	187	**"AJ"**	16.02.2025
73	Health & Medical Education	Child Psychologist	02 of 2021	210	**"AK"**	16.02.2025
74	Health & Medical Education	Drug Control Officer	03 of 2021	600	**"AL"**	16.02.2025
75	Forest, Ecology and Environment Department	Scientist 'A'	03 of 2021	556	**"AM"**	23.02.2025
76	Forest, Ecology and Environment Department	Lab Assistant	03 of 2021	595	**"AN"**	23.02.2025
77	Culture	Lab Assistant	04 of 2020	61	**"AO"**	23.02.2025
78	Higher Education	Data Entry Operator	06 of 2020	202	**"AP"**	02.03.2025
79	Forest, Ecology and Environment Department	Labortory Assistant	03 of 2021	568	**"AQ"**	02.03.2025
80	Forest, Ecology and Environment Department	Labortory Assistant	03 of 2021	569		
81	Forest, Ecology and Environment Department	Labortory Assistant	03 of 2021	570		
82	Health & Medical Education	Telephone operator	02 of 2021	308		
83	Estates Department	Telephone Operator	04 of 2022	130		
84	Estates Department	Pump Operator	04 of 2022	131		

85	Animal/Sheep Husbandry & Fisheries Department.	Grinder operator	04 of 2022	155	**"AR"**	02.03.2025
86	Animal/Sheep Husbandry & Fisheries Department.	Mechanic cum Mistri	04 of 2022	156		
87	Skill Development	Junior Engineer	07 of 2020	334	**"AS"**	02.03.2025
88	Information	Cameraman	01 of 2021	142	**"AT"**	02.03.2025
89	Information	Cameraman	01 of 2021	156		
90	Information	Cameraman	01 of 2021	158		
91	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	135	**"AU"**	02.03.2025
92	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	145		
93	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	146		
94	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	147		
95	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	148		
96	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	149		
97	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	150		
98	Animal/Sheep Husbandry & Fisheries Department.	Veterinary Pharmacist	04 of 2022	151		
99	Hospitality & Protocol Department	Receptionist	04 of 2022	129	**"AV"**	02.03.2025
100	Transport	Foreman	04 of 2020	80	**"AW"**	02.03.2025

101	Health and Medical Education	Psychiatric Social Worker	02 of 2021	203	**"AX"**	02.03.2025
102	Health and Medical Education	Drug De- Addiction Councilor	02 of 2021	212		
103	Higher Education	Educator-cum-Studio Assistant	06 of 2020	180	**"AY"**	02.03.2025
104	Higher Education	Educator- Cum-Studio Assistant	06 of 2020	191		
105	Skill Development	Audio Visual Mechanic	07 of 2020	319	**"AZ"**	09.03.2025
106	Forest, Ecology and Environment Department	Junior Scientific Assistant	03 of 2021	566	**"BA"**	09.03.2025
107	Forest, Ecology and Environment Department	Junior Scientific Assistant	03 of 2021	567		
108	Culture	Chemical Assistant	04 of 2020	060	**"BB"**	16.03.2025
109	Skill Development	Kitabat Instructor	07 of 2020	329	**"BC"**	16.03.2025
110	Higher Education	Technical Assistant EduSat	06 of 2020	184	**"BD"**	16.03.2025
111	Higher Education	Technical Assistant EduSat	06 of 2020	194		
112	Higher Education	EduSat Assistant	06 of 2020	185	**"BE"**	16.03.2025
113	Higher Education	EduSat Assistant	06 of 2020	195		
114	Culture Department	Photographer	04 of 2020	58	**"BF"**	16.03.2025
115	Culture Department	Photographer	04 of 2020	59		
116	Labour& Employment	Career Counseling Officer	04 of 2020	074	**"BG"**	16.03.2025

Annexure "A"

Syallbus for Junior Radiotherapy Tech. and Senior Radiotherapy Tech.

Marks 120

First Year

Time : 02 Hours

Radiation Physics **(Marks 15)**

Unit 1: General Physics - Introduction - Measurements & Units- force, work and energy, temperature and heat - its SI units -Atomic structure- structure of atoms -Nucleus, atomic number, mass number, electron orbit and energy levels -isotopes - isobars - ionization and excitation.-Electromagnetic radiation -electromagnetic waves- quantum theory of radiation and visible light.

Unit 2: Radioactivity - discovery of radioactivity - types of radiation emitted - transformation process - branching - radioactive decay - artificial or induced radioactivity- Natural radioactivity - Half life - unit of activity - specific activity -gamma ray sources for medical uses. Nuclear fission and fusion.

Unit 3: interaction of radiation with matter: Attenuation of electromagnetic radiation with matter - photoelectric, Compton effect - pair production -transmission of homogeneous beam through a medium - filtration - transmission of beam through body tissues.

Unit 4: Radiation units - Roentgen - Exposure - Radiation intensity -flux and fluence-limitation of roentgen - kerma, absorbed dose - radiation dose equivalent - radiation weighting factor - old and SI units and their relations ship - Radiation detection and measurements and its equipments.

Human Anatomy, Physiology and Pathology **(Marks 15)**

Unit 1: Definition of various terms used in anatomy-Structure and function of cell-Elementary tissues of the body- structure and function of skeleton-composition of blood and its functions- lymphatic system - structure and function of heart .

Unit 2: Structure and function of respiratory system and urinary system - parts of nervous system - sensory organ - digestive system and their functions - Endocrine glands and hormones - reproductive organs and their functions.

Unit 3: Physiology of reproductive system and breast - Structure and function of liver physiology of digestive system and absorption - Endocrine gland and hormones, location of the glands their hormones and functions of pituitary, thyroid gland and pancreas.

Unit 4: Growth of the cell- reproduction of cell, cell cycle - tumors - benign and malignant - cause of cancer, spread of cancer in the body - lymphatic's -metastasis, biopsy - purpose and method, degeneration and process of cell death, repair of wound, inflammation, infection and immunity.

Diagnostic Radiology Applied to Radiotherapy **(Marks 15)**

Unit 1: X-rays - properties and production of x rays - Bremsstrahlung and characteristic X-rays spectra of x-rays - quality and intensity of x-rays - factors influencing quality and quantity of x-rays - - self rectifying circuits - half wave rectifier - full wave rectifier-

constant potential circuits - measurements of high voltage - X-rays circuits - Mains voltage circuits - X-ray tube voltage (kV) -Exposure control - X-ray tube current (mA) - control of kV circuits and mA circuits.

Unit 2: Radiographic Image: Primary radiological image formation - use of contrast media , density - contrast - brightness - exposure of x-rays - developers -effect of temperature - optical density measurement - Fog and noise- Intensifying screen - Fluorescence - constituents of intensifying screens - type of screens -intensification factors - speed of screen -screen unsharpness. Cassette -construction and use of cassettes - effect of screen in reduction of patient dose.

Unit 3: Scattered Radiation and Fluoroscopy: Significance of scatter - Beam limiting devices - Grid principle and structure - Types of Grids - Stationary grid, parallel grid, focused grid - crossed grid, moving grid - potter bucky diaphragm.

Unit 4: CT, Ultrasound and MRI: Theory of tomography - multi section radiography - tomographic equipment - CT- scanning principle - reconstruction of image- viewing and evaluation of the image- image quality - Physical aspects of ultrasound - different ultrasound scans - Doppler effect - MRI principle - imaging methods - slice section - image contrast - factors affecting image quality.

Basic Radiotherapy Techniques **(Marks 15)**

Unit 1: Methods of treatment of malignant disease- chemotherapy , hormone therapy, Radiotherapy and surgery in management of disease, relative value of each method for individual tumors or tumor sites -importance of correct dosage, Blood supply, time factor, fractionation, quality - Radical and palliative treatment. Principle affecting the treatment of malignant disease, emergency radiotherapy, terminal care.

Unit 2: Choice of treatment and radiotherapy -Anatomical site, relation to other tissue, general condition of the patient to include inherent diseases, extent of tumor and histopathology, place of previous treatment, place of radical and palliative therapy. Tumors sensitivity, anatomical site, relation to other structure availability of equipments.

Unit 3: Single and multiple field techniques for all treatment sites (from Head to Feet) with appropriate immobilizing device(s).- Fix, Rotation, Arc and Skip therapy procedures. Use of Rubber traction, POP, Orfit, Body Frame in treatment technique, Evaluation of patient setup for simple techniques.

Unit 4: Use of Beam Modifying devices, such as wedges, Tissue compensators, Mid Line Block (MLB) in the treatment of respective sites. Customized shielding blocks and its properties. Asymmetric jaws, Motorized wedges.

Second Year

Physics of Radiation Oncology & Instrumentation **(Marks 15)**

Unit 1: Teletherapy Machines - Historical development - kilo voltage - grenz ray therapy - contact therapy - superficial therapy - deep therapy megavoltage therapy - Radio isotopes units - physical components of cobalt 60 telecobalt units - source housing

beam collimation and penumbra - Different type of shutter mechanism in telecobalt units - Caesium 137 units - Advantages and disadvantages - Gamma knife units - simulators and its description.

Unit 2: Introduction of high energy X- rays in Linear accelerators -physical components of linear accelerators - Different beam bending magnets systems - Microwave generators - Accelerator wave guides - Collimators - primary and secondary collimators - Target and beam flattening system- electron beam and electron scattering foil and applicators - Cyclotron.

Unit 3: Beam therapy data- various sources used in radiotherapy and their properties - physics of photons, electrons, protons and neutrons in radiotherapy. Physical parameters of dosimetry - phantoms - PDD, TAR, BSF, TMR, TPR - SSD technique and SAD technique Treatment time dose calculation basics.

Unit 4: Treatment planning concepts and Beam directing devices and special techniques: Physics of Bolus & Phantom material - isodose curves - measurements of isodose curves - wedge filters - application of wedge filters in radiotherapy and compensating filters - shielding blocks, patient immobilization devices , port film, processing and development . Dose calculations with isodose curves and wedge fields. SRS, SRT, IMRT, IGRT and Tomotherapy- Brachytherapy - ICR , LDR, MDR and HDR - interstitial implants.

Radiotherapy Techniques **(Marks 15)**

Unit 1: Technique of fixed beam treatment - single direct filed, parallel fields, multiple fields, regional fields. The use of wedge filters, compensators and shaping blocks, diaphragms and applicators, positioning of the patient, principles of rotation and arc therapy - beta ray and electron beam therapy, 3DCRT, IMRT, IGRT, cyber knife, gamma knife, concept of simulation and virtual simulation.

Unit 2: Methods of use to include after loading techniques and remote control system - advantages and disadvantages of various radionuclides used, dosage fractionation and overall treatment time - cleaning, sterilization and care of small sealed radioactive sources - beta ray application, interstitial implants, ICR, ILRT and mold therapy.

Unit 3: Planning procedures and immobilization devices- contour, isodose plans, tissue inhomogeneity, large field matching, immobilization devices, mould room procedure. General problems - iodine and thyroid gland - phosphorous - tracer and therapy techniques - precautions in use and hazards involved - emergency procedures. Use of equipment’s and responsibilities : General welfare of patient during treatment, including care of patient in case of any inherent disease (ex. diabetes, TB, Arthritis)- Observation and reporting of any change in the signs and symptoms of patients receiving radiation treatment -observation of instruments and reporting of faults - care and use of accessory equipment - beam directing devices - lead rubber aprons - management of radiotherapy equipments - records supervision of patients work - administration - some legal points

Radiation Hazard Evaluation & Control (Marks 15)

Unit 1: Background radiation levels - philosophy behind radiation protection and Basic concepts of radiation protection standards- ICRP and its recommendations - the system of radiological protection - Justification of practices, Optimization of protection and individual dose limits - Radiation and tissue weighting factors, equivalent dose, effective doe, committed equivalent dose, committed effective dose - concepts of collective dose - potential exposures, dose categories of exposures - occupational, public and medical exposures internal exposure.

Unit 2: Effects of time, distance, shielding - shielding materials- shielding calculations- different barrier thickness calculations - General considerations and evaluation of work load -personnel and area monitoring rules and instruments - Brachytherapy facilities - telegamma and accelerator installations,- protective equipment - Radiation safety during source transfer operations Special safety features in accelerators, reactors-.

Unit 3: Radioactive wastes - Classification of waste - Disposal of radioactive wastes - Transportation of radioactive substances- Regulations applicable for different modes of transport- Special requirements for transport of large radioactive sources and fissile materials - Exemptions from regulations -Shipment approval

Unit 4: Radiation accidents and emergencies -Typical accident cases. Regulatory framework - Atomic Energy (Radiation Protection) Rules - Applicable Safety Codes, Standards, Guides and Manuals - Regulatory Control - Licensing, Inspection and Enforcement - Responsibilities of Employers, Licensees, Radiological Safety Officers and Radiation Workers.

Radiobiology Clinical Oncology (Marks 15)

Unit 1: Symptoms at presentation, Diagnosis, Staging and Treatment for most common cancers in India specifically of Head and Neck, esophageal, gastric, brain, lung, breast, cervical, colon, rectum, pancreatic, ovary, endometrial, leukemia and lymphomas.

Unit 2: Care of Patient - Before, during and after radiotherapy, Concepts in cancer treatment (single modalities, combination, especially chemoirradiation, adjuvant, neo-adjuvant, palliative treatment). Pharmacology of important cancer drugs used in chemoirradiation. Principles and procedures in basic life saving skills during radiotherapy (cardiopulmonary resuscitation (CPR) methods, controlling bleeding). Symptoms at presentation, Diagnosis, Staging, Radiation treatment schedules. Important scientific terminologies and their meanings (mucositis, dermatitis, anemia, febrile neutropenia, Leukocytosis etc) and grading of important radiation side effects using the international scales (RTOG/WHO/
CTCAE).

Unit 3: Basics of Radiobiology - Biological basis of radiation-induced cell kill (direct and indirect), hydrolysis of water, cell damage, DNA damage, Somatic effects, Genetic

effects, Stochastic and non-stochastic effects, Effects on organs, 23 Rs in radiation, Hypoxia and treatment, free radicals, oxygen effect and free radical scavengers, LET and
RBE theory. Differences in cell kill mechanism by conventional radiotherapy and SRT. Radiation sensitizers, protectors and biologicals (growth factors) used in radiotherapy
Dose modifying factors.

Unit 4: Medical Ethics - History of Medical ethics (Nuremberg code, Helsinki declaration, Belmont report, ICMR guidelines), patient's rights, confidentiality, Beneficence and Non-Maleficance, autonomy, empathy and informed consent. Ethics in
data collection, documentation and storage. Research ethics, Code of ethics for technologists during interacting with health care professionals, patients and their caregivers.

Annexure "B"

Marks 120
Time 02 Hours

Syllabus for Museum Curator

1st Year (Marks 40)

1. Ecology
2. Microbiology
3. Biochemistry and Cellular basis of Life
4. Evolution and Genetics
5. Cell and Molecular Biology
6. Wildlife Forensics
7. Microbial Diversity
8. Biosphere
9. Development and Management of British Habitats

2nd Year (Marks 40)

1. Biology of Vertebrates
2. Invertebrates
3. Vertebrate Organisms
4. Entomology
5. Animal behavior
6. Organismal and Population Biology
7. Research Methods
8. SZOO Science
9. Wildlife conservation
10. Ethology

3rd Year **(Marks 40)**

1. Marine Ecology
2. Conservation of Ecology
3. Biodiversity
4. Oncology and Immunology
5. Behavioral Physiology
6. Community and Population Ecology
7. Parasitology
8. Wildlife conservation
9. Anthropogenic Threats to Biosphere
10. Welfare and Behavior of Domesticated Animals

Annexure "C"

Syllabus for Medical Physics Technician

Marks 120 **Time: 02 Hours**

1. Electronic Circuits And Microprocessor (Marks 5)

- Analog Electronics I
- Analog Electronics II
- Transducer
- Digital Electronics
- Electronics For Nuclear Devices

2. Mathematical Physics And Bio Statistics (Marks 5)

- Vector Calculus And Matrices
- Complex Analysis
- Fourier And Laplace Transforms
- Partical Differential Equations
- Probability, Statistics And Error

3. Non Ionizing Radiation Physics In Medicine (Marks 5)

- Review Of Nonionising Radiationphysics In Medicine
- Tissue Optics
- Mediphotonics
- Medical Ultrasound
- Radio Frequency And Microwave

4. Radiological Physics (Marks 5)

- Atomic Physics And Nuclear Transformation
- Interaction Of Radiation With Matter
- Dosimetric Concepts And Quantities
- Principles Of Radiation Detection And Dosimeters
- Radiation Monitoring Instruments

5. Electronics And Instrumentation Laboratory (Marks 5)

> Experiments

- Rc, Lc Oscillator Design.
- Dual Regulated Power Supply
- Astable & Monostable Multivibrator Design
- Operational Amplifier - Characteristics Of Summer, Difference Amplifier And Integrator, Comparator Circuit, Schmitt Trigger
- Filters - High Pass, Low Pass And Band Pass G. M. Counter
- Microprocessor 8085 / 8086
- Waveform Generator Sin Wave & Square Wave Using Op-Amp
- Gamma Ray Spectrometer
- Ic Regulated Power Supply
- Flip Flop, Jk & Rs Using Logic Gates.
- Half Adder & Full Adder
- Data Transfer Using Shift Register
- Digital To Analog And Analog To Digital Conversion

- Digital Circuits For Measurements
- Interfacing And Programming Using 8279, 8259 & 8253
- Digital Clock Programming

6. Engineering Graphics And Workshop Practice (Marks 3)

- Engineering Graphics
- Workshop Practice

7. Anatomy And Physiology (Marks 5)

- Human Anatomy Overview
- Digestive System
- Respiratory, Reproduction And Excretory Systems
- Endocrine System
- Nervous System

8. Numerical Methods And Programming In "C" (Marks 3)

- Solutions Of Equations
- Interpolations
- Differentiation, Integration And Differential Equations
- Curve Fitting
- C-Programming

9. Radiation Dosimetry And Treatment Planning (Marks 5)

- Dosimetric Concepts And Quantities
    - Calibrating, Measuring And Quality Assurance Of Teletherapy
- Radiation Treatment Planning Parameters
- Beam Data Measurements And Qa Of Planning Systems
- Treatment Planning Aspects And Algorithms

10. Radiotherapy Equipments (Marks 5)

- Telegamma Machines
- Particle Accelerators
- Linear Accelerators
- Radiotherapy Simulators
- Advanced Radiotherapy Equipments

11. Diagnostic And Therapeutic Laboratory- I (Marks 10)

- Calibration Of Telecobalt Unit Using Water Phantom.
- Field Congruence Test For Telecobalt And The Linear Accelerator.
- Calibration Of The High Energy Photon Beams Using Water Phantom.
- Calibration Of The Electron Beams Using Water Phantom.
- External Beam Treatment Planning -Conventional
- Calibration Of The High Dose Rate Source Using Well-Type Chamber.
- Brachytherapy Planning For Manual After Loading Applicator Using Cs-137
- Brachytherapy Planning For Hdr Remote After Loading Treatment
- Cross Calibration Of The Ionization Chamber.
- Percentage Depth Dose And Profile Measurements Using Rfa.

- Ecg Preamplifier
- Bridge Amplifier
- Ultrasonic Diffraction Instruments
- Pacemaker I
- Pacemaker Ii
- Absorption Characteristics Using Uv Visible Spectrophotometer
- Fluorescence Spectrum Using Spectrofluorometer
- Gm Counter Characterisitcs
- Estimation Of Ph Value For Different Physiological Fluids
- Bio Amplifiers

- Calibration Of Survey Instruments And Pocket Dosimeters
  - Calibration Of Tl Phosphor And Tld Reader And Its Use In Dose Distribution
  - Measurements
  - Recording Of Bio Signals And Analysis (Ecg, Emg)
  - Analysis Of Safety Aspects Of Surgical Diathermy

12. Biomedical Instrumentation (Marks 5)

- Biopotential Electrodes And Transducers
- Bioelectric Signal Recording
- Physiological Assist Devices
- Clinical And Operation Theater Equipments
- Biotelemetry And Safety Instrumentation

13. Brachytherapy Physics (Marks 5)

- Definitions And Classification
- Radionuclides And Their Properties
- Dosimetry
- Clinical Practice
- Advanced Brachytherapy Systems

14. Materials For Implant Applications (Marks 5)

- Biological Performance Of Materials And Characterization Techniques
- Classes Of Materials Used In Medicine
- Ophthalmologic Applications And Drug Delivery Systems
- Artificial Orthopeadic And Dental Material
- Cardiovascular Materials

15. Diagnostic And Therapeutic Laboratory- II (Marks 10)

- Quality Assurance Of A Diagnostic X-Ray Machine.
- Evaluation Of Characteristics Of A Radiographic Image.
- Study And Calibration Of Thyroid Uptake Measurement Unit.
- Dose Output Measurement Of Photon (Co Gamma Rays And High Energy X-Rays)
- Beams Used In Radiotherapy Treatment.
- Dose Output Measurement Of Electron Beams Used In Radiotherapy Treatment.
- Determination Of Percentage Depth Dose Of Photon And Electron Beams.
- Integrity Check And Calibration Of Low Activity Brachytherapy Sources.
- Aks/ Rakr Measurement Of An Hdr Brachytherapy Source Using Well Type
- And Cylindrical Ionisation Chambers.

- In-Phantom Dosimetry Of A Brachytherapy Source.
- Familiarisation With Treatment Planning Procedure Using A Computerised
- Radiotherapy Treatment Planning System.
- Survey Of A Radioisotope Laboratory And Study Of Surface And Air Contamination.
- Protection Survey Of Neutron Installations - Calibration And Evaluation Of
- Neutron Badge.
- Protection Survey Of Industrial Radiography Camera.
- Absorption And Backscattering Of Gamma Rays - Determination Of Hvt.
- Radiation Protection Survey Of Teletherapy Installations.
- Radiation Protection Survey Of Diagnostic Radiology Installations.
- Treatment Planning Of Parallel Opposing Techniques
- Treatment Planning Of Three Field Techniques
- Treatment Planning Of Four Field Box Techniques
- Treatment Planning Of Four Field Cross Field Technique
- Treatment Planning Of Wedge Field Techniques

16. Advanced Clinical Radiation Therapy Physics (Marks 5)

- Conformal Radiotherapy With Multi Leaf Collimator
- Intensity Modulation Radiation Therapy
- Special Techniques In Radiation Therapy
- Image Guided Radiation Therapy
- Volumetric Modulated Arc Therapy

17. Biological Effects Of Ionizing Radiation (Marks 5)

- Action Of Radiation On Living Cells
- Cell Respons To Irradiation And Its Radi
- Somatic Effects Of Radiation
- Genetic Effects Of Radiations
- Radiobiological Basis Of Radiotherapy

18. Biomedical Optical Spectroscopy (Marks 3)

- Tissue Optics
- Light Propogation In Turbid Media
- Opto Electronic Devices
- Optical Spectroscopy In Medicine
- Optical Imaging Of Cells And Tissues

19. Biosensors (Marks 3)

- Biosensor Transducers
- Biosensor Fabrication
- Types Of Biosensors
- Detection In Biosensors/ Biorecognition System
- Biosensors For Medical Applications

20. Industrial Radiography (Marks 3)

- Radiation Sources
- Image Formation
- Exposure And Exposure Time Estimation

- Testing Methods For Different Applications
- Neutron Radiography

21. Medical Applications Of Lasers (Marks 2)

- Laser Characteristic As Applied To Medicine And Biology
- Studies Of Cell Biological Functions And Structure Using Lasers
- Surgical Applications Of Lasers
- Lasers In Diagnosis And Therapy
- Laser Safety Regulations

22. Medical Imaging Techniques (Marks 5)

- Advanced X-Ray Imaging Systems
- Magnetic Resonance Imaging
- Diagnostic Ultrasound
- Radioisotopes In Diagnosis
- Thermography And Other Imaging Techniques

23. Monte Carlo Techniques In Dosimetry (Marks 2)

- Elements Of Monte Carlo Tecnhique
- Monte Carlo Techniques For Photon And Neutron Transport
- Monte Carlo Techniques For Electron Transport
- Monte Carlo Modeling Of Light Transport In Tissues

24. Nanotechnology For Biomedical Applications (Marks 2)

- Fundamentals Of Micro Fabrication
- Micro Fluidic Patterning And Biopolymer Patterning
- Nanofabrication
- Nano-Biotechnology
- Nanobiosensors

25. Nuclear Medicine (Marks 2)

- Physics Of Nuclear Medicine And Radio Pharm
- Rectilinear Scanners And Gamma Cameras
- Clinical Scanning Of Different Organs
- Display Systems
- Dynamic Studies Using Radioisotopes And Advanced Imaging Systems

26. Radiation Hazards Evaluation And Control (Marks 5)

- Radiation Protection Standards
- Evaluation Of External And Internal Hazards
- Planning And Shielding Calculations
- Adioactive Waste Disposal And Transport Of Radionuclides
- Radiation Emergencies, Medical Management & Legislation

27. Ultrasonics In Medicine (Marks 2)

- Generation And Detection Of Ultrasound
- Pulse Echo And Nic Diagnostic Techniques
- Signal Processing, Display And Safety
- Ultrasound In Obstetrics And Gynaecology Vascular System
- Ultrasound In Ophthalmology And Echocardiography

Annexure "D"

Syllabus for Clinical Psychologist

Part - I

Marks 120
Time 02 Hours

Psychosocial Foundation of Behavior and Psychopathology

- Introduction
- Mental health and illness
- Epidemiology
- Self and relationships
- Family influences
- Societal influences
- Disability
- Rehabilitation
- Policies and Acts

Psychopathology

- Introduction to psychopathology
- Psychological theories
- Indian thoughts

Statistics and Research Methodology

- Introduction
- Sampling
- Concept of probability
- Hypothesis testing
- Tests of significance - Parametric tests:
- Tests of significance - Non-parametric tests
- Experimental design
- Epidemiological studies
- Multivariate analysis
- Sample size estimation
- Qualitative analysis of data
- Use of computers
- Signs and symptoms
- Psychoses
- Neurotic, stress-related and somatoform disorders
- Disorders of personality and behavior
- Organic mental disorders
- Behavioral, emotional and developmental disorders of childhood and adolescence: types, clinical features, etiology and management.
- Mental retardation
- Neurobiology of mental disorders
- Therapeutic approaches
- Consultation-liaison psychiatry
- Special populations/Specialties

Practical : Psychological Assessments including Viva Voce

- Introduction
- Tests of cognitive functions
- Tests for diagnostic clarification
- Tests for adjustment and personality assessment
- Rating scales
- Psychological assessment of children
- Tests for people with disabilities
- Neuropsychological assessment

Part - II

Biological Foundations of Behavior

(Anatomy, Physiology and Biochemistry)

- Anatomy of the brain
- Structure and functions of cells
- Biochemistry of the brain
- Neurobiology of sensory-motor systems and internal environment
- Regulation of Internal Environment
- Neurobiology of Behaviour
- Neurotransmitters and behavior

(Neuropsychology)

- Introduction
  - Temporal lobe syndrome
  - Parietal and occipital lobe syndromes
  - Neuropsychological profile of neuro-psychiatric conditions
  - Functional human brain mapping
  - Neuropsychological assessment
  - Neuropsychological rehabilitation

Psychotherapy and Counseling

- Introduction to Psychotherapy
- Therapeutic Relationship
- Interviewing
- Affective psychotherapies
- Behavior therapies
- Cognitive therapies
- Systemic therapies
- Physiological therapies
- Counseling
- Therapy in special conditions
- Therapy with children
- Psychoeducation (therapeutic education)
- Psychosocial rehabilitation
- Indian approaches to Psychotherapy
- Contemporary issues and research

Behavioral Medicine

- Introduction
- Central nervous system
- Cardiovascular system
- Respiratory system
- Gastrointestinal system
- Genitourinary/renal/reproductive system
- Dermatology
- Oncology
- HIV/AIDS
- Pain
- Terminally ill

- Other general clinical conditions
- Contemporary Issues

Annexure "E"

Syllabus for Remedial Therapist and Special Educator

Marks 120 **Time: 02 Hours**

SEMESTER – I (Marks 30)

- Human Growth and Development.
- Contemporary India and Education
- Introduction to Sensory Disabilities (VI, HI, Deaf-blind)
- Introduction to Neuro Developmental Disabilities (LD,ID / MR, ASD)
- Introduction to locomotor & Multiple Disabilities (Deaf -blind, CP, MD)
- Assessment and Identification of Needs.
- Practical : Cross Disability and Inclusion.

SEMESTER - II (Marks 30)

- Learning, Teaching and Assessment.
- Pedagogy of school subjects (Any One from Part - I to Part V)
- Pedagogy of school subjects (Any One from Part - I to Part V)
- Inclusive Education
- Curriculum Designing, Adaptation and Evaluation.
- Practical : Disability specialization.

SEMESTER - III (Marks 30)

- Educational Intervention and Teaching Strategies.
- Technology and Disability
- Psycho Social and Family Issues
- Practical : Disability Specialization.
- Main Disability special school (Related in Area C)
- Reading and Reflecting on Tests (EPC)
- Drama and Art in Education (EPC)

SEMESTER - IV (Marks 30)

- Skill based Optional Course (Cross Disability and inclusion) ANY ONE
- Skill based optional course (specialization disability) Any ONE
- Basic Research & Basic Statistic (EPC)
- Practical : Cross Disability and Inclusion
- Other disability special school
- Inclusive school

Annexure "F"

Syllabus for Sanitary Inspector

Marks 120 **Time 02 Hours**

Sanitary Inspector: A Paramedical worker primarily trained for ensuring standards of cleanliness in and around public places but with capabilities to handle or be part of most routine health care activities. The Course is designed to develop among students an understanding of health disease and other health related phenomenon so that they are able to contribute effectively in the delivery of health care to reduce the magnitude as well the impact of disease in the community.

PART- I

A) Anatomy

- Basic Concepts
- Organ Systems Elementary Knowledge

(Marks 05)

B) Physiology

- Basic concepts
- Various systems Elementary Knowledge.

(Marks 05)

C) Community Medicine

(Marks 40)

i) History of Community Medicine and Public Health

ii) Basic concepts

- Concept of health
- Concept of disease
- Concept of prevention

iii) Epidemiology - Basic concepts

iv) Infectious Disease.

- Dynamics of transmission
- Concept of control
- Immunity and Immunization
- Disinfection

v) Essentials of Outbreak Investigation

vi) Non Communicable Disease

- General concepts
- Prevention of Hypertension, Diabetes, Stroke, Blindness

v) Environmental Health

- Basic Concepts
- Water - Physical , Chemical and Biological standards for potable water sources and nature of pollution of water, hazards of water pollution, purification of water on large and small scale, sanitary well and tube well, water supply and storage system at community and household level.

- Air-sources of air pollution, estimation of level of pollutants, green house effect, thermal comfort, radiation.
- Noise pollution.
- Housing - standards for healthy housing.
- Athropods of public Health Importance.
- **Solid Waste management** - classification of solid waste, harmful effect of solid waste system of collection and disposal of solid waste.
- **Liquid Waste management** - classification, quality of different type of waste, hazards, sanitary sewerage system.
- **Night Soil Disposal -** Hazards of insanitary disposal, types of latrines in use, Borehole, Dug well, RCA and Septic tank latrines, sanitation of trenching ground.

vi) Disaster Management

- Basics

vii) Bio Medical Waste Management

- Basics

PART - II

1. Health Communication (Marks 05)

- Basics
- Approaches in Health Education
- Methods
- Contents
- Planning an IEC

2. Nutrition (Marks 10)

- Food components
- Nutritional Assessment
- Deficiency diseases
- Food adulteration
- Food borne diseases
- Food hygiene
- Nutritional Programs

3. Sanitation and Hygiene (Marks 10)

- Sanitation of Public places and Hospitals
- Slaughter House
- Eating Establishment

4. Health Administration (Marks 05)

- Health Care delivery System

- National Health Programs (Selected)
- Health Statistics
- Role of Sanitary Inspector

5. MCH and Family Planning (Marks 10)

- Ante Natal Care
- INC, PNC, Under five Care
- Family and Demography
- Methods of FP

6. Occupational Health (Marks 05)

- Hazards
- Diseases

7. International Health (Marks 05)

8. Drug Therapy (Marks 05)

- Basic concepts
- Classification of drugs
  - Brief description of common drugs at primary level

9. First Aid during (Marks 05)

- Common Ailments
- Injuries, Fractures, RTA
- Burns, Drowning, Bites, Poisoning

10. Store Keeping- Basics (Marks 05)

11. Organization and functioning of Municipal Corporations (Marks 05)

Annexure "G"

Syllabus for Food Safety Officer

Total Marks 120 **Time 02 Hours**

- Indian and International Food Laws **(Marks 10)**
- FSSAI - Role, Functions, Initiatives (A General Under Stand : I **(Marks 10)**
- Food Safety Eco System in India **(Marks 15)**
- Principles and Basics of Food Chemistry and their role in Human Nutrition. **(Marks 15)**
- Food Microbiology & General Principles of Food Hygiene (**Marks 15)**
- Food , Science and Nutrition **(Marks 15)**
- Food Quality **(Marks 10)**
- General concept of Food Analysis and Testing **(Marks 10)**
- Food Processing and Preservation **(Marks 10)**
- Principles of Food Preservation, Processing and Packaging **(Marks 10)**

Annexure "H"

Syllabus for Paramedical Assistant (Dermatology)

Marks 120
Time 02 Hours

- Basic Sciences in Dermatology, Venereology & Leprosy.
- Principles of Dermatology
- Venereology and Leprosy , Diagnosis and Therapeutics.
- The structure, functions and development of human skin.
- Skin as an organ of protection, barrier function and thermoregulation.
- Basics of cutaneous bacteriology, mycology, virology, parasitology and host resistance.
- Common laboratory procedures, stains and culture media etc, related to the cutaneous diagnosis.
- Common laboratory stains and procedures used in the histopathologic diagnosis of skin diseases and special techniques such as immune fluorescence, immunoperoxidase and other related techniques.
- Approach to the patient with leprosy
- Epidemiological Aspects
- Structure, biochemistry, microbiology of Mycobacterium leprae
- Animal models
- Pathogenesis
- Classification
- Immunology and molecular biological aspects
- Histopathology and diagnosis including laboratory aids
- Clinical features
- Reactions
- Systemic involvement (Ocular, bone, mucosa, testes and endocrine etc.)
- Pregnancy and leprosy
- HIV infection and leprosy
- Therapeutic aspects including newer drugs.
- Immunotherapy
- Disabilities, deformities and Rehabilitation
- Prevention, education and counseling
- National Leprosy Control and Elimination Programme

Annexure "I"

Syllabus for the post of Plumber

Marks 120 **Time 02 Hours**

1. English — 20 Marks
   a) Nouns and its kinds
   b) Parts of Speech
   c) Masculine/feminine (Gender)
   d) Number

2. Science — 30 Marks
   a) Micro-organism (useful and harmful micro-organism)
   b) Coal and Petroleum origin and uses.
   c) Reproduction in Animals (Elementary Knowledge)
   d) Matter and its States
   e) Force and Pressure.
   f) Motion- Elementary Knowledge.
   g) Stars and Solar System.
   h) Pollution of Air and Water.
   i) Carbon and its allotropic forms.
   j) Light

3. History — 30 Marks
   a) Indian Freedom Struggle after the revolt of 1857.
   b) Gandhiji era of Freedom Struggle.
   c) Moderater and Extremists.
   d) Reform Moments.

4. Geography — 25 Marks
   a) Natural Resources
   b) Demographic Profile of Jammu and Kashmir State.
   c) Population of India as per 2011 Census.
   d) Wildlife National Parks and Sanctuaries in Jammu and Kashmir.
   e) Hydroelectric Potential of Hydroelectric Power Houses in Jammu and Kashmir.

5. Mathematics — 25 Marks
   a) Rational Numbers
   b) Linear Equation in one Variable

c) Squares and Square roots.
d) Cubes and cube roots.
e) Simple Algebraic Identities.

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Annexure "J"

Syllabus for the post of Medical Record Keeper

Marks 120 **Time 02 Hours**

GENERAL ENGLISH (Marks 20)

(a) Essay Writing
(b) Precis Writing
(c) Letter Writing
(d) Idioms & Phrases
(e) Expansion of passages
(f) Comprehension of given passages
(g) Grammar:

- Parts of Speech : Nouns, Adjective, Verb, Adverb, Preposition, etc

(h) Correct usage and vocabularies

TECHNICAL PAPER – I (Marks 50)

Unit - I Definition of Medical Records

Unit - II Importances of Medical Records

Unit- III Uses of Medical Records

Unit- IV Values of Medical Records

Unit- V Aims and objective of Medical Records

Unit - VI Central Admitting Office

Unit - VII Medical Records Form

Unit - VIII Retension and Preservation of Medical Records

Unit - IX Hospital Management information system

TECHNICAL PAPER – II (Marks 50)

Unit - I Medical Terminology

Unit - II Legal aspect of Medical Records

Unit- III Hospital statistics

Unit- IV Coding and Indexing

Unit - V Daily census

Unit - VI Assembling and deficiency check

Unit - VII International classification of disease

Unit- VIII Aptitude Test

Annexure "K"

Marks 120
Time 02 hours

Syllabus for Refrigeator Mechanic

FIRST SEMESTER (Marks 60)

- Importance of the trade in domestic industrial & commercial fields. Industrial safety & fire fighting occupational health & safety.
- Allied trade knowledge, Basic fitting, Welding, Sheet Metal Work , Concept of Shop floor layout of the trade.
- AC Induction Motor - Single phase (Split phase- Capacitor, shaded pole, repulsion) & tree phase (squirre cage & slip ring)
- Transformer - single phase (auto transformer & current transformer, Potential transformer) and three phase inverter controls EER motors.
- Basic Electronics, Concept of Semi conductor, Rectifier, Transistor. FET.Mosfet, Bipolar Transistors, IGBT(Integrated Bi-Polar Transistor) IC, Thermister, Transducer, function, concept of Microprocessor, PLC, Regulated Power supplies, SMPS.
- Fundamentals and different terminology of RAC machineries, Laws of Thermodynamics, Gas Lawas, Carnot cycle and reverse Carnot cycle.
- Methods of Refrigeration - Ice Refrigeration, Dry ice, Steam jet, Gas throtting, Liquid Gas, Air refrigeration, vapour absorption, Vapour compression, Thermo electric, Magnetic, Thermo acoustic, Pulse tube, vortex tube.
- Types of refrigeration systems and cycles. Capacity of RAC machineries, applications in domestic commercial and Industrial fields.
- Description of major components used in RAC systems Function construction, Application of Domestic and commercial applications.
- Types of compressor used in domestic appliances Reciprocating Rotary Scroll screw etc.
- Types of Condenser used in domestic appliances Water cooled, Air cooled Evaporative etc.
- Expansion Device types, construction working, adjustments & applications.
- Evaporator -types (domestic & Commercial) construction working (Direct & Indirect systems) DX Chiller, Flooded types & applications
- Refrigerants, Description Function Composition Appliances & Types Environmental impact of different refrigerants. Alternatives of cfcs. Thermodynamic properties & characteristics of ideal refrigerants. Azeotropic and Zeotropic blends. Description odp Retro fitting, filter drier.
- Secondary refregerants, Properties of brines & glycols. Application of various brines, Inhibitor & other secondary refrigerants.
- Basic concepts of Tribology, Lubricants & Lubrication in RAC compressors properties of lubricants Thermal insulation types & function properties of insulating materials.
- Thermal insulation types, Selection of insulating material, Duct insulation & properties of insulating materials.
- Conventional Refrigerator, Frost free refrigerator, Water cooler,Deep Freezer, etc.
- Window AC, Split & Package AC description Advantage & Application.
- Introduction about commercial plants.
- Automobile AC, Function of Individual components. Refrigerants used & retrofitting of old car / Mobile AC's

SECOND SEMESTER (Marks 60)

- Non-conventional refrigeration system :- Thermo-Acoustic, Magnetic vortex-tube, Pulse-Tube Refrigeration & Lithium Bromide- Vapour Absorption System.
- PTC & NTC function & applications, Rectifications in single phase and three phase AC to DC, Variable frequency Drive (VFD) Starters-DOL, Star Delta Starter, Inter locking.
- IC's PWM (Pulse Width Modular) controller, Micro processor, Micro controller CRO
- Commercial used compressors, Digital Scroll compressor, Centrifugal Compressor, Capacity control of commercially used compressor
- Commercial used condenser, Air colled, water cooled, Evaporative Description types condenser capacity.
- Fibre reinforced Plastic (FRP) cooling Tower, Description & Types construction Application and function. Descaling procedure, Cooling tower capacity terms etc.

- Refrigerant controls for commercial plants description types Liquid expansion valve, Electronic Expansion valve, level Master Control & Equalizer construction, Function & application.
- Chilled water System - DX and flooded chiller
- Foor preservation System : Cold storage milk chilling, ice plant, pasteurizing, Description types , construction, function and Appliation.
- Refrigerant and Lubrication variable Refrigerant Flow System (VRF) with Micro controller controlling.
- Cassette Type Systems, Inverter AC's, Ductable Package, ceiling suspended split A/C , Floor standing Type, Panel A/C
- Precision Air Conditioning System, Comfort Air Conditioning System, Hospital Air Conditioning System and Unitary Systems.
- Central Air Conditioning Plants, Starting and Stopping procedure of Central Air Conditioning plant.
- HVAC Systems. Different heating systems, calculating the tonnage of heating system
- Air Distribution System : Duct Designing material classifications applications and Fabrication. Air filtering, Classifications and applications, Air outlets, fans and blowers. Acoustic and Air washer. Application of clean rooms, Air Curtain AHU and FCU.
- Heat recovery wheel (HRW) for maintaining IAQ (Indoor Air Quality) CAV (Constant Air Volume) and VAV.
- Psychrometry : Properties of air, Preparation of Chart processes relations, Different systems, heating coolong, Himidifying , De-humidifyong.
- Cooling Load Calculations and Design of Air Conditioning Systems. Different Heat source and Heat load Bypass Factor.
- Errection commissioning Heat balancing and Evaluation of central Air conditioning system. System performance, Plant operation, maintain log book, Preventive Maintenance of Commercial Plants, Trouble shooting etc.
- Transport Air Conditioning Introduction Bus, railway, Marine, Air craft-Types Function Construction, Types Capacity Application of Central Air conditioning system.

Annexure "L"

Syllabus for the post of Telephone Operator/Junior Projectionist/Film Operator/Tracer

Marks: 120 *Time: 02.00 Hrs.*

Unit-I GENERAL ENGLISH 15 Marks

(i) Paragraph writing / Comprehension
(ii) Editing / Proof Reading.
(iii) Rearranging of jumbled sentences
(iv) Dialogue
(v) Narration
(vi) Models
(vii) Articles
(viii) Paragraph writing with blanks to be filled in with the following
  i. Phrases
  ii. Pronouns
  iii. Homonyms / homophones.
(ix) Clauses
(x) Punctuation
(xi) Synonyms and antonyms
(xii) Pairs of words and their use in meaningful sentences.
(xiii) Idioms and phrases.
(xiv) Uses of Prepositions

Unit-II MATHEMATICS 15 Marks

(i) Problems on finding Surface areas and volumes of combinations of any two of the given cubes, cubiods, spheres, hemispheres and right circular cylinders / cones. Frustum of a cone.
(ii) Problems involving converting one type of metalic solid into another and other mixed problems.
(iii) Profit and loss
(iv) Simple / Compound interest.
(v) Linear equations with two variables.
(vi) Progression / BODMAS
(vii) Probability: Simple problems on Single event.

Unit-III HISTORY 15 Marks

(i) Revolt of 1857 - Causes and Effects.
(ii) Rise of National Movement - Factors.
(iii) Formation of the Indian National Congress in 1885 and Role of Moderates.

(iv) Factors leading to the rise of Exremism in the Congress with special reference to the Partition of Bengal.
(v) Important dates and historical events with reference to India
(vi) Boycott and Swadeshi Movement.
(vii) Rise of Muslim League in 1906 : Cause.
(viii) Khilafat Movement and the Non-Cooperation Movement.
(ix) Quit India Movement.
(x) Independence and Partition of India.

Unit-IV CIVICS 15 Marks

(i) Origin of democracy and its types. Direct and Indirect Democracy, Hindrance to Democracy
(ii) Fundamental Rights.
(iii) Fundamental duties.
(iv) Directive Principles.
(v) Public opinion.
(vi) Representaion.
(vii) Franchise.
(viii) Secret Ballot.
(ix) Nomination.
(x) Symbol.
(xi) The Campaign
(xii) Presidential elections.
(xiii) Languages
(xiv) Cities and Villages.
(xv) The United Nations.

Unit-V GEOGRAPHY 15 Marks

(i) Change of Seasons/ Planets/ Solar System/ Longitude - Latitude.
Types of forests (with special reference of UT of J&K)
(ii) Conservation and protection of forests.
(iii) National / Zoological Parks and wildlife sanctuaries (Reference of J&K Sanctuaries and National Parks).
(iv) Water resources. Sources of Water (with special reference of UT of J&K)
(v) Resources. Conservation and management of water resources.
(vi) Rainwater Harvesting.
(vii) Roads (Different routes of UT of J&K)

Unit-VI GENERAL KNOWLEDGE AND CURRENT AFFAIRS 20 Marks

(i) Abbreviations
(ii) Popular Personalities
(iii) Geographical Discoveries
(iv) Principal Languages of India
(v) Capitals and Currencies of Countries

(vi) International Organisations- UNO, WHO, WTO, IMF, UNESCO, UNCTAD etc.
(vii) Important Regional Organizations and Blocs- BRICS, OPEC, ASEAN, SAARC, BIMSTEC, G-20, G-7 etc.
(viii) Space Programme of India
(ix) India's Automic Research Programme
(x) Honours and Prizes, Seven Wonders.
(xi) The World of Sports
(xii) Exports and Imports
(xiii) GDP, GNP, Per capita Income etc
(xiv) Thermal / Nuclear/ Hydro Power Plants in India.

Unit-VI GENERAL KNOWLEDGE WITH SPECIAL REFERENCE to UT of J&K 15 Marks

(i) Popular names of personalities and their achievements/ Contribution (National and International).
(ii) Weather, Climate, Crops, Means of Transport.
(iii) J&K History, Economy and Culture
(iv) Flora and Fauna of J&K
(v) Rivers and Lakes.
(vi) Important Tourist Destinations.
(vii) J&K Panchayati Raj Act, 1989 (as ameneded upto December, 2020), 73rd & 74th Constitutional amendments.
(viii) J&K Reorganisation Act, 2019

Unit-VIII MENTAL ABILITY TEST 10 Marks

(i) Number series
(ii) Letter series
(iii) Coding decoding
(iv) Direction sense
(v) Blood relations
(vi) Mathematical reasoning
(vii) Speed, Distance and Time
(viii) Statements and conclusions

Annexure "M"

Marks 120
Time 02 Hours

Syllabus for the post of: Junior Cultural Assistant

Basic Knowledge of Swaras: shud, Komal, Vikrit, vadi and samvadi
Basic Knowledge of: Folk Music of J&K
Knowledge of Harmonium Playing and accompaniment
Knowledge of Folk Musical Instruments of J&K
Knowledge of different types ofOctaves
Performance skills: knowledge of Taal and Laya (Kaharwa Dadra, Khemta)

Annexure "N"

Syllabus for the post of Rent Collector/Re-Toucher Artist/Carpenter Cum Mistri-II/Welder

Marks: 120 *Time: 02.00 Hrs.*

Unit-I GENERAL ENGLISH 15 Marks

(i) Paragraph writing / Comprehension
(ii) Editing / Proof Reading.
(iii) Rearranging of jumbled sentences
(iv) Dialogue
(v) Narration
(vi) Models
(vii) Articles
(viii) Paragraph writing with blanks to be filled in with the following
  i. Phrases
  ii. Pronouns
  iii. Homonyms / homophones.
(ix) Clauses
(x) Punctuation
(xi) Synonyms and antonyms
(xii) Pairs of words and their use in meaningful sentences.
(xiii) Idioms and phrases.
(xiv) Uses of Prepositions

Unit-II MATHEMATICS 15 Marks

(i) Problems on finding Surface areas and volumes of combinations of any two of the given cubes, cubiods, spheres, hemispheres and right circular cylinders / cones. Frustum of a cone.
(ii) Problems involving converting one type of metalic solid into another and other mixed problems.
(iii) Profit and loss
(iv) Simple / Compound interest.
(v) Linear equations with two variables.
(vi) Progression / BODMAS
(vii) Probability: Simple problems on Single event.

Unit-III HISTORY 15 Marks

(i) Revolt of 1857 - Causes and Effects.
(ii) Rise of National Movement - Factors.
(iii) Formation of the Indian National Congress in 1885 and Role of Moderates.

(iv) Factors leading to the rise of Exremism in the Congress with special reference to the Partition of Bengal.
(v) Important dates and historical events with reference to India
(vi) Boycott and Swadeshi Movement.
(vii) Rise of Muslim League in 1906 : Cause.
(viii) Khilafat Movement and the Non-Cooperation Movement.
(ix) Quit India Movement.
(x) Independence and Partition of India.

Unit-IV CIVICS 15 Marks

(i) Origin of democracy and its types. Direct and Indirect Democracy, Hindrance to Democracy
(ii) Fundamental Rights.
(iii) Fundamental duties.
(iv) Directive Principles.
(v) Public opinion.
(vi) Representaion.
(vii) Franchise.
(viii) Secret Ballot.
(ix) Nomination.
(x) Symbol.
(xi) The Campaign
(xii) Presidential elections.
(xiii) Languages
(xiv) Cities and Villages.
(xv) The United Nations.

Unit-V GEOGRAPHY 15 Marks

(i) Change of Seasons/ Planets/ Solar System/ Longitude - Latitude.
Types of forests (with special reference of UT of J&K)
(ii) Conservation and protection of forests.
(iii) National / Zoological Parks and wildlife sanctuaries (Reference of J&K Sanctuaries and National Parks).
(iv) Water resources. Sources of Water (with special reference of UT of J&K)
(v) Resources. Conservation and management of water resources.
(vi) Rainwater Harvesting.
(vii) Roads (Different routes of UT of J&K)

Unit-VI GENERAL KNOWLEDGE AND CURRENT AFFAIRS 20 Marks

(i) Abbreviations
(ii) Popular Personalities
(iii) Geographical Discoveries
(iv) Principal Languages of India
(v) Capitals and Currencies of Countries

(vi) International Organisations- UNO, WHO, WTO, IMF, UNESCO, UNCTAD etc.
(vii) Important Regional Organizations and Blocs- BRICS, OPEC, ASEAN, SAARC, BIMSTEC, G-20, G-7 etc.
(viii) Space Programme of India
(ix) India's Automic Research Programme
(x) Honours and Prizes, Seven Wonders.
(xi) The World of Sports
(xii) Exports and Imports
(xiii) GDP, GNP, Per capita Income etc
(xiv) Thermal / Nuclear/ Hydro Power Plants in India.

Unit-VI GENERAL KNOWLEDGE WITH SPECIAL REFERENCE to UT of J&K 15 Marks

(i) Popular names of personalities and their achievements/ Contribution (National and International).
(ii) Weather, Climate, Crops, Means of Transport.
(iii) J&K History, Economy and Culture
(iv) Flora and Fauna of J&K
(v) Rivers and Lakes.
(vi) Important Tourist Destinations.
(vii) J&K Panchayati Raj Act, 1989 (as ameneded upto December, 2020), 73rd & 74th Constitutional amendments.
(viii) J&K Reorganisation Act, 2019

Unit-VIII MENTAL ABILITY TEST 10 Marks

(i) Number series
(ii) Letter series
(iii) Coding decoding
(iv) Direction sense
(v) Blood relations
(vi) Mathematical reasoning
(vii) Speed, Distance and Time
(viii) Statements and conclusions

Annexure "O"

Syllabus for Conservation Assistant

Total Marks 120 **Time 2 Hours**

Part-I: 16 Marks

01. Definition of Museum, Museology and Museography.
02. History and development of Indian Museum.
03. Museum Collection.
    a. Primary source
    b. Secondary source
    c. Documentation system
    d. Catalogue
    e. Exhibition
04. What is documentation system?
05. Museum and an educational research institution.
06. Communication policy of the Museum.
07. Importance of design of Museum gallery and Museum building.
08. Museum as an agency of non-formal education.

Part-II: 8 Marks

Delocalized Chemical bonding

Conjugation, Cross conjugation, rule of resonance, steric inhibition of resonance.

Aromaticity: Huckel rule and concept of aromaticity, Molecular orbital description of aromaticity and antiaromaticity, Relation between NMR and aromaticity. Annulenes (Two to more than ten-electronic system), Aromaticity of hetero annulenes and fullerenes (C-60). Homoaromaticity. Hyper conjugation: Explanation of hyper conjugative effect, isovalent and sacrificial hyper conjugation.

Part-III: 8 Marks

Stereochemistry:

Elements of symmetry, Chirality due to chiral centre, molecules with more than one Chiral centre, thero and erythron isomers optical activity in the absence of chiral carbon (biphenyls, allenes and spirans). Chirality due to helical shape. Enantiotropic and diastereotropic atoms, groups and faces.

Part-IV: 8 Marks

Reaction Mechanism/Structure and reactivity

Types of mechanisms. Types of reactions, thermodynamic and kinetic requirements.

Effect of structure on reactivity

Resonance and field effects, steric effect, quantitative treatment

Part-V: 8 Marks

Aliphatic Electrophilic substitutions

General mechanism of SE1, SE2 and SEireactions, Mechanism of reactions involving migration of double bond. Effect of substrate, leaving group and solvent on reactivity.

Aliphatic Nucleophilic substitutions

Mechanisms and stereochemical implications of SN2, SN1, SNiandneighbouring group participation (by double and single-bonds) reactions. Effect of substrate structure, attacking nucleophile, leaving group and solvent on the rates of SN1 and SN2 reactions.

Part –VI: 8 Marks

Elimination reactions:

Discussion of E1, E2, E1cB and E2C mechanisms. Effect of substrate structure base and the leaving group on reactivity. Competition between substitution and elimination reactions. Stereochemistry and orientation of E2 elimination. Mechanism and orientation inpyrolytic eliminations, Shapiro reaction.

Part-VII 8 Marks

Aromatic Electrophilic Substitution

The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/ratio, ipso attack. Orientation of substitution in benzene rings having more than one substituents. Orientation in other ring systems. Mechanisms of diazonium coupling, Vilsmier-Haackand Gattermann-Koch reactions and Fries rearrangement.

Part-VIII: 8 Marks

Aromatic Nucleophilic substitution

Discussion of different mechanism (SN1;SNAr, Benzyne and srn!) Structure reactivity relationships. Effect of leaving group and attacking nucleophile. Mechanisms of Von-Richter, Sommelet-Hauser and Smiles arrangements and Chichibabin reaction.

Part-IX: 8 Marks

Free Radical Substitution

Free radical substitution mechanisms. Mechanism at an aromatic substrate, neighboring group assistances, reactivity for aliphatic and aromatic substrates. Reactivity in the attacking radical. Effect of solvent on reactivity. Allylic alogenations (NBS), oxidation of aldehydes to carboxylic

acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts, Sandmayer reaction, free radical rearrangement and Hunsdiecker reaction.

Part-X: 24 Marks

I). Preventive conservation in terms of:

1. Light
2. Insects
3. Fungus
4. Atmosphere
5. Pollution

II). Curative Conservation

1. Conservation of Paper Material-Currency notes, judicial papers, manuscripts in museums.
2. Care of bronze, brass and other alloy artefacts and metal objects like iron, copper and zinc etc.
3. Conservation of terracotta.
4. Conservation of mannequins using base materials.
5. Basic steps in conservation of paper machie artefacts/objects.
6. Conservation of animas in aquatic medium using alcoholic medium.

Part-XI: 16 Marks

General Knowledge

1. What is Preventive conservation?
2. What is curative conservations?
3. What is conservation
4. What is archaeology?
5. What is archives? When was achieves established in J&K.
6. What is museum?
7. When was SPS museum Srinagar established/Give history?
8. When was Dogra art museum Jammu established?
9. What is documentation?
10. How is Identification of Antiquities made?
11. What types of antiquities were recovered from the Harwan during the course of excavation?
12. When was Burzaham excavated and what type of antiquities were recovered?
13. How many periods are traced in Burzaham? Give their details period wise.
14. When is world Heritage Day celebrated?
15. When is world heritage week celebrated?
16. When was International museum day celebrated?
17. What is Indian treasure true act 1978.
18. What is Antiquities and Art Treasure Act 1971 AD.

19. Define Ancient Monument and Archaeological sites and remains Act 1958?
20. Define J&K Ancient monuments and preservation act 1977 (samvath).

Annexure "P"

Syllabus for Modeller

Total Marks 120 **Time 2 Hours**

1.	History of Art	6 Marks
2.	Antique study	6 Marks
3.	Drawing, Drawing (Memory), Drawing (Perspective)	12 Marks
4.	Modelling (Head Study)	6 Marks
5.	Sculptural Design (C)	6 Marks
6.	Sculpture (M)	6 Marks
7.	Aesthetics	6 Marks
8.	Drawing from Life	6 Marks
9.	Modelling (Full figure and bust study from life)	6 Marks
10.	Sculptural Composition	6 Marks
11.	Metal Sculpture & Bronze Casting	6 Marks
12.	Anatomy	6 Marks
13.	Sculpture (Modelling and Carving Design)	6 Marks
14.	Dissertation	6 Marks
15.	Drawing (Human Figure)	6 Marks
16.	Sculptural Composition (Relief)	6 Marks
17.	Sculptural Composition (Round)	6 Marks
18.	Portraiture	6 Marks
19.	Metal Sculpture	6 Marks

Annexure "Q"

Syllabus for the post of Assistant Secretary/Head Assistant

Marks. **120** *Time: 02.00 Hrs.*

S. No.	Subjects/ Topic	Marks assigned
1	GENERAL AWARENESS with special reference of J&K UT	36
2	GENERAL ENGLISH & COMPREHENSION	24
3	GENERAL INTELLIGENCE & REASONING	24
4	QUANTITATIVE APTITUDE	24
5	BASIC KNOWLEDGE OF COMPUTERS	12
	TOTAL	120

1. GENERAL AWARENESS with special reference of J&K UT

(i) Current Events of National and International importance
(ii) Political & Physical divisions of World & India
(iii) Climate & Crops in India
(iv) Transport & Communication.
(v) Demography- Census, its feature and Vital Statistics.
(vi) Important Rivers & Lakes in India.
(vii) Indian Economy.
(viii) Indian Culture & Heritage.
(ix) Indian History with special reference to Freedom Movement.
(x) Indian Constitution- Basic features- Preamble, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy
(xi) Science & Technology.
(xii) Environment, Ecology & Bio-diversity.
(xiii) Taxation in India- Direct & Indirect Tax - CBDT, GST etc.
(xiv) J&K UT
    a) History
    b) Economy
    c) Geography- (Weather, Climate, Crops, Rivers, Lakes, Flora, Fauna.)
    d) Heritage & Culture
    e) Important Tourist Destinations
(xv) J&K Reorganisation Act, 2019.

2. GENERAL ENGLISH & COMPREHENSION

(i) Tenses
(ii) Narration
(iii) Modals
(iv) Articles
(v) Reading Comprehension

(vi) Fill in the blanks with Phrases, Pronouns, homonyms/ homophones etc
(vii) Clauses
(viii) Synonyms and antonyms
(ix) Pairs of words and their use in meaningful sentences.
(x) Rearranging of jumbled sentences.
(xi) Idioms and phrases.
(xii) Uses of Prepositions.
(xiii) Active & Passive Voice
(xiv) Error Spotting
(xv) Sentence Correction
(xvi) Spellings Correction

3. GENERAL INTELLIGENCE & REASONING

(i) Number series, Letter series, Semantic Series, Speed, Distance and Time, Statements and conclusions, Logical Reasoning, Mental Reasoning, Word Building, Numerical Operations, Semantic Analogy, Symbolic/ Number Analogy, Figural Analogy, Semantic Classification, Symbolic/ Number Classification, Figural Classification, Problem Solving.

(ii) Symbolic Operations, Trends, Space Orientation, Space Visualization, Venn Diagrams, Drawing inferences, Punched hole/ pattern- folding & un-folding, Figural Pattern- folding and completion, Indexing, Address matching, Date & city matching, Classification of centre codes/roll numbers, Small & Capital letters.

4. QUANTITATIVE APPTITUDE

The scope of the test will be computation of

(i) Whole numbers, decimals, fractions and relationships between numbers, Profit and Loss, Discount, Partnership Business, Mixture and Alligation, Time and distance, Time & Work,Percentage. Ratio & Proportion, Square roots, Averages, Interest, Basic algebraic.

(ii) Graphs of Linear Equations, Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles, Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Heights and Distances, Histogram, Frequency polygon, Bar diagram & Pie chart, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square base, Trigonometric ratio, Degree and Radian Measures, Standard Identities, Complementary angles.

5. KNOWLEDGE OF COMPUTERS

(i) Basic Applications of Computer and its component.
(ii) Fundamentals of computer sciences.
(iii) Hardware & Software, Concept of Open-Source Technologies.

(iv) Input & output Devices.

(v) Knowledge of MS Word, MS Excel, MS Access, MS PowerPoint, PDF Internet and E-mail.

(vi) Concept of Computer Virus and Latest Anti-Virus.

(vii) Role of Information Technology in Governance.

Annexure "R"

Syllabus for the post of Tabla Assistant

Max. Marks: 120
Time: 2:00 hrs

1. Origin and Evolution of Tabla. (10 Marks)
2. Sangeet and Taal. (10 Marks)
3. Tabla and its six Gharanas with examples. (10 Marks)
4. Taal and its "Ten Pranas". (10 Marks)
5. Jaati and its Five Kinds. (10 Marks)
6. Writting ability of different compositions in different Taals with different Layakaries. (10 Marks)
7. Brief knowledge of "Rasas"and its use in Tabla. (15 Marks)
8. Knowledge about :Hindustani"and "Karnataki"Taal Padhati. (15 Marks)
9. Knowledge about the following Layakaries:- 2:3, 4:5, 4:7 (15 Marks)
10. Brief Biographical Sketch of:- (15 Marks)
    (a) Ustad Allah Rakha Khan
    (b) Pandit Krishan Maharaj
    (c) Pandit Samta Prasad
    (d) Ustad Zakir Hussain

Syllabus for the post of Public Address System Operator(PASO)

Total Marks:120

Annexure "S"

Time: 02 Hours

Unit-I GENERAL ENGLISH

12 marks

(i) Articles
(ii) Verbs
(iii) Punctuation
(iv) Synonyms and Antonyms
(v) Idioms and phrases.
(vi) Uses of Prepositions

Unit-II MATHEMATICS

24 marks

(i) Decimals
(ii) Averages
(iii) Time, Work and Distance
(iv) Profit and loss
(v) Simple / Compound interest.
(vi) Linear equations with two variables.
(vii) Progression / BODMAS
(viii) Probability
(ix) Problems of Age
(x) LCM,HCF
(xi) Ratio and Proportion
(xii) Percentage
(xiii) Bar diagram and Pie chart
(xiv) Mixture and Alligation
(xv) Circles and its Chords
(xvi) Triangles

Unit-III REASONING

24 marks

(I) Number series
(II) Letter series
(III) Coding/Decoding
(IV) Direction sense
(V) Blood relations
(VI) Speed, Distance and Time
(VII) Statements and conclusions.
(VIII) Venn Diagram
(IX) Figure Series Completion

Unit-IV GENERAL AWARENESS AND CURRENT AFFAIRS

24 marks

Abbreviations, Important Dates, Popular Personalities, Geographical Discoveries, Books and Authors, Principal Languages of India, Capitals and Currencies of Countries, United Nations Organisation, Members of United Nations Organisation (UNO), Other International Organisations and Groups, Members of SSARC, ASEAN, BRICS AND G-7, Space Programme of India, India's Automic Research Programme, Awards, Honours and Prizes, Seven Wonders. The World of Sports, Exports and Imports, India GDP, Per capita Income, Thermal / Nuclear/ Hydro Power Plants in India.

Popular names of personalities and their achievements / contribution, Weather, Climate, Crops, Means of Transport, Important projects and their impact on Economy, Rivers and Lakes, Important Tourist Destinations, History of J&K, Historical places and their importance, Flora and Fauna of J&K.

Unit-V

BASIC ELECTRONICS AND COMMUNICATION

36 marks

(i) Concept of Insulator, Conductor, Semiconductors, Concept of Intrinsic and Exterinsic Semiconductor, Conductivity

(ii) PN Junction Diodes: Forward and Reserve Baised PN Junction, Concept of junction capactiance, Application of Diode, Filters ,Transistors: BJT(CE,CB,CE configuration), FET: FET & MOSFET, Amplifiers, Oscillators

(iii) Digital Electronics: Logic Gates, Logic Simplification, Adder & Subtractor, K-Map, Multiplexer &Demultiplexer , Latches and Flip Flop, Counters, Shift Register, Microprocessor: Architecture, Programming, Interfacing, Interrupts

(iv) Concept of Modulation, Amplitude Modulation, Frequency Modulation, Phase Modulation, Pulse Modulation, AM/FM Receiver, Propagation, Optical fiber Communication.

(v) Public Address System, Microphones and Loudspeakers, concept of LED & LCD.Computer Networking and interfacing,Multimedia projection.

Annexure "T"

SYLLABUS FOR THE POST OF JUNIOR PROGRAMMER

Marks 120 **Time 02 Hours**

1. COMPUTER PROGRAMMING USING 'C'

Algorithm and Programming Development, Program Structure, Control Structures, Functions, Arrays, Pointers, Structures and Unions, Strings, Files.

2. DATABASE MANAGEMENT SYSTEM (RDBMS)

Database System Concepts and Architecture, Data Modeling using E.R. Model (Entity Relationship Model), Relational Model, Normalization, Database Access and Security, MYSQL/SQL (Structured Query Language)

3. OPERATING SYSTEMS

Process Management Functions (Principles and Brief Concept); Job Scheduler, Process Scheduler, Process synchronization. Memory Management Function (Principles and Brief Concept); Introduction, Single Process System, Fixed Partition Memory, System Loading, Segmentation, Swapping, Simple Paging System, Virtual Memory. I/O Management Functions (Principles and Brief Concept); Dedicated Devices, Shared Devices, I/O Devices, Storage Devices, Buffering, Spooling. File Management; Principles and Brief Concept, Types of File System; Simple file system, Basic file system, Logical file system, Physical file system. Dead Lock; Condition for Dead lock, Dead Lock Preventions, Dead Lock Avoidance.

4. DATA STRUCTURES

Problem solving concept, top down and bottom up design, structured programming, Concept of data types, variables and constants, Concept of pointer variables and constants, Arrays, Linked Lists, Stacks, Queues and Recursion, Trees. , Search algorithm (Linear and Binary), Concept of sorting, sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge Sort, Heap Sort) and their comparisons.

5. OBJECT ORIENTED PROGRAMMING USING C++

Fundamentals of object oriented programming – procedure oriented programming. Object oriented programming concepts – Classes, reusability, encapsulation, inheritance, polymorphism, dynamic binding, message passing, data hiding., Review of constructs of C used in C++ : variables, types and type declarations, user defined data types; increment and decrement operators, relational and logical operators; if then else clause; conditional expressions, input and output statement, loops, switch case, arrays, structure, unions, functions, pointers; preprocessor directives, Classes and Objects, Member Functions, Overloading Member Functions, Inheritance, Polymorphism and Virtual Functions, File and Streams.

6. JAVA PROGRAMMING

Java Virtual Machine (JVM), Java In Time (JIT) compiler, JDK, Working with data types, control flow statements, arrays, casting, command line arguments, Java Classes and Memory Management, Interfaces and Packages, Exception Handling and Stream Files, Threads and Multi-threading, Java Data Base Connectivity (JDBC).

7. VISUAL PROGRAMMING USING (.NET)

Introduction to .NET framework, feature of .Net framework, architecture and component of .Net, VB.NET Basics, Visual Basic .NET Programming Language-Variables & Data Type, Strings, Arithmetic Operators, Building the project, Common Control Controls, Functions Call and Arguments, Select Case, Loops, Nesting of Loops, Decision Structures, Error handling using Try.. Catch Block, Database Connectivity

8. SOFTWARE ENGINEERING

Size factors. Quality and productivity factors. Management issues, Models: waterfall, spiral, prototyping, fourth generation techniques, s/w process, Introduction to agile technologies.

Cost factors, cost estimations techniques. Staffing level estimation, estimating software maintenance costs, COCOMO.

Problem analysis, requirement engineering. The software requirements specifications (SRS). formal specifications techniques, characteristics of a good SRS.

Quality assurance work through and inspections static analysis, symbolic execution unit testing, formal verifications. Black box and white box testing techniques.

Definition of Quality, Quality Concepts, Quality Control, Quality Assurance, SQA Activities, Software Reviews, Inspections, Walkthroughs, Formal Technical Reviews, Review Guidelines, Quality Assurance Standards, ISO 9000, ISO 9001:2000, ISO 9126, CMM, TQM, TQM principles, Six Sigma, SPICE.

Risk Management and Configuration Management

9. COMPUTER NETWORKS

Concept of network, Models of network computing, Networking models, Peer-to -peer Network, Server Client Network, LAN, MAN and WAN, Network Services, Topologies, Concept of switching, Switching Techniques ,OSI Reference Model.

Concept of physical and logical addressing, Different classes of IP addressing, special IP address, Sub netting and super netting ,Loop back concept, IPV4 and IPV6 packet Format, Configuring IPV4 and IPV6.

Network Security, Introduction to basic encryption and decryption, concept of symmetric and asymmetric key cryptography, overview of DES, RSA and PGP. Introduction to Hashing: MD5, SSL, SSH, HTTPS, Digital Signatures.

Computer Network Attacks, Active Attacks, Passive Attacks, Stealing Passwords, Social Engineering, Bugs and Backdoors, Authentication Failures, Protocol Failures, Information Leakage, Denial-of-Service Attacks, Botnets, Phishing Attacks.

10. INTERNET AND WEB TECHNOLOGIES

Telephone line, cable, leased line, ISDN, VSAT, RF link. World Wide Web and its evolution, web page, web server, HTTP protocol. Examples of web servers. Navigation Tools: Mozilla Firefox, Google Chrome, Internet Explorer, Uniform Resource Locator (URL). Hypertext, hyperlinks and hypermedia, URL, its registration, browsers, search engines, proxy servers.

Basics of authentication and authorization. Introduction to firewall, various techniques of encryption and decryption, SSL (Secure Socket Layer).

Annexure "U"

Syllabus for Rehabilitation Psycholgist

Part - I

Marks 120
Time 02 Hours

Psychosocial Perspectives of Disability (Marks 20)

- introduction
- Concepts and theory
- Adjustment and well-being
- Family and disability
- Society and disability
- Mental health issues
- Ethical issues

Biological Perspectives of Disability (Marks 20)

- introduction
- Medical Aspects of Impairments
- Medical aspects of disability
- Wellness and illness
- Assistive technology
- Aids and appliances

Statistics and Research Methods (Marks 15)

- Introduction
- Sampling and test of significance
- Non-parametric statistics
- Research design
- Multivariate analysis
- Analysis of data

Psychodiagnostics Assessments of Persons with Disability (Marks 10)

- Introduction
- Assessment of cognition
- Assessment of aptitudes
- Assessment of psychopathology
- Assessment of work functioning
- Assessment of daily functioning
- Assessment for case formulation

Part - II

Psychological Interventions (Marks 20)

- Introduction
- Health behavior
- Affective therapies
- Cognitive therapies
- Systemic therapies
- Counseling
- Ethics and psychotherapy

Behavioral Interventions (Marks 20)

- Theoretical foundations
- Relaxation procedures
- Skills training
- Counter-conditioning and extinction procedures
- Applied behavior analysis
- Intervention research

Community-Based Rehabilitation (Marks 15)

- Goals and Objectives
- Components
- Role of professionals
- Community issues
- Resources
- Policy issues

Annexure "V"

Syllabus for Laboratory Assistant

(Health & Medical Education)

Total Marks 120 Time 02 hours

. PAPER-I: PHARMACY

- A. Forensic Pharmacy
- B. Manufacturing Pharmacy
- C. Pharmaceutical Analysis
- D. Medicinal Chemistry
- E -Pharmacognosy
- F- Pharmacology & Toxicology
- G- Hospital & Clinical Pharmacy
- H. Anatomy, Physiology & Health Education

• PAPER-II (GENERAL KNOWLEDGE) :

A. FORENSIC PHARMACY (Marks 25)

1. Drugs and Cosmetic Act, 1940 and Rules thereunder, 1945 with amendments.
2. Pharmacy Act, 1948.
3. Drug Price Control Order, 1995.
4. Medical Termination of Pregnancy Act, 1971.
5. Poison Act, 1919 and Dangerous Drugs Act, 1930.
6. Drugs and Magic Remedy Act, 1954.
7. Medical and Toilet Preparation Act, 1955.
8. Prevention of Cruelty to Animal Act.
9. Trademark Registration Act.
10. Pharmaceutical Ethics.

B. MANUFACTURING PHARMACY (Marks 25)

1. Tablet and Tablet coating.
2. Capsule.
3. Emulsion, Suspension, Ointment, and Cream.
4. Ophthalmic Solutions.
5. Blood Fluid and Electrolytes.
6. Parenteral preparation and Quality Control.
7. Surgical Dressing.
8. Biological preparation (Sera, Vaccine and Anti-Sera)
9. Biopharmaceutics.

C. PHARMACEUTICAL ANALYSIS (Marks 20)

1. Limit Test.
2. Bio-Assay.
3. Sterility Test.
4. Pyrogen Test.
5. Theory & Application of Colorimeter, Fluorimeter, Nephelometer and Turbidometer, U.V.Visilile Spectrophotometer.
6. Kerl Fischer Titration.

7. Alcohol determination.
8. Microbiological Assay of Vitamins, Antibiotics and Vaccine Preparation.

D. MEDICINAL CHEMISTRY (Marks 20)

Structure, Storage, Preparation & Brand names of the Following Classes
(Definition, Classification, etc.) :

1. Steroids
2. Sedatives and Hypnotics.
3. Psycho-therapeutic Agents.
4. Antihistaminic Agents.
5. Analgesics (narcotic, non-narcotic and NSAID)
6. Cardiovascular Agents.

E. PHARMACOGNOSY (Marks 20)

Source, Chemical constituents, uses and adulteration of the following classes of natural drugs of the followings

1. Rauwolfia,
2. Ipecacuahna,
3. Belladonna,
4. Cinchona,
5. Cinnamon,
6. Digitalis,
7. Senna,
8. Aloe,
9. Noxvomica,
10. Opium,
11. Kurchi,
12. Brahmi,
13. Tulsi,
14. Bael, and
15. Ephedra.

PAPER-II (GENERAL KNOWLEDGE) : (Marks 10)

- General Knowledge of Indian Constitution,
- Science - Inventions & Discoveries,
- History, India and Neighboring Countries,
- Sports, Knowledge of Current Events,
- General Politics, Budget and Five Year Plans,
- Geography,
- Current Affairs,
- Economy,
- Banking and Finance

- Economy.

Annexure "W"

Syllabus for Cleaner

Total Marks=120
Time=02 Hours

1) Basis Mathematics =20 Marks

- Percentage
- Average
- Time, Work and Distance
- Ration and Proportions
- Problem of Age
- Probability
- LCM, HCF
- Mensuration

2) Basis Reasoning =20 Marks

- Analogies
- Relationship concepts
- Figure odd one out
- Direct Sense
- Figure Series completion
- Venn Diagram
- Number series
- Coding/Decoding

3) Basis English =30 Marks

- Articles
- Synonyms
- Antonyms
- Preposition
- Verbs
- Reading comprehension
- Determiners
- Spellings
- Sentences

4) General Awareness and Science =50 Marks

- General current events (National Level)

- Sports
- India culture
- India history
- Indian geography
- Capital/State
- General Science
- Health, Hygiene and Sanitation
- Geography of Jammu and Kashmir
- Culture of Jammu and Kashmir
- History of Jammu and Kashmir

Annexure "X"

Syllabus: Junior Librarian

Total Marks = 120 Time = 02 Hours

UNIT I 20 Marks

(i) Types of Libraries and their Features
(ii) Role of Libraries in contemporary Society
(iii) Five Laws of Library Sciences
(iv) Library legislations in India
(v) Digital Library
(vi) Intellectual Property Rights (IPR)
(vii) National and International Library Associations: ILA, IASLIC, IATLIS, IFLA, FID ALA, ASLIB etc
(viii) National and intercalation Agencies: UNESCO, OCLC, PRRLF, UGC, INFLIBNET, DELNET etc
(ix) Information Centres, DRTC, ISI, INSDOC (NISCAIR), NASSDOC, DESIDOC, SENDOC, etc

Unit-II Marks 20

(i) Basic Terminology: call Number, Class Number, Book Number, Isolates
(ii) Classification; concept & purpose.
(iii) Types and characteristics of classification scheme.
(iv) ISBD, ISBN, ISSN; classification schemes.
(v) Features of DDC, UDC, and CC
(vi) Five Fundamental Categories
(vii) Notation: Definition and Purpose
(viii) Library Catalogue; Definition and purpose
(ix) Cannons of Classification and Cataloguing

Unit-III Marks 20

(i) Principles of Book Selection
(ii) Selection Tool; Print and Non-Print Materials
(iii) Processing of Documents; Accessioning, Classification, Cataloguing, labelling and shelving
(iv) Difference between catalogue, Accession Register, bibliography and Shelf list.
(v) Serials/ Journals; Selection and procurement
(vi) Book Transaction System: Traditional and Modern
(vii) Stock verification of Books; Methods and Tools
(viii) Weeding Process

Unit-IV Marks 20

(i) Information sources: Definition, types and importance;

(ii) Information sources- Primary, Secondary and Tertiary.
(iii) Information Services: Definition and need of reference, documentation and information services.
(iv) Types of Dictionaries, Encyclopaedias
(v) Geographical and Biographical Sources
(vi) Indexing and Abstracting Sources
(vii) Types of Bibliographies
(viii) Bibliographies Sources

Unit-V Marks 20

(i) Types of Reference service, Ready reference service, Long Rang Reference Service
(ii) Reference Librarian: Role Skills and Competences
(iii) User Education/ Information Literacy Skills
(iv) CAS/SDI
(v) International Information System; INIS, AGRIS, MEDLARS/MEDLINE, INSPEC
(vi) Information Seeking Pattern

Unit-VI Marks 20

(i) Study of Computer including concept of Hardware.
(ii) Library Automation Need and Purpose.
(iii) Need for computer applications, Areas of computer applications. Automation in library Management. Software Packages for Library Management-Essential features
(iv) Computer and its Units, Computer and its classification.
(v) Study of Various operating systems.
(vi) General-purpose application software: Word Processing such as MS-office, lotus.
(vii) Special Purpose application software: CDS/ISIS.
(viii) Library Networking: Needs & Purpose.
(ix) OPAC AND Web-OPAC.

(Ashok Kumar) JKAS,
Controller of Examination,
J&K Services Selection Board,
Jammu

Annexure "Y"

Syllabus for the post of Electrician

Time: 02 Hours

Marks: 120

1. Basic English - 12 Marks

- Articles
- Synonyms
- Antonyms
- Reading Comprehension
- Spelling
- Tenses , Sentence
- Noun, Adjective, Pronoun
- Homophones
- Communication Skills

2. Basic Mathematics - 12 Marks

- Arithmetic Algebra
- Average
- Percentage
- LCM, HCF
- Profit & Loss
- Number System
- Square root
- Ratio and proportion

3. Basic Electrical - 48 Marks

- Basic Concept of Electricity, its applications.
- Ohms Law, Kirchhoff's Law, Resistors and its combination- Series & Parallel Combinations.
- Earthing- Principle of different methods of earthing and selection i.e., pipe, plate etc.
- Domestic Appliances and their Working Principles- Heater, Electric iron, Geyser, Washing Machine, Refrigerator.
- Illumination and its types, Laws of Illumination.
- Power Generation- Various Sources of Electrical Power Generation.
- Introduction to electromagnetism, magnetic field around a straight current carrying conductor and a solenoid and methods to finds its direction, force between two parallel current carrying.
- Conductor- concept of hyteresis loop, and hyteresis loss.

Faraday's law of electromagnetic Induction, Lenz's Law, Fleming right and left hand rule.

- Difference between A.C and D.C Concept of alternating current and voltage, equation of instantaneous value, form factor. Power factor and its practical significance. Advantages of 3 phases over single phase system.
- Various electrical symbols used in domestic and industrial installation and power system as per 89S.
- Study of electrical safety measures as mentioned in the electricity rules and shock treatment. Including first aid, tools, accessories and instruments required for installations, maintenance and repair work of electrical equipments.

AC & DC Machines - 24 Marks

- Electrical Machines and their types- D.C. Generator, D.M Motor, Transformer, Alternator, Three Phase Induction Motor

Electrical Measuring Instruments - 12 Marks

- Electrical Measuring Instruments- Ammeter, Voltmeter, Wattmeter, Earth Tester, P.F. meter

4. Basic of Computer - 12 Marks

- Introduction, Computer and its generations.
- Hardware and peripherals Devices.
- Basic of Operating system.
- Concept of Internet – www, Web browser, Web Site.
- Basic of Computer Networks- LAN, WAN, MAN.
- Email.
- Digital devices.
- Mobile devices.
- Smart watch, Smart television.
- Search engine.
- Internet services and Email.
- To use mobile data or other networks through Bluetooth and WIFi.
- MS- Word, MS- Excel & MS- Power point.

Annexure "Z"

Syllabus for Laboratory Technician

(Health & Medical Education)

Total Marks 120 Time 02 Hours

. PAPER-I: PHARMACY

- A. Forensic Pharmacy
- B. Manufacturing Pharmacy
- C. Pharmaceutical Analysis
- D. Medicinal Chemistry
- E -Pharmacognosy
- F- Pharmacology & Toxicology
- G- Hospital & Clinical Pharmacy
- H. Anatomy, Physiology & Health Education

• PAPER-II (GENERAL KNOWLEDGE) :

A. FORENSIC PHARMACY (Marks 25)

1. Drugs and Cosmetic Act, 1940 and Rules thereunder, 1945 with amendments.
2. Pharmacy Act, 1948.
3. Drug Price Control Order, 1995.
4. Medical Termination of Pregnancy Act, 1971.
5. Poison Act, 1919 and Dangerous Drugs Act, 1930.
6. Drugs and Magic Remedy Act, 1954.
7. Medical and Toilet Preparation Act, 1955.
8. Prevention of Cruelty to Animal Act.
9. Trademark Registration Act.
10. Pharmaceutical Ethics.

B. MANUFACTURING PHARMACY (Marks 25)

1. Tablet and Tablet coating.
2. Capsule.
3. Emulsion, Suspension, Ointment, and Cream.
4. Ophthalmic Solutions.
5. Blood Fluid and Electrolytes.
6. Parenteral preparation and Quality Control.
7. Surgical Dressing.
8. Biological preparation (Sera, Vaccine and Anti-Sera)
9. Biopharmaceutics.

C. PHARMACEUTICAL ANALYSIS (Marks 20)

1. Limit Test.
2. Bio-Assay.
3. Sterility Test.
4. Pyrogen Test.
5. Theory & Application of Colorimeter, Fluorimeter, Nephelometer and Turbidometer, U.V.Visilile Spectrophotometer.
6. Kerl Fischer Titration.

7. Alcohol determination.
8. Microbiological Assay of Vitamins, Antibiotics and Vaccine Preparation.

D. MEDICINAL CHEMISTRY (Marks 20)

Structure, Storage, Preparation & Brand names of the Following Classes
(Definition, Classification, etc.) :

1. Steroids
2. Sedatives and Hypnotics.
3. Psycho-therapeutic Agents.
4. Antihistaminic Agents.
5. Analgesics (narcotic, non-narcotic and NSAID)
6. Cardiovascular Agents.

E. PHARMACOGNOSY (Marks 20)

Source, Chemical constituents, uses and adulteration of the following classes of natural drugs of the followings

1. Rauwolfia,
2. Ipecacuahna,
3. Belladonna,
4. Cinchona,
5. Cinnamon,
6. Digitalis,
7. Senna,
8. Aloe,
9. Noxvomica,
10. Opium,
11. Kurchi,
12. Brahmi,
13. Tulsi,
14. Bael, and
15. Ephedra.

PAPER-II (GENERAL KNOWLEDGE) : (Marks 10)

- General Knowledge of Indian Constitution,
- Science - Inventions & Discoveries,
- History, India and Neighboring Countries,
- Sports, Knowledge of Current Events,
- General Politics, Budget and Five Year Plans,
- Geography,
- Current Affairs,
- Economy,
- Banking and Finance

- Economy.

Annexure "AA"

Syllabus for Assistant Food Analyst

Total Marks: 120
Time: 02 Hours

1. Food Laws and Standards of India and International Food Laws

(Marks 15)

I. Food Safety and Standards Act of India, 2006:
II. FSS Rules and Regulations
III. Other National Laws and Standards

- **a)** Agricultural Produce Act, 1937 (Grading and Marketing)
- **b)** Export (Quality Control & Inspection), Act, 1963 and Rules
- **c)** Bureau of Indian Standards relevant to Food Safety (Water, Infant Formulate)
- **d)** Legal Metrology Act

IV. International Food Control Systems/ Laws, Regulations and Standards/ Guidelines with regard to Food Safety:

- **a)** CODEX Alimentarius Commission: History, Members, Standard setting and Advisory mechanisms: JECFA, JEMRAJMPR
- **b)** WTO agreements: SPS/TBT
- **c)** Role of OIE, IPPC.

2. Planning Organization and setting up of Food Analysis Laboratory including NABL / ISO / IEC-17025: 2017 and laboratory safety.

(Marks 15)

I. Understand the requirements for setting up a laboratory for the legal defensibility of analytical data. The ideal structure design, environment, layout for chemical and microbiological testing, Air handling etc

II. What is accreditation, Different accreditation bodies (NABL, APLAC, and ILAC). Requirements for ISO/IEC 17025:2017, documentation, prerequisites for accreditation, management requirements, technical requirements, measurement of traceability

III. Laboratory safety: Personnel and laboratory hygiene, emergency planning, General hazards in a food laboratory, safety equipment, storage of chemicals, acids, flammables etc, handling compressed gases, centrifuge, chemical and biological spills and wastedisposal.

3. Principles of Food Preservation, Processing and Packaging.

(Marks 20)

I. Food Processing Operations: Manufacturing processes: batch, Semi-batch and continuous Cleaning of raw materials: cleaning methods and contaminations, Size reduction and screening of solids: equipment, modes of operation. Disintegration of materials: slicing, dicing, shredding, pulping. Mixing and emulsification. Filtration and membrane separation: principles, design features and general applications Centrifugation: principles and applications. Solid-liquid

extraction and expression. Sorting and grading of foods: weight, size, shape, buoyancy, photometry sorting

II. Food Preservation by

a) Heat: Principles of Heat Transfer, Blanching, Pasteurization, Heat Sterilization, thermal extrusion, cooking
b) Water Removal: Forms of Water in Foods, Sorption of Water in Foods, Water Activity, Drying and Evaporation Technology
c) Temperature Reduction: Chilling, Freezing
d) Radiation: Ionizing Radiation, Microwave
e) By use chemicals: Class-I and Class-II preservatives, smoke other Chemical Additives
f) New non-thermal methods: high hydrostatic pressure, modified atmosphere, high- intensity pulsed electric fields, intense pulsed light, oscillating magnetic fields), hurdle technology, ultrasonic and ohmic heating etc.

III. Food Packaging:

a) EffectofEnvironmentonFoodStability:Light,Oxygen,Water,Temperature, Sensitivity to Mechanical Damage and attack by biological agents Including barrier properties, strength properties, optical properties: Glass, Metals, Paper, Plastics, Biodegradable and Edible Films and Coatings, aseptic packaging and Combinations.
c) Selection of packaging material and design for various food commodities including fresh produce (fruits and vegetables), milk and milk products (dairy), cereal, pulses, oil, meat, fish, poultry, water and processed foods.
d) Evaluation of quality and safety of packaging materials - different testing procedures
e) Functions of Packaging: Protective Packaging and active packaging smart and intelligent packaging.
f) Newer packaging technologies- CAP/MAP packaging, aseptic processing and packaging, irradiated packaging, retort pouch, microwaveable packaging.

4. Principles and Basics of Human Nutrition (Marks 20)

a) Water: sources, body's needs, physiologic function
b) Body composition, Energy metabolism and nutritional requirements of the body. Recommended daily allowance (RDA), Basic metabolic rate(BMR)
c) Carbohydrates: Digestion of Simple and complex carbohydrates, dietary fiber, absorption of glucose, carbohydrate metabolism, Diabetes.
d) Lipids: Triglycerides, digestion, absorption, and transport, essential fatty acids (EFA), metabolism of fats. Cholesterol role in cardiovascular disease
e) Protein: Essential and nonessential amino acids, digestion and absorption of protein, protein metabolism, protein quality (biological

value, protein efficiency ratio, net protein utilization intake and role in the body.

f) Vitamins: Deficiency diseases toxicity, sources, and functions.

g) Minerals: Major and minor minerals nutritional significance and physiological role of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper, selenium. (their dietary sources and deficiencies).

5. Food Chemistry (Marks 20)

I. *Water:* Water as a nutrient, function, sources, requirement, structure, water balance – effect

II. *Carbohydrates:* Nomenclature and different methods of classification, structure and chemical properties of monosaccharide, disaccharides and polysaccharides and complex carbohydrates; amino sugars, proteoglycans and glycoproteins.

III. *Proteins and amino acids:* Classification of amino acids based on structure; aromatic, aliphatic, acidic, basic, sulfur containing,

IV. *Lipids:* Classification, nomenclature, structure, properties and functions of fatty acids, fats, phospholipids, sphingolipids, cerebrosides, steroids, cholesterol, plant sterols, bile acids, prostaglandins, lipoamino acids, lipoproteins, proteolipids, lipopolysaccharides.

V. *Vitamins:* Water- and fat-soluble vitamins: Classification, structure, physiology biochemical functions as coenzyme. Effect of various processing treatments and fortification of foods.

VI. *Food Additives:* Structure, Chemistry, Function and application of Preservatives, Emulsifying and Stabilizing agents, Sweeteners, buffering agents, bleaching, maturing agents and starch modifiers, Food colors, flavors, anti-caking agent, Antioxidants etc. The nature, properties and functions and mode of action. Safety assessment of Food additives: No-observed Effect Level (NOEL Acceptable daily intake (ADI), Dietary exposure,) in chronic toxicity studies

VII. *Antinutritional Factors:* Protease Inhibitors, Haemagglutinins (Lectins), Glucosinolates, Cyanogens, Saponins, Gossypol, Lathyrogens, Antivitamins, Antiminerals. Bitter substances, tannins and their removal fromfoods.

Food Enzymes: Properties, classification, enzyme units, enzyme kinetics, MichaelisMenten equation, regulatory enzymes, isoenzymes, enzyme, Role in foods: Beta- galactosidase, alpha galactosidase, proteases (papain, bromelain), lipases, oxidases etc, Polyphenol oxidase, enzymatic and non-enzymatic browning.

IX. *Nucleic Acids:* DNA: Physical and chemical properties (renaturation and denaturation). Structure of nitrogenous bases, nucleosides, nucleotides, DNA Doublehelix -Watson & Crick model of DNA,RNA Classes; mRNA, tRNA and rRNA.

X. *Nutraceuticals and Functional Foods:* Definition and function of Nutraceuticals, Functional Foods, Food Supplements, Dietary supplements prebiotics andprobiotics, Medical foods and foods for special purposes. examples Phenyl alanine free diet for Phenylketonuria patients, Lactose free for Lactose intolerant.

XI. *Plant pigments:* Structure and function of Chlorophylls, lycopene, betalaine, curcuminoids, annatto, Carotenoids, anthocyanins, flavonoids, melanin, tannins, quinones, and xanthone. And roles in foodindustry.

XII. *Genetically modified organism (GMOs):* What are GMOs? Which are the major GMOs in food and what are the traits that have been engineered. How to detect and quantify GMOs.

XIII. *Food contaminant and adulterants:* Major Classes of Pesticide and their residues. Heavy metals. Antibiotic & hormone residues, Veterinary drug residue, other new contaminants and toxins (For example: Cyclopiazonic acid in Buckwheat flour) , radioactive nuclides, mycotoxins (Aflatoxin, Ochratoxin, Patulin, DON, Ochratoxins, Sterigmatocystin, Fumonisins, Zearalenone). Common Adulterants: Lead chromate, mineral oil, urea, SDS, starch, blotting paper, metanil yellow, Rhodamineargemone, khesari dal, brick power etc,)

6. Food Microbiology & Food Hygiene (Marks 15)

Introduction to Food microbiology: Classification and nomenclature of microorganisms. Morphology and Structure of Microorganisms in Foods (Yeasts and Molds, Bacterial Cells Viruses). Important genera of Mold, yeast, bacteria (gram- negative aerobesand facultative anaerobes, gram-positive cocci, endospore-forming rods, non-sporulating), bacterial acid, acetic acid, butyric acid etc), thermophilic, proteolytic, saccharomyticetc, coliforms, faecal coliforms, enteric pathogens. Emergingmicrobes.

II. *Sources of microorganisms in food chain* (raw materials, water, air, equipment etc) and microbiological quality of foods.

///. *Microbial food spoilage and Food borne diseases,* food pathogens *Aeromonashydrophila, Bacillus cereus and other Bacillus Species, Brucella, Campylobacter, Clostridium botulinum, Clostridiumperfringens,Enterobactersakazakii, Escherichia coli, Listeria monocytogenes, Salmonella, Shigella, Staphylococcus aureus, Vibrio, Yersinia enterocolitica, Fungi, virus etc*

IV. Methods for the Microbiological Examination of Foods: Sampling Two-class and three-class sampling plan. Pure culture isolation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-culturable bacteria. Indicator Organisms: Direct Examination, Enumeration Methods, Plate Counts, Most Probable Number Counts, biochemical test, Rapid Methods for Detection of Specific Organisms and Toxins, Immunological Methods, DNA/RNA Methodology

Physical, Chemical and Instrumental analysis (Marks 15)

I. *Sampling and sample preparation:* Definition, types of sample, sampling plan, sub sampling, designing a sampling plan, concept of sample size and representative. Sample preparations - particle size, homogeneity, dissolution technology and decomposition, storage of samples.Solid Phase Extraction- Introduction, sorbents, matrix solid phase dispersion and applications.

II. *Statistics and statistical terms:* Systematic and random errors. Mean distribution. Confidence interval. Confidence limits and confidence level. Outliers. Definition and calculation of: Average, Mean, Standard deviation, Relative standard deviation, Coefficient of variation, Confidence limits of a measurement, Statistical Tests, Linear correlation and regression curve fitting, fitting of linear equations. Choosing and using statistical tests, Analysis of Variance (ANOVA),

III. *Classical Methods of food analysis:* Law of mass action, Le chateliers principle, stoichiometry, volumetric and gravimetric analysis. Preparation of standards, working standards and solutions of known concentration (percent, molar, molal, normal, ppm and ppb) and their dilution. Proximate analysis, physical methods for extraneous matteranalysis

IV. *Classical analytical techniques: Gravimetry, Titrimetry, Refractometry and Polarimetry:* Principle, Instrumentation and applications of each technique in foodanalysis

V. *UV-Visible and Fluorescence Spectrometry:* Electromagnetic spectrum, Beer and Lambert's Law, Absorbance, Transmittance, Molar absorptivity (Molar Extinction coefficient), E 1%, 0Max. Components and functioning of an UV-vis spectrophotomer: Single beam and double beam. Components of a UV-VIS spectrum. Calibration curve andapplications in food analysis.

VI. *Raman spectroscopy:* Principle Theory Instrumentation, techniques and Applications of Raman spectroscopy in foodanalysis

VII. *Chromatographic techniques:* Fundamentals of chromatographic separations and their classification. The plate theory. Capacity factor and resolution factor. Chromatographic efficiency. Van Deemter's equation. Partition coefficient etc. Principles and applications of paper (Ascending, Descending, Radial, Two dimensional) Partition, Thin layer chromatography, HPTLC, size exclusion and ion exchange chromatography. Applications in food analysis

VIII. *High Performance Liquid Chromatography (HPLC):* Sample Preparation Techniques, Applications in quantitative food analysis of aflatoxins, vitamins, sugars, sweeteners, preservatives etc.

IX. *Gas chromatography:* Basics of Gas chromatography, Mobile phase and criteria for its selection - Sample introduction techniques -Stationaryphases- Supports for liquid stationary phases, Selection ofcolumns. Detectors FID, TCD, FPB, ECD, TID. Temperature programming in GC - Derivatization and sample preparation in GC - Fatty acid profile and quantitative analysis of fatty acids in fats and oils.

X. *Hyphenated Techniques:* Mass Spectrometry and Chromatography Coupling. GC-MS/MS, LC-MS/MS, Capillary electrophoresis-MS, Isotopic**.**

XI. *Atomic absorption Spectroscopy, Atomic emission spectroscopy, ICP-MS:* Principles-Atomization process, Atomic line widths and radiation sources for AAS, Basic principles and instrumentation of ICP-MS; data acquisition and interpretation;

applications of ICP-MS for analysis of metallic contaminants in food. Sample preparation, microwave digestion.

XII. *Biological Techniques (DNA/protein based):* Fundamental principles and instrumentation of the systems; measurement techniques and result interpretations of Polymerase Chain Reaction (PCR), Real-time Polymerase Chain Reaction (PCR) technique; Enzyme Linked Immunosorbent Assay (ELISA); Radioimmunoassay (RIA). Use of PCR for detection of genetically-modified organisms (GMO);meat and fish speciation and other applications in analysis of food adulteration.

XIII. *Measurements of Rheological properties:* Instrumental Measurement of Texture of Foods, Visco Analysis, viscometer, texture analyser etc.

XIV. *Quality assurance and Quality control:* Introduction to quality control in analytical chemistry. Terminology in analytical measurements: True value, measured value, Accuracy, Precision, Uncertainty, Random errors. Sample traceability, internal quality control, certified reference materials. Spiked reference samples. Recovery studies, Method validation/verification (LOD, LOQ, specificity, selectivity, linearity, range, robustness, repeatability, reproducibility. External and internal standards, Control chart. Proficiency testing, scores.

Annexure "AB"

Syllabus for Screen Technician/Supervisor

Total Marks=120
Time=02 Hours

1) Basis Mathematics =20 Marks

- Percentage
- Average
- Time, Work and Distance
- Ration and Proportions
- Problem of Age
- Probability
- LCM, HCF
- Mensuration

2) Basis Reasoning =20 Marks

- Analogies
- Relationship concepts
- Figure odd one out
- Direct Sense
- Figure Series completion
- Venn Diagram
- Number series
- Coding/Decoding

3) Basis English =30 Marks

- Articles
- Synonyms
- Antonyms
- Preposition
- Verbs
- Reading comprehension
- Determiners
- Spellings
- Sentences

4) General Awareness and Science =50 Marks

- General current events (National Level)

- Sports
- India culture
- India history
- Indian geography
- Capital/State
- General Science
- Health, Hygiene and Sanitation
- Geography of Jammu and Kashmir
- Culture of Jammu and Kashmir
- History of Jammu and Kashmir

Annexure "AC"

Syllabus for Animal Keeper

Syllabus for Written test (Objective Type)

Time: 02.00 Hrs.
Marks: 120

1. English
   a) Nouns and its kinds
   b) Parts of Speech
   c) Masculine/feminine (Gender)
   d) Number

2. Science
   a) Micro-organism (useful and harmful micro-organism)
   b) Coal and Petroleum origin and uses.
   c) Reproduction in Animals (Elementary Knowledge)
   d) Matter and its States
   e) Force and Pressure.
   f) Motion- Elementary Knowledge.
   g) Stars and Solar System.
   h) Pollution of Air and Water.
   i) Carbon and its allotropic forms.
   j) Light

3. History
   a) Indian Freedom Struggle after the revolt of 1857.
   b) Gandhiji era of Freedom Struggle.
   c) Moderater and Extremists.
   d) Reform Moments.

4. Geography
   a) Natural Resources
   b) Demographic Profile of Jammu and Kashmir State.
   c) Population of India as per 2011 Census.
   d) Wildlife National Parks and Sanctuaries in Jammu and Kashmir.
   e) Hydroelectric Potential of Hydroelectric Power Houses in Jammu and Kashmir.

5. Mathematics
   a) Rational Numbers
   b) Linear Equation in one Variable

c) Squares and Square roots.
d) Cubes and cube roots.
e) Simple Algebraic Identities.

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Annexure "AD"

Syllabus: Medical Record Technician

Marks 120 **Time 02 Hours**

GENERAL ENGLISH (Marks 20)

(a) Essay Writing
(b) Precis Writing
(c) Letter Writing
(d) Idioms & Phrases
(e) Expansion of passages
(f) Comprehension of given passages
(g) Grammar:

- Parts of Speech : Nouns, Adjective, Verb, Adverb, Preposition, etc

(h) Correct usage and vocabularies

TECHNICAL PAPER – I (Marks 50)

Unit - I Definition of Medical Records

Unit - II Importances of Medical Records

Unit- III Uses of Medical Records

Unit- IV Values of Medical Records

Unit- V Aims and objective of Medical Records

Unit - VI Central Admitting Office

Unit - VII Medical Records Form

Unit - VIII Retension and Preservation of Medical Records

Unit - IX Hospital Management information system

TECHNICAL PAPER – II (Marks 50)

Unit - I Medical Terminology

Unit - II Legal aspect of Medical Records

Unit- III Hospital statistics

Unit- IV Coding and Indexing

Unit - V Daily census

Unit - VI Assembling and deficiency check

Unit - VII International classification of disease

Unit- VIII Aptitude Test

Annexure "AE"

Syllabus for the post of Panchayat Secretary

Marks: 120 **Time: 02.00 Hrs.**

S.No.	Subjects/Topic	Marks assigned
1.	GENERAL AWARENESS with special reference of UT of J&K	24
2.	GENERAL ENGLISH & COMPREHENSION	24
3.	GENERAL INTELLIGENCE & REASONING	24
4.	QUANTITATIVE APTITUDE	18
5.	BASIC KNOWLEDGE OF COMPUTERS	30
	TOTAL	**120**

1. GENERAL AWARENESS with special reference of J&K UT

i. Current Events of National and International importance
ii. Political & Physical divisions of India
iii. Climate & Crops in India
iv. Transport & Communication.
v. Demography- Census, its feature and Vital Statistics.
vi. Important Rivers & Lakes in India.
vii. Indian Economy.
viii. Indian Culture & Heritage.
ix. Indian History with special reference to Freedom Movement.
x. Indian Constitution- Basic features-Preamble, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy.
xi. Science & Technology.
xii. Environment, Ecology & Bio-diversity.
xiii. Taxation in India- Direct & Indirect Tax - CBDT, GST etc.
xiv. J&K UT
   a) History
   b) Economy
   c) Geography- (Weather, Climate, Crops, Rivers, Lakes, Flora, Fauna.)
   d) Heritage & Culture
   e) Important Tourist Destinations
   f) J&K Reorganization Act, 2019.
xv. Centrally Sponsored Schemes (MGNREGA, PMAY, SBM) and Panchayati Raj Act/Rules.

2. GENERAL ENGLISH & COMPREHENSION

(i) Tenses
(ii) Narration
(iii) Modals
(iv) Articles
(v) Reading Comprehension
(vi) Fill in the blanks with Phrases, Pronouns, homonyms/homophones etc
(vii) Clauses
(viii) Synonyms and antonyms
(ix) Pairs of words and their use in meaningful sentences.
(x) Rearranging of jumbled sentences.
(xi) Idioms and phrases.
(xii) Uses of Prepositions.
(xiii) Active & Passive Voice
(xiv) Error Spotting
(xv) Sentence Correction
(xvi) Spellings Correction

3. GENERAL INTELLIGENCE & REASONING

(i) Number series, Letter series, Semantic Series, Speed, Distance and Time, Statements and conclusions, Logical Reasoning, Mental Reasoning, Word Building, Numerical Operations, Semantic Analogy, Symbolic/Number Analogy, Figural Analogy, Semantic Classification, Symbolic/Number Classification, Figural Classification, Problem Solving.

(ii) Symbolic Operations, Trends, Space Orientation, Space Visualization, Venn Diagrams, Drawing inferences, Punched hole/ pattern- folding & un-folding, Figural Pattern- folding and completion, Indexing, Address matching, Date & city matching, Classification of centre codes/roll numbers, Small & Capital letters.

4. QUANTITATIVE APPTITUDE

The scope of the test will be computation of

(i) Whole numbers, decimals, fractions and relationships between numbers, Profit and Loss, Discount, Partnership Business, Mixture and Alligation, Time and distance, Time & Work, Percentage. Ratio & Proportion, Square roots, Averages, Interest, Basic algebraic.
(ii) Graphs of Linear Equations, Triangle and its various kinds of centers, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles, Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Heights and Distances, Histogram, Frequency polygon, Bar diagram & Pie chart, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square base, Trigonometric ratio, Degree and Radian Measures, Standard Identities, Complementary angles.

5. KNOWLEDGE OF COMPUTERS

(i) Basic Applications of Computer and its component.
(ii) Fundamentals of computer sciences.
(iii) Hardware & Software, Concept of Open-Source Technologies.
(iv) Input & output Devices.
(v) Knowledge of MS Word, MS Excel, MS Access, MS PowerPoint, PDF Internet and E-mail.
(vi) Concept of Computer Virus and Latest Anti-Virus.
(vii) Role of Information Technology in Governance.

Annexure "AF"

Time: 02 Hours

Total Marks: 120

SYLLABUS FOR THE POST OF COMPUTER INSTRUCTOR/OPERATOR

Computer Basics	Characteristics of Computers. Input, Output. Storage units. CPU. Computer System. Binary number system. Binary to Decimal Conversion. Decimal to Binary Conversion. ASCII Code. Unicode.
Computer Organization	Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM, Booting. Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM, DVD, Mass Storage Devices: USB thumb drive. Managing disk Partitions. File System Input Devices - Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors. Printers - Dot matrix. inkjet, laser, Multimedia- What is Multimedia, Text, Graphics, Animation, Audio, Images. Video; Multimedia Application in Education, Entertainment, Marketing. Names of common multimedia file formats, Computer Software- Relationship between Hardware and Software; System Software. Application Software, Compiler, names of some high level languages, free domain software.
Operating System	Microsoft Windows- An overview of different versions of Windows, Basic Windows elements, File management through Windows. Using essential accessories: System tools - Disk cleanup, Disk defragmenter, Entertainment, Games, Calculator, Imaging - Fax, Notepad, Paint, WordPad. Command Prompt- Directory navigation, path setting, creating and using batch files. Drives, files, directories, directory structure. Application Management: Installing, uninstalling, Running applications. Linux- An overview of Linux, Basic Linux elements: System Features, Software Features, File Structure, File handling in Linux: H/W, S/W requirements, Preliminary steps before installation, specifics on Hard drive repartitioning and booting a Linux system.
Word Processing	Word processing concepts: saving, closing, Opening an existing document, Selecting text, Editing text, Finding and replacing text, printing documents, Creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating Tables and Charts, Document Templates and Wizards.
Spreadsheet Package	Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells, handling operators in Formulae, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells - changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs - Creating, Previewing, Modifying Charts. Integrating

	word processor, spread sheets, web pages
Presentation Package	Creating, Opening and Saving Presentations, Creating the Look of Your Presentation, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows, Running and Controlling a Slide Show, Printing Presentations
Data Base Operations	Data Manipulation-Concept: Database, Relational Database, Integrity Operations: Creating, dropping, manipulating table structure, Manipulation of Data: Query, Data Entry Form, Reports.
Information Technology and Society	Indian IT Act, Intellectual Property Rights - issues, Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.
Introduction to Internet	Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette, Internet Applications - Commerce on the Internet, Governance on the Internet, Impact of Internet on Society - Crime on/through the Internet.
TCP/IP - Internet Technology and Protocol	Packet switching technology, Internet Protocols: TCP/IP, Router, Internet Addressing Scheme: Machine Addressing (IP address), E-mail Addresses, Resources Addresses
Internet Connectivity	Connectivity types: level one, level two and level three connectivity, Setting up a connection: hardware requirement, selection of a modem, software requirement, modem configuration, Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options - Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options - Shell, SLIP, PPP, Service options - E-mail, WWW, News Firewall etc.
Internet Network	Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security, Network Components: Severs, Clients, Communication Media, Types of network: Peer to Peer, Clients Server, Addressing in Internet: DNS, Domain Name and their organization, understanding the Internet Protocol Address, Network topologies: Bust, star and ring, Ethernet, FDDI, ATM and Intranet
Services on Internet (Definition and Functions)	E-mail, WWW, Telnet, FTP, IRC and Search Engine

ctronic Mail	Email Networks and Servers, Email protocols -SMTP, POP3, IMAp4, MIME6, Structure of an Email - Email Address, Email Header, Body and Attachments, Email Clients: Netscape mail Clients, Outlook Express, Web based E-mail, Email encryption- Address Book, Signature File.
Current Trends on Internet	Languages, Internet Phone, Internet Video, collaborative computing, e-commerce.
Web Publishing and Browsing	Overview, SGML, Web hosting, HTML, CGL, Documents Interchange Standards, Components of Web Publishing. Document management, Web Page Design Consideration and Principles, Search and Meta Search Engines, WWW, Browser, HTTP, Publishing Tools
HTML Programming Basics	HTML page structure, HTML Text, HTML links, HTML document tables, HTML Frames, HTML Images, multimedia
Interactivity Tools	ASP, VB Script, JAVA Script, JAVA and Front Page, Flash
Internet Security Management Concepts, Information Privacy and Copyright Issues	Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptosystems

Annexure "AG"

Syllabus for Electrician Grade-II

Time: 02 Hours

Marks: 120

1. Basic English - 12 Marks

- Articles
- Synonyms
- Antonyms
- Reading Comprehension
- Spelling
- Tenses , Sentence
- Noun, Adjective, Pronoun
- Homophones
- Communication Skills

2. Basic Mathematics - 12 Marks

- Arithmetic Algebra
- Average
- Percentage
- LCM, HCF
- Profit & Loss
- Number System
- Square root
- Ratio and proportion

3. Basic Electrical - 48 Marks

- Basic Concept of Electricity, its applications.
- Ohms Law, Kirchhoff's Law, Resistors and its combination- Series & Parallel Combinations.
- Earthing- Principle of different methods of earthing and selection i.e., pipe, plate etc.
- Domestic Appliances and their Working Principles- Heater, Electric iron, Geyser, Washing Machine, Refrigerator.
- Illumination and its types, Laws of Illumination.
- Power Generation- Various Sources of Electrical Power Generation.
- Introduction to electromagnetism, magnetic field around a straight current carrying conductor and a solenoid and methods to finds its direction, force between two parallel current carrying.
- Conductor- concept of hyteresis loop, and hyteresis loss.

Faraday's law of electromagnetic Induction, Lenz's Law, Fleming right and left hand rule.

- Difference between A.C and D.C Concept of alternating current and voltage, equation of instantaneous value, form factor. Power factor and its practical significance. Advantages of 3 phases over single phase system.
- Various electrical symbols used in domestic and industrial installation and power system as per 89S.
- Study of electrical safety measures as mentioned in the electricity rules and shock treatment. Including first aid, tools, accessories and instruments required for installations, maintenance and repair work of electrical equipments.

AC & DC Machines - 24 Marks

- Electrical Machines and their types- D.C. Generator, D.M Motor, Transformer, Alternator, Three Phase Induction Motor

Electrical Measuring Instruments - 12 Marks

- Electrical Measuring Instruments- Ammeter, Voltmeter, Wattmeter, Earth Tester, P.F. meter

4. Basic of Computer - 12 Marks

- Introduction, Computer and its generations.
- Hardware and peripherals Devices.
- Basic of Operating system.
- Concept of Internet – www, Web browser, Web Site.
- Basic of Computer Networks- LAN, WAN, MAN.
- Email.
- Digital devices.
- Mobile devices.
- Smart watch, Smart television.
- Search engine.
- Internet services and Email.
- To use mobile data or other networks through Bluetooth and WIFi.
- MS- Word, MS- Excel & MS- Power point.

Annexure "AH"

Syllabus for Film Production Assistant

Time: 02 Hours **Total Marks: 120**

1. History of Photography(from Camera Obscura to DSLR)
2. Basic Photography(Types of Cameras/Optics/Anatomy of camera/ types of lenses)
3. Photo Aesthetics(Need for the light in Photography/Light characteristics/Golden mean/ Rule of third)
4. Basic Photo Lighting Techniques (Key light/Fill in light/Bounce light/Diffused light/Low Key/High Key)
5. Digital Photography(Components of Digital Camera/Digital Camera Lenses/-Methods of storage)
6. Digital Photography Techniques (Exposure /ISO/manual Settings/Auto Exposure modes)
7. Basic of Computers(Types of computer/Components of computer/Output devices/Photo editing softwares)
8. Different Types of Photography: Candid Photography, Environmental Portrait, Men at Work, Child Labour, Street Life. Culture, traditions, life style, food, monuments, festivals,: Photo sequence, Photo feature)

Annexure "AI"

SYLLABUS FOR THE POST OF "JUNIOR LABORATORY TECHNICIAN"

Time: 2 Hours

Maximum Marks=120

CIVIL ENGINEERING

(24 Marks)

- **CONSTRUCTION MATERIAL**

  Properties & uses of various construction materials (Stones, Bricks, Lime, Cement & Timber), Physical/Field Testing, Elements of brick masonry.

- **FOUNDATIONS**

  Bearing Capacity of soil & its importance, Types of Foundations & their salient Features, Suitability of various foundations for heavy, light & vibrating machines.

- **CONCRETE**

  Introduction, Ingredients of concrete, Water cement ratio, properes of concrete (Plastic stage & hardened stage), Measurement of workability, Admixtures (Mineral & Chemical), Special Concretes, Concreting Operations.

- **RCC**

  Basics of RCC & its uses, Introduction to various Structural elements of building.

COMPUTER ENGINEERING

(24 Marks)

- **Introduction to Computers**: Types, components (input, output devices, CPU, memory, storage).
- **Operating Systems**: Functions, types (Windows, Linux, macOS), and file management.
- **MS Office Suite**:
- MS Word: Document creation, formatting, and collaboration.
- MS Excel: Spreadsheets, formulas, data visualization.
- MS Access: Database basics, querying, and reporting.
- MS PowerPoint: Presentation design and multimedia integration.
- **PDF, Internet, and E-mail**: Creating PDFs, internet safety, and e-mail management.
- **Computer Security**: Understanding computer viruses, anti-virus measures, and safe browsing practices.
- **Role of Information Technology in Governance**: E-governance concepts, applications, and impact on transparency.
- **Emerging Technologies**: Cloud computing, artificial intelligence, big data, and cybersecurity.
- **Practical Sessions**: Hands-on experience with MS Office, internet research, and e-governance simulations.

ELECTRICAL ENGINEERING

(24 Marks)

- Concepts of resistance, inductance, capacitance.
- Circuit laws: ohms law, KCL and KVL.
- Concept of Three phase circuits.
- Energy bands in silicon, intrinsic and extrinsic semiconductors.
- P-N junction diode, Zener diode, tunnel diode, BJT, JFET.
- Single phase transformer – equivalent circuit, phasor diagram.
- Autotransformer.
- Brief idea about DC machines, Induction machines and Synchronous machines.
- Hydel and thermal power Station.

MECHANICAL ENGINEERING

(24 Marks)

- Resolution of a force, Composition of forces, Stresses and Strains: Concept of Load, stresses, and Strain, Tensile, compressive and shear stresses and strains. B.M. and S.F Diagram of various Beams.
- Unit cell and space lattice: Crystal system: The seven basic crystal systems. Theory of Heat Treatment: Purpose of heat treatment, Solid solutions and its types, Iron Carbon diagram
- Thermodynamic state and system, boundary, surrounding, universe, Thermodynamic systems, Types of thermodynamic processes.
- Introduction to Refrigeration: Definition of Refrigeration; Refrigerating effect-unit of refrigeration- Coefficient of performance, Air conditioning: Introduction to Air conditioning; Factors Affecting air conditioning; Psychometric chart and its use.
- Properties of fluid: Density, Specific gravity, Specific Weight, Specific Volume, Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility. Fluid Pressure and Pressure Measurement.
- Hydraulic Turbines: Layout of hydroelectric power plant, Features of Hydroelectric power plant, Classification of hydraulic turbines,
- Simple Mechanisms: Introduction to link, kinematic pair, lower and higher pair, Kinematic chain Mechanism, Inversions, Different types of mechanisms.

ELECTRONICS

(24 Marks)

- Semiconductor Physics- Conductor, Semiconductor, Insulator, n-type & p-type semiconductor.
- Basics of BJT & FET: Bipolar Junction Transistor & its operation modes, Field effect Transistor & its modes.
- Diode Circuits: Half Wave Rectifier, Full Wave Rectifier & Bridge Rectifier, Zener Diode as a Voltage Regulator.
- Logic Gates: NOT, AND, OR, NAND, NOR, EXOR & EXNOR.
- Number System Conversion
- 8085 Microprocessor, its features and Block Diagram.
- 8051 Microcontroller, its features and Block Diagram.

Annexure "AJ"

Syllabus: Assistant PTI

Marks :-120
Time :- 2.00 Hours

Foundation of Physical Education: 15 Marks

i. Concept of Physical Education.
ii. Aims and objectives of Physical Education. Scope of Physical Education in modern Era.
iii. Explain Cognitive domain, psychomotor domain, Affective domain.
iv. Relationship between Physical Education and General Education.
v. Nature, meaning and scope of Philosophy in Physical Education.
vi. Major components of Philosophy.
vii. Philosophies of Physical Education (Idealism, Naturalism, Pragmatism, Realism & Existentialism).

Historical Perspective: 10 Marks

i. Physical education in Ancient and Modern India
ii. Physical Education in Greece, USA, Germany, British and Rome.
iii. Ancient and Modern Olympic Games
iv. Asian and Common Wealth Games.
v. South Asian Federation (S.A.F) Games
vi. National sports awards (Arjuna award, Dronacharya award, Rajiv Ghandi khel Ratna Award, Maulana Abul Kalam Azad (MAKA) Trophy.
vii. Famous sports Personalities in India.

Officiating and Coaching: 10 Marks

i. Concept of Officiating and Coaching
ii. Moderns Trends in Coaching
iii. Duties of Officials
iv. Layout of standard track.
v. Dimension and marking for track and field events.
vi. Rules and their interpretation of track and field events.
vii. Rules and regulations of different games (Football, Volley Ball, Hockey, Basket Ball, Cricket, Kho Kho, Kabaddi and Badminton.

Psychological Foundations: 10 Marks

i. Sports Psychology and factors effecting sports performance.
ii. Elements of learning, individual differences in learning, Learning Curve
iii. Theories of learning, Nature of motor skill learning.
iv. Transfer of training.

v. Personality, Dimensions of personality.
vi. Growth and Development at different stages.
vii. Heredity and Environment.

Sociological Foundation: 10 Marks

i. Socialization bases of Physical Education,
ii. Sports as cultural Heritage of Man Kind
iii. Cooperation and competition, social recognition.
iv. Social Institutions, Social Development.
v. Group Dynamics, Leadership and its importance.
vi. Media in Sports, Politics in Sports
vii. National / International integration through Sports

Kinesiology: 10 Marks

i. Historical Development of kinesiology, its need and scope in Physical Education & Sports.
ii. Axes and planes of movements, line of pull.
iii. Structure, Classification of the muscles and Joints.
iv. Origin Insertion and action of major muscles.
v. Meaning of Biomechanics, role of biomechanics in Physical Education.
vi. Motion, types of motion, Newton's laws of motion.
vii. Equilibrium, Stability and its principles. Lever and its types. Spin, Projectile and Impulse,

Training Methods: 15 Marks

i. Characteristics and principle of sports training
ii. Different methods of sports training.(Interval training, Weight Training Circuit training, Fartlek training and Plyometric Training).
iii. Development of Different Motor Abilities.
iv. Vital capacity, Second wind, Fatigue, Oxygen debt.
v. Effect of training on muscular system, Respiratory system and Circulatory System.
vi. Technical and tactical preparation of Sports
vii. Warm-up, its types and values.

Management: 15 Marks

i. Introduction, Meaning and Definition of management.
ii. Management techniques and financial management.
iii. Meaning of Organization and Administration.
iv. Organization of Physical Education and sports at different levels.
v. Supervision and Evaluation in physical education and sports.
vi. Concept of teaching and Learning and Methods of Teaching.
vii. Lesson plan, Importance and need of lesson plan.

Planning: 15 Marks

i. Meaning, Importance and Principles of Planning.
ii. Short term &Long Term Planning.
iii. Intra-mural and Extra mural tournaments.
iv. Talent Identification & Classification of students
v. Sports meet and Sports day.
vi. Education technology and Teaching aids.
vii. Criteria for the selection of Players.

First aid: 10 Marks

i. Concept, Meaning of first aid and its types.
ii. Principles of First Aid.
iii. Sports injuries, types of injuries, causes of injuries and their Treatment in various cases (Sprain, Strain, Dislocation, Fracture, Burns, abrasions, & Cuts).
iv. Definition and concept of Rehabilitation.
v. Goals and principles of Rehabilitation.
vi. Massage Manipulation & therapeutic Exercises.
vii. Doping in Sports.

Annexure "AK"

Syllabus for Child Psychologist

Time: 02 Hours Total Marks: 120

Part- I (Marks 30)

- **Theoretical Foundations of Psychology.**
- **Experimental Psychology**
- **Social Psychology**
- **Research Methodology in Psychology**

Part- II (Marks 30)

- **Cognitive Psychology.**
- **Bio-Psychology**
- **Psychology of Personality.**
- **Statistics in Psychology**

Part - III (Marks 30)

- **Psychopathology**
- **Psychometrics**
- **Health Psychology**
- **Organisational Psychology**

Part - IV (Marks 30)

- **Clinical Psychology**
- **Developmental Psychology**
- **Educational Psychology**
- **Counselling Psychology**
- **Rehabilitation Psychology**
- **Industrial Psychology**

Annexure "AL"

Syllabus for Drug Control Officer

Total Marks 120 Time 02 Hours

. PAPER-I: PHARMACY

- A. Forensic Pharmacy
- B. Manufacturing Pharmacy
- C. Pharmaceutical Analysis
- D. Medicinal Chemistry
- E -Pharmacognosy
- F- Pharmacology & Toxicology
- G- Hospital & Clinical Pharmacy
- H. Anatomy, Physiology & Health Education

• PAPER-II (GENERAL KNOWLEDGE) :

A. FORENSIC PHARMACY (Marks 25)

1. Drugs and Cosmetic Act, 1940 and Rules thereunder, 1945 with amendments.
2. Pharmacy Act, 1948.
3. Drug Price Control Order, 1995.
4. Medical Termination of Pregnancy Act, 1971.
5. Poison Act, 1919 and Dangerous Drugs Act, 1930.
6. Drugs and Magic Remedy Act, 1954.
7. Medical and Toilet Preparation Act, 1955.
8. Prevention of Cruelty to Animal Act.
9. Trademark Registration Act.
10. Pharmaceutical Ethics.

B. MANUFACTURING PHARMACY (Marks 25)

1. Tablet and Tablet coating.
2. Capsule.
3. Emulsion, Suspension, Ointment, and Cream.
4. Ophthalmic Solutions.
5. Blood Fluid and Electrolytes.
6. Parenteral preparation and Quality Control.
7. Surgical Dressing.
8. Biological preparation (Sera, Vaccine and Anti-Sera)
9. Biopharmaceutics.

C. PHARMACEUTICAL ANALYSIS (Marks 20)

1. Limit Test.
2. Bio-Assay.
3. Sterility Test.
4. Pyrogen Test.
5. Theory & Application of Colorimeter, Fluorimeter, Nephelometer and Turbidometer, U.V.Visilile Spectrophotometer.
6. Kerl Fischer Titration.

7. Alcohol determination.
8. Microbiological Assay of Vitamins, Antibiotics and Vaccine Preparation.

D. MEDICINAL CHEMISTRY (Marks 20)

Structure, Storage, Preparation & Brand names of the Following Classes
(Definition, Classification, etc.) :

1. Steroids
2. Sedatives and Hypnotics.
3. Psycho-therapeutic Agents.
4. Antihistaminic Agents.
5. Analgesics (narcotic, non-narcotic and NSAID)
6. Cardiovascular Agents.

E. PHARMACOGNOSY (Marks 20)

Source, Chemical constituents, uses and adulteration of the following classes of natural drugs of the followings

1. Rauwolfia,
2. Ipecacuahna,
3. Belladonna,
4. Cinchona,
5. Cinnamon,
6. Digitalis,
7. Senna,
8. Aloe,
9. Noxvomica,
10. Opium,
11. Kurchi,
12. Brahmi,
13. Tulsi,
14. Bael, and
15. Ephedra.

PAPER-II (GENERAL KNOWLEDGE) : (Marks 10)

- General Knowledge of Indian Constitution,
- Science - Inventions & Discoveries,
- History, India and Neighboring Countries,
- Sports, Knowledge of Current Events,
- General Politics, Budget and Five Year Plans,
- Geography,
- Current Affairs,
- Economy,
- Banking and Finance

- Economy.

Annexure "AM"

Time: 02 Hours **Total Marks: 120**

Syllabus for Scientist –A

Qualification Prescribed: *Master's Degree in Environmental Science / Chemistry / Microbiology / Biochemistry with at least 60 % marks in aggregate from a recognized University*

A. Environmental Science:-

- Principles of Environmental Sciences.
- Geographical classification and zones.
- Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Mass and Energy transfer across the various interfaces, material balance. Laws of thermodynamics, heat transfer processes. Scale of Metcorology, pressure,temperature, precipitation, humidity, radiation and wind. Atmospheric stability, inversions and mixing heights.
- Natural resources conservation and sustainable development, Sustainable Development Goals (SDGs).

B. Fundamentals of Environmental Chemistry :-

- Stochiometry, Gibb's energy, Chemical potential, Chemical equilibria, acid base reactions, solubility product, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons.
- Chemical composition of Air.
- Water Chemistry.
- Soil Chemistry.
- Toxic Chemicals in the environment.
- Industrial pollutants.
- **Principles of Analytical Methods**: Colourimetry, Spectrophotometry, Chromatography, Gas Chromatography, Atomic Absorption Spectrophotometry, GLC, HPLC, Electrophoresis. X-ray fluorescence, X-ray diffraction, Flame photometry etc.

C. Ecology :-

- Principles and scope of Ecology.
- Aquatic, Terrestrial, Human ecology and Human settlement,Evolution, Origin of life and speciation.
- Ecosystems, pathways in Ecosystems. Physico-chemical and Biological factors in the Environment.
- Common flora and fauna of India: Aquatic, Phytoplankton, Zooplankton and Macrophytes.
- Endangered and Threatened Species, Eco-sensitive zones, Protected Areas, Biosphere Reserves, MBP.
- Biodiversity and its conservation: Definition, Hotspots of Biodiversity, Strategies for Biodiversity conservation, National Parks and Sanctuaries, Gene pool, Peoples Biodiversity Registers (PBRs).

D. Environmental Biotechnology:-

- Bioremediation, Biotransformation, Biodegradation, Phytoremediation, tissue culture techniques.

E. Environmental Geosciences and Energy:-

- The Earth systems and Biosphere, Earth's thermal environment and seasons, Earth's processes and geological hazards, Mineral/Water Resources and Environment, water cycle , carbon cycle.
- Principles of Remote sensing and its application in Environmental Sciences. Application of GIS in Environmental Management.

F. Environmental Pollution:-

- *Air:* Natural and anthropogenic sources of pollution. Primary and Secondary pollutants. (various Industrial effluents such as being generated from Pulp and Paper Mills, Pesticides, Pharmaceuticals, Iron & Steel Industries). Transport and diffusion of pollutants. Gas laws governing the behaviour of pollutants in the atmosphere. Air Sampling techniques. Identification of aeroallergens. Air-borne diseases and allergies.
- Methods of monitoring and control of air pollution SOx, NOx, CO, National Ambient Air Quality parameters, AQI, Non-attainment cities under National Clean Air Progreamme (NCAP)
- Suspended Particulate Matter (SPM). Effects of pollutants on human beings, plants, animals, materials and on climate. Acid Rain.
- *Water:* Types, sources and consequences of water pollution. Physico-chemical and Bacteriological sampling and analysis of water quality. Standards, sewage and waste water treatment and recycling. Water quality standards. STPs, ETPs and Technologies used.
- *Soil:* Physico-chemical analysis, bacteriological sampling as well as analysis of soil quality. Soil Pollution Control. Industrial waste effluents and heavy metals, their interactions with soil components. Soil micro-organisms and their functions, degradation of different insecticides, fungicides and weedicides in soil. Different kinds of synthetic fertilizers (N, P & K) and their interactions with different components of soil.
- *Noise:* Sources of noise pollution, measurement of noise and Indices, effect of meteorological parameters on noise propagation. Noise exposure levels and standards. Noise control and abatement measures. Impact of noise on human health. Silence zones, noise limiters, white noise, pink noise, black noise.
- *Marine:* Sources of marine pollution and control. Criteria employed for disposal of pollutants in marine system-coastal management. Radioactive and Thermal Pollution.

G. Environment Impact Assessment:-

- Introduction to Environmental Impact Assessment, EIA notification 2006.
- Environmental impact Statement and Environmental Management Plan. EIA guidelines and notifications by Government of India, Public Hearing,
- Impact Assessment Methodologies.
- Procedure for reviewing Environmental impact analysis and statement. Guidelines forEnvironmental Audit.
- Environmental priorities in India and sustainable development.
- Environmental Monitoring : Methods of assessment of Environmental quality, short term studies/surveys, Rapid Assessment, Continuous Short and Long term Monitoring, Remote Sensing and its application i.e. Environmental Monitoring.

H. Waste Management:-

- Sources and generation of Solid Wastes, Hospital Waste, COVID BM Waste, Hazardous Waste, Plastic Waste, E-Waste. Different methods of disposal and their management; Recycling of waste material. Waste minimization technologies, laws/ rules for waste management under Environment (Protection) Act, 1986.
- Environment protection-issues and problems, International and National efforts for Environment Protection, Provisions in Constitution of India regarding Environment Protection.
- Environmental Policy Resolution, Legislation, Public Policy Strategies in Pollution Control, Wildlife Protection Act, 1972, Air (Prevention and Control of Pollution) Act, 1981 as amended, Motor Vehicle Act, 1988, The Water (Prevention and Control of Pollution) Act, 1974 as amended, The Environment (Protection) Act, 1986 and Rules 1986.
- Scheme of labelling of environmentally friendly products (Ecomark), Public LiabilityInsurance Act, 1991 and Rules 1991.

I. Bio Statistics:-

- Fundamentals of Biostatistics
- Sample survey
- Sampling distribution and Test of Significance
- Standard Deviation and its applicability.

J. Miscellaneous:-

- **Environmental Education and Awareness**. Environmental Ethics and Global imperatives.
- **Global Environmental problems** - Ozone depletion, global warming and climatic change. Current Environmental issue in India.
- Environmental Movements for protection of Forest, Environment etc in India.
- Judicial activism for environmental protection by Hon'ble Supreme Court of India and Hon'ble National Green Tribunal.
- International Environment Treaties and Conventions.

K. Microbiology:-

- Introduction to Microbiology and Bacterial Technology
- Environmental Microbiology
- Bio Instrumentation
- Microbial Genetics and Molecular Biology Immunology
- Microbial Physiology and Metabolism
- Medical Microbiology

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Annexure "AN"

Time: 02 Hours | Total Marks: 120

SALLYBUS FOR LAB ASSISTANT ENVIRONMENT DEPARTMENT

1. **Basis Mathematics**
   - Percentage
   - Average
   - Time, Work and Distance
   - Ration and Proportions
   - Problem of Age
   - Probability
   - LCM, HCF
   - Mersuration
2. **Basis Reasoning**
   - Analogies
   - Relationship concepts
   - Figure odd one out
   - Direct Sense
   - Figure Series completion
   - Venn Diagram
   - Number series
   - Cocing/Decoding
3. **Basis English**
   - Articles
   - Synonyms
   - Antonyms
   - Preposition
   - Verbs
   - Reading comprehension
   - Determiners
   - Spellings
   - Sentences
4. **General Awareness and Science**
   - General current events (National Level)
   - Sports
   - Incia history
   - Incian geography
   - Capital/State
   - General Science
   - Geography of Jammu and Kashmir
   - Ecology and Environment
   - Environmental Laws
   - Environmental Pollution
   - Remote Sensing and GIS (Bas cs)

Annexure "AO"

Syllabus: Lab Assistant

Total Marks 120 **Time 2 Hours**

Part-I: 16 Marks
Stereochemistry:

Elements of symmetry, Chirality due to chiral centre, molecules with more than one Chiral centre, threo and erythron isomers optical activity in the absence of chiral carbon (biphenyls, allenes and spirans). Chirality due to helical shape. Enantiotropy and diastereotropic atoms, groups and faces. Asymmetric synthesis, stereospecific reactions. (Diels Alder reaction, anti-addition of halogens, enzyme catalyzed reactions and Rhodium complex reaction). Stereoselective synthesis of ephedrine and epiandrosterone and pheromone.

Part-II: 16 Marks
Delocalized Chemical bonding

Conjugation, Cross conjugation, rule of resonance, steric inhibition of resonance.

Aromaticity: Huckel rule and concept of aromaticity, Molecular orbital description of aromaticity and antiaromaticity, Relation between NMR and aromaticity. Annulenes (Two to more than ten-electron system), Aromaticity of hetero annulenes and fullerenes (C-60). Homoaromaticity.

Hyper conjugation: Explanation of hyper conjugative effect, isovalent and sacrificial hyper conjugations.

Tautomerism: Different types including valence tautomerism.

Part-III: 16 Marks
Reaction Mechanism/Structure and reactivity

Types of mechanisms. Types of reactions, thermodynamic and kinetic requirements, Hammond postulate, Curtrin-Hammett principle. Potential energy diagrams, transition states and intermediates. Methods of determining reaction mechanism, isotope effects. **Effect of structure on reactivity:** Resonance and field effects, steric effect, quantitative treatment. The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation.

Part-IV: 8 Marks
Aliphatic Electrophilic substitutions

General mechanism of SE1, SE2 and Sei reactions, Mechanism of reactions involving migration of double bond. Effect of substrate, leaving group and solvent on reactivity. Strok-enamine reaction.

Part-V: 8 Marks

Aliphatic Nucleophilic substitutions

Mechanisms and stereochemical implications of SN2, SN1, SNiandneighbouring group participation (by double and single-bonds) reactions. Effect of substrate structure, attacking nucleophile, leaving group and solvent on the rates of SN1 and SN2 reactions. Mixed SN1 and SN2 reactions. Nucleophilic substitution at allylic, aliphatic trigonal and vinylic carbon.

Part -VI 8 Mark

Elimination reactions:

Discussion of E1, E2, E1cB and E2C mechanisms. Effect of substrate structure base and the leaving group on reactivity. Competition between substitution and elimination reactions, Stereochemistry and orientation of E2 elimination. Mechanism and orientation in pyrolytic eliminations, Shapiro reaction.

Part-VII 8 Marks

Aromatic Electrophilic substitution

The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack. Orientation of substitution in benzene rings having more than one substituents. Orientation in other ring systems. Mechanisms of diazonium coupling, Vilsmeier-Haackand Gattermann-Koch reactions and Fries rearrangements

Part-VIII:

Part- I: 8 Marks

I). Preventive conservation in terms of:

1. Light
2. Insects
3. Fungus
4. Atmosphere
5. Pollution

Part-II): 8 Marks

Curative Conservation terms of:

1. Care of stone collection.
2. Conservation of polished/unpolished wood.
3. Conservation of Animal Skin, Photographs, sketches.

Part-III). 8 Marks

How to make a condition report?

Basic things to keep in mind during conservation

General Knowledge: 16 Marks

1. What is Preventive conservation?
2. What is curative conservations?
3. What is conservation
4. What is archaeology?
5. What is archives? When was achieves established in J&K?
6. What is museum? When was SPS museum Srinagar established/Give history?
7. When was Dogra art museum Jammu established?
8. What is documentation?
9. How is Identification of Antiquities made?
10. What type of antiquities were recovered from the archeological site at Harvan during the course of excavation?

Annexure "AP"

Syllabus for Data Entry Operator

Syllabus for written

Marks. **120** ***Time: 02.00 Hrs.***

S. No.	Subjects/ Topic	Marks assigned
1	GENERAL AWARENESS with special reference of J&K UT	**36**
2	GENERAL ENGLISH & COMPREHENSION	**24**
3	GENERAL INTELLIGENCE & REASONING	**24**
4	QUANTITATIVE APTITUDE	**24**
5	BASIC KNOWLEDGE OF COMPUTERS	**12**
	TOTAL	**120**

1. GENERAL AWARENESS with special reference of J&K UT

(i) Current Events of National and International importance
(ii) Political & Physical divisions of World & India
(iii) Climate & Crops in India
(iv) Transport & Communication.
(v) Demography- Census, its feature and Vital Statistics.
(vi) Important Rivers & Lakes in India.
(vii) Indian Economy.
(viii) Indian Culture & Heritage.
(ix) Indian History with special reference to Freedom Movement.
(x) Indian Constitution- Basic features- Preamble, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy
(xi) Science & Technology.
(xii) Environment, Ecology & Bio-diversity.
(xiii) Taxation in India- Direct & Indirect Tax - CBDT, GST etc.
(xiv) J&K UT
    a) History
    b) Economy
    c) Geography- (Weather, Climate, Crops, Rivers, Lakes, Flora, Fauna.)
    d) Heritage & Culture
    e) Important Tourist Destinations
(xv) J&K Reorganisation Act, 2019.

2. GENERAL ENGLISH & COMPREHENSION

(i) Tenses
(ii) Narration
(iii) Modals
(iv) Articles
(v) Reading Comprehension

(vi) Fill in the blanks with Phrases, Pronouns, homonyms/ homophones etc
(vii) Clauses
(viii) Synonyms and antonyms
(ix) Pairs of words and their use in meaningful sentences.
(x) Rearranging of jumbled sentences.
(xi) Idioms and phrases.
(xii) Uses of Prepositions.
(xiii) Active & Passive Voice
(xiv) Error Spotting
(xv) Sentence Correction
(xvi) Spellings Correction

3. GENERAL INTELLIGENCE & REASONING

(i) Number series, Letter series, Semantic Series, Speed, Distance and Time, Statements and conclusions, Logical Reasoning, Mental Reasoning, Word Building, Numerical Operations, Semantic Analogy, Symbolic/ Number Analogy, Figural Analogy, Semantic Classification, Symbolic/ Number Classification, Figural Classification, Problem Solving.

(ii) Symbolic Operations, Trends, Space Orientation, Space Visualization, Venn Diagrams, Drawing inferences, Punched hole/ pattern- folding & un-folding, Figural Pattern- folding and completion, Indexing, Address matching, Date & city matching, Classification of centre codes/roll numbers, Small & Capital letters.

4. QUANTITATIVE APPTITUDE

The scope of the test will be computation of

(i) Whole numbers, decimals, fractions and relationships between numbers, Profit and Loss, Discount, Partnership Business, Mixture and Alligation, Time and distance, Time & Work,Percentage. Ratio & Proportion, Square roots, Averages, Interest, Basic algebraic.

(ii) Graphs of Linear Equations, Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles, Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Heights and Distances, Histogram, Frequency polygon, Bar diagram & Pie chart, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square base, Trigonometric ratio, Degree and Radian Measures, Standard Identities, Complementary angles.

5. KNOWLEDGE OF COMPUTERS

(i) Basic Applications of Computer and its component.
(ii) Fundamentals of computer sciences.
(iii) Hardware & Software, Concept of Open-Source Technologies.

(iv) Input & output Devices.

(v) Knowledge of MS Word, MS Excel, MS Access, MS PowerPoint, PDF Internet and E-mail.

(vi) Concept of Computer Virus and Latest Anti-Virus.

(vii) Role of Information Technology in Governance.

Annexure "AQ"

Time: 02 Hours

Total Marks: 120

Syllabus for Laboratory Assistant

Qualification Prescribed: *Bachelor's Degree in Science from a recognized University with Chemistry/Botany / Zoology / Environmental Science with at least 60 % marks in aggregate.*

A) Chemistry:-

- Qualitative and Quantitative estimation of various cations and anions, Different techniques used in pesticide residue analysis, Principles of Analytical Methods in Titrimetery and Gravimetry.

B) Botany / Zoology:-

- Biochemistry and Cellular basis of life, Genetics evolution of life, Diversity of life forms, Molecular Biology, Ecology, Biostatistics, Industrial and Environmental Microbiology, Natural Resource Management, Bio-fertilizers, Environmental Biotechnology.

C) Environmental Science:-

- Introduction to Environmental Studies, Ecosystems, Natural Resources, Biodiversity and Conservation, Environmental Pollution, Waste Management, Global Environmental Issues and Policies, biogeochemical cycles, eco - system and ecology, eco tones, Man and biosphere programme.

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Annexure "AR"

Syllabus: Telephone Operator/Pump Operator/ Grinder Operator/ Mechanic cum Mistri

Total Marks=120 **Time: 02 Hours**

UNIT I — 15 Marks

(i) Articles
(ii) Tenses
(iii) Modals
(iv) Clauses
(v) Determiners
(vi) Preposition
(vii) Idioms and Phrases.
(viii) Synonyms / Antonyms
(ix) Spellings
(x) Sentences
(xi) Phrases
(xii) Homonyms/ Homophones

UNIT II — 15 Marks

(i) Current events of National importance
(ii) Honours and Awards
(iii) The World of Sports
(iv) Geographical Discoveries
(v) Principal Languages of India
(vi) Capitals and Currencies of Countries
(i) History, Geography, Culture and Economy of UT of Jammu and Kashmir
(ii) Flora and Fauna of J&K
(iii) Rivers and Lakes.
(iv) Important Tourist Destinations of UT of Jammu and Kashmir

Unit III — 20 Marks

(i) Percentage
(ii) Average
(iii) Time, Work and Distance
(iv) Ratio and Proportions
(v) Problem of Age
(vi) Probability
(vii) LCM, HCF
(viii) Mensuration
(ix) Trigonometry

(x) Polynomials and Quadratic equation

UNIT IV — 20 Marks

(i) Sources of energy; Conventional & Non-Conventional
(ii) Reflection & refraction of light, Mirror formula.
(iii) Refractive index, Lens formula, image formation, sign conventions.
(iv) Defects of vision & their correctness.
(v) Electric current; Electric potential and Potential difference
(vi) Ohms Law, Heating effects of Current
(vii) Environmental pollution
(viii) Nutrition, Respiration, Excretion etc
(ix) Communicable & Non-Communicable Dieases.
(x) Ecosystem – Its components, Food chains and Food webs.
(xi) Ozone layer, its depletion, Green House Effect.
(xii) Chemical Equation, types of chemical reactions.
(xiii) Oxidation & reduction reactions
(xiv) Bonding in Carbon, Allotropes of Carbon
(xv) Physical & Chemical properties of metals and non-metals.

Unit-V — 20 Marks

(i) Partition of Bengal.
(ii) Boycott and Swadeshi Movement.
(iii) Muslim League/ Khilafat Movement/Non-Cooperation Movement
(iv) Quit India Movement.
(v) Independence and Partition of India.
(vi) Change of Seasons/ Planets/ Solar System
(vii) Longitude - Latitude.
(viii) Types of Forests
(ix) Classification of Soils
(x) Types of farming
(xi) Major Crops
(xii) Resources- Types, Conservation etc.
(xiii) Federalism
(xiv) Democracy – Direct & Indirect.
(xv) Fundamental Rights, Fundamental Duties.
(xvi) Representation, Franchise, Secret Ballot.
(xvii) Political Parties- National, State, Regional etc.
(xviii) Economy-Primary, Secondary and Tertiary Sectors

UNIT V — 10 Marks

(i) Analogies
(ii) Relationship concepts

(iii) Figure odd one out
(iv) Direct Sense
(v) Figure Series completion
(vi) Venn Diagram
(vii) Number series
(viii) Coding/Decoding

Unit VI 20 Marks

(i) Communication and its importance.
(ii) Types of communication – verbal, non-verbal, written, email etc.
(iii) Safety and Health- Importance of safety and health at workplace.
(iv) Occupational Hazards- Basic Hazards, Chemical Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards.
(v) First Aid, Care of injured & Sick at the workplaces.
(vi) Pollution and pollutants including liquid, gaseous, solid and hazardous waste
(vii) Skills, Working Aids, Automation, Environment, Motivation.
(viii) Idea of ISO 9000 and BIS systems and its importance in maintaining qualities
(ix) Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's Compensation Act.
(x) Metric System: Measurement of length, breadth & height in metric units Measurement of weight in metric system. Unit conversion. Reading of plain scales. Reading of tapes & foot rules.

Annexure "AS"

Syllabus for Junior Engineer (Skill Development)

M. Marks- 120
Time Duration-02 Hours

ENGINEERING DRAWING (25 Marks)

a) Engineering Curves:

- Conventional lines and signs used in Engineering Drawing.
- Dimension and Tolerances.
- Printing and Lettering.
- Curves used in Engineering Practice: Cycloids, Involutes, Spirals, and Helices.

b) Loci - Conic Sections:

- Terms used in conic sections.
- Curves defined as Loci.
- Practical application of conics: Ellipse, Parabola, Hyperbola.

c) Projection of Planes:

- Projections of a plane with the principal planes in simple and inclined positions.
- Rotation method and the Auxiliary plane method.
- Space relations of a plane.
- To locate a point on a plane given its projections.
- Parallel relation of planes.
- Projection of planes inclined to different principal planes.

d) Projection of Solids:

- Classification and main features: Prisms and Pyramids.
- Projection of solids inclined to both the reference planes by:
    1. Rotation Method
    2. Auxiliary plane method.
- Projection of solids in combination (Co-axial) in simple and inclined positions.

e) Sectioning of Solids:

- Object of sectioning.
- Types of cutting planes.
- True shape of section.
- Auxiliary views of sections of multiple co-axial solids in simple and tilted positions.

f) Interpenetration of Solids and Intersection of Surfaces:

- Intersection of geometrical solids/hollow sections.
- Tracing of lines of intersection by line method and by section method.

g) Development of Surfaces:

- Classification of surfaces.
- Methods of development: Straight line method and Radial line method.
- Development of solids and hollow sections in full or part development of transition pieces.
- To draw projections from given development.

h) Isometric Projection:

- Isometric scale, Isometric axes, and isometric planes.
- Isometric projection of solids and simple machine blocks.

ENVIRONMENTAL SCIENCE (05 Marks)

a) Concept of Environmental Science:

- Major segments of the environment (Brief idea about atmosphere, hydrosphere, and lithosphere).

b) Air Pollution:

- Types and control of Air Pollution.

c) Water Pollution:

- Classification and control of Water Pollution.

d) Concept of Noise Pollution.

MECHANICS (15 Marks)

a. STATICS

- Concept of a particle rectilinear motion, motion curves.
- Rectangular components of curvilinear motion.
- Flight of Projectiles.
- Normal and tangential components of acceleration.
- Radial and transverse components.
- Newton's Laws of Motion.
- D'Alembert's Principle.

b. DYNAMICS

- Kinematics of rigid bodies.
- Types of rigid body motion, angular motion, fixed axis rotation.
- Analysis of plane motion and its applications.
- Instantaneous center and instantaneous axis of rotation.
- Kinetics of Particle Translation.
- Analysis of a particle as a rigid body.
- Kinetics of rigid bodies.
- Equations of plane motion, fixed axis rotation, rolling bodies.
- General plane motion.
- Impulse and momentum in plane motion.
- Angular momentum.

PHYSICS (25 Marks)

BASIC CONCEPT OF ELECTRICITY

- Concepts of resistance, inductance, capacitance, and various factors affecting them.
- Concepts of current, voltage, power, energy, and their units.
- Circuit laws, Kirchhoff's law.
- Simple circuit solution using network theorems.
- Magnetic Circuit – Concepts of flux, mmf, reluctance.
- Different kinds of magnetic materials.
- Magnetic calculations for conductors of different configurations (e.g., straight, circular, solenoidal).

ELECTROMAGNETIC FIELDS AND WAVES

- Concepts of Del Operator – gradient, divergence, curl and their physical significance.
- Displacement Current.
- Maxwell's equations in vacuum and non-conducting medium.
- Electromagnetic wave propagation in free space (plane wave solutions of electric & magnetic fields for free space) & their solutions (plane wave solution).
- Velocity of EM waves.
- Relation between E_0 & B_0.
- Definition of Poynting vector.
- Poynting theorem.

OSCILLATIONS

- Damped and Forced oscillations and their differential equations.
- Logarithmic decrement.
- Relaxation time & Quality factor.

- Ultrasonic waves and their production by Piezo-electric method and general applications.

QUANTUM MECHANICS

- Wave function definition, interpretation, and significance of wave function.
- Schrödinger's wave equations (Steady-State and time dependent) for 1-dimensional case.
- Concept of operators and expectation values.
- Applications of Schrödinger's equation (Time-independent) to: a) Particle in a 1-dimensional box of infinite height,
  b) Single step potential barrier,
  c) Tunnel effect.

SEMICONDUCTOR PHYSICS

- Structure of Atoms.
- Energy Band diagram.
- Metal, Insulator, and Semiconductor.
- Intrinsic and Extrinsic semiconductors.
- Direct & Indirect semiconductors.
- Bond in semiconductor & effect of temperature on semiconductors.
- Hole & Electron description.
- Charge densities in semiconductors.
- Generation & Recombination of charge carriers.
- Law of mobility & conductivity.
- Current densities in semiconductors.
- Fermi levels.
- Mass action law.
- Drift & Diffusion currents.
- Hall effect, Hall co-efficient & its applications.

OPTICS

- Interference in thin films (by reflection and transmission of light).
- Theory of Newton's rings by reflected light.
- Determination of wavelength and refractive index of monochromatic light by Newton's theory.
- Fraunhofer & Fresnel's diffractions.
- Fresnel's half-period zones and rectilinear propagation of light.
- Fraunhofer diffraction due to a single slit.
- Plane diffraction grating & its theory for secondary maxima and minima.
- Unpolarized and polarized light.
- Nicol Prism, Mathematical representation of polarization of different types.
- Quarter & half wave plates.

COMPUTER APPLICATIONS (10 Marks)

a) Fundamentals of Computer Science
b) Hardware & Software. Concept of Open Source Technologies
c) Input & Output Devices
d) Flow Charts and Algorithms
e) Operating System - MS Word, MS Excel, MS Access, MS PowerPoint, PDF
f) Internet & E-mail
g) Concept of Computer Virus & Latest Anti-Virus
h) Data Communication and Networking
i) Introduction to Database Management

MATHEMATICS (25 Marks)

a) Differential Calculus - I

- Limit theorem (without proof), partial differentiation, Euler's theorem on homogeneous functions, asymptotes, double points, curvature, curve tracing in Cartesian, polar, and parametric forms.

b) Differential Calculus - II

- Rolle's theorem, mean value theorem, Taylor's and Maclaurin's series with remainder, Taylor's series in two variables, maxima and minima of functions of two variables, method of Lagrange's multipliers.

c) Integral Calculus

- Definite integrals with important properties, differentiation under the integral sign.
- Gamma, Beta, and error functions with simple problems.
- Applications of definite integrals to find length, area, volume, and surface area of revolutions.
- Transformation of coordinates, double and triple integrals with simple problems.

d) Vector Calculus

- Scalar and vector product of vectors.
- Derivatives of vectors, partial derivatives of vectors.
- Directional derivatives and gradient, divergence, and curl of a vector.
- Vector integration, Gauss's divergence theorem, Green's theorem, Stokes' theorem.

e) Ordinary Differential Equations

- Differential equations of first order and first degree, exact and non-exact differential equations.
- Linear and Bernoulli's differential equations, higher-order linear differential equations.
- Complementary solution, particular integral, and general solution of these equations.
- Variation of parameters, technique to find particular integral of second-order differential equations.
- Cauchy's and Lagrange's differential equations.
- Application of ordinary differential equations to simple electrical and mechanical engineering problems.

GENERAL KNOWLEDGE (15 Marks)

a) Indian History, with special reference to Freedom struggle
b) Languages & Culture
c) International Organizations - UNO, WHO, WTO, IMF, UNESCO, UNCTAD, Etc.
d) Important Regional Organizations and Blocs - BRICS, OPEC, ASEAN, SAARC, BIMSTEC, G-20, G-7 etc
e) Sustainable Development Goals
f) Communicable Diseases - Cure and Prevention.
g) NCDC: COVID-19 - SOPs, Advisories, Guidelines etc.
h) World famous Awards
i) The world of Sports
j) Climate & Crops in India
k) Political & Physical divisions of world & India
l) Important Rivers & Lakes in India
m) Current Events of National and International importance

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Annexure "AT"

Syllabus for Cameraman

Time: 02 Hours

Total Marks: 120

1. History of Photography(from Camera Obscura to DSLR)
2. Basic Photography(Types of Cameras/Optics/Anatomy of camera/ types of lenses)
3. Photo Aesthetics(Need for the light in Photography/Light characteristics/Golden mean/ Rule of third)
4. Basic Photo Lighting Techniques (Key light/Fill in light/Bounce light/Diffused light/Low Key/High Key)
5. Digital Photography(Components of Digital Camera/Digital Camera Lenses/-Methods of storage)
6. Digital Photography Techniques (Exposure /ISO/manual Settings/Auto Exposure modes)
7. Basic of Computers(Types of computer/Components of computer/Output devices/Photo editing softwares)
8. Different Types of Photography: Candid Photography, Environmental Portrait, Men at Work, Child Labour, Street Life. Culture, traditions, life style, food, monuments, festivals,: Photo sequence, Photo feature)

Annexure "AU"

Syllabus for Written Test for the post of Veterinary Pharmacist

Marks: 120
No. of Questions: 120
Time: 02:00 Hours

S.No.	Subject/Topic A. Aptitude(60)	Total number of questions
1.	General English	15
2.	General Knowledge and current affairs (India)	15
3.	General Knowledge with special reference to J&K	5
4.	Numerical and Reasoning Ability	15
5.	Basic Concepts of Computers	10
	Total Marks (Aptitude)	**60**
	B. Subject Related(60)	
1	ANIMAL DIVERSITY I	10
2	ANIMAL DIVERSITY II	10
3	ANIMAL DIVERSITY III	10
4	COMPARATIVE PHYSIOLOGY & ANATOMY	10
5	EVOLUTION	10
6	IMMUNOLOGY	10
	Total Marks (Subject Related)	**60**
	Grand Total(A+B)	**120**

DETAILED SYLLABUS

1. GENERAL ENGLISH

- Articles
- Clauses
- Pronouns
- Homonyms/ homophones
- Tenses
- Clauses
- Punctuation
- Synonyms and antonyms
- Analogies
- Idioms and Phrases
- Uses of prepositions

2. GENERAL KNOWLEDGE AND CURRENT AFFAIRS (INDIA)

- Important dates in Indian History/Freedom Struggle, different dates and events
- First in world (Adventure, Sports, Discoveries).
- First in India (Adventure, Sports, Discoveries)
- Popular names of Personalities (Religion, Politics, Scientific discoveries, Geographical, Sports, History)
- The Newspaper world - (Current Dailies & Weeklies of India)
- Books & Authors – General
- Famous Places in India
- Languages
- Capitals & Currencies
- United Nations Organizations - Veto Powers, No. of Countries as its Members Principal organs and their functions
- SAARC, ASEAN
- Everyday Science
- World famous Awards - (1. in Science)
  (2. in Literature)
  (3. in Sports)
- National Awards (1. in Science)
  (2. in Literature)
  (3. in Sports)
- The world of Sports
- Climate & Crops in India
- Constitution of India (Formation, Fundamental rights, Directive Principles).
- Democratic institutions
- Forms of Government
- Political & Physical divisions of world & India
- Important rivers & Lakes in India
- Current Events of National and International Level
- Agriculture in economic development; Industrialization and economic development
- Centrally Sponsored Schemes-Guidelines and Objectives
- Indian Foreign Trade

3. GENERAL KNOWLEDGE WITH SPECIAL REFERENCE TO J&K

- Abbreviations, Important dates, popular names of personalities and their achievements/Contribution (National and International)
- Weather, Climate, Crops, Means of Transport Important power projects and their impact on J&K Economy
- Rivers and Lakes
- Important Tourist Destinations
- History of J&K - Historical places of the J&K and their importance
- RTI Act
- Indus Water Treaty and its impact on economy
- Agriculture in Economic Development, industrialization and economic Development.
- Current events of Local, National and International Importance.

4. NUMERICAL AND REASONING ABILITY

The candidates will be tested primarily on the fundamental mathematical concepts and application oriented reasoning. The broad areas will include the following:

Basic Arithmetic:

- Number System
- Percentage
- Average
- Profit & Loss
- Ratio & Proportion
- Speed, Distance and Time
- Mathematical reasoning
- Basic Algebra
- Mensuration
- Decimal Fractions
- Simple and Compound Interest
- Trigonometry
- Simplification

Reasoning ability:

- Number series
- Letter series
- Coding decoding

- Direction sense
- Blood relations
- Statements and conclusions
- Logical Reasoning
- Mental Reasoning
- Sequential output tracing
- Assertions and reasons
- Arithmetical Operations

5. BASIC CONCEPTS OF COMPUTERS

The candidates' understanding of the concepts of computers and its application will be tested and it will broadly cover the following:

- Computer terminology
- Hardware and Software
- Input and Output Devices
- MS word and MS Excel
- Storage and Operating systems
- Safety and Security
- E-mail and Internet Usage
- Search Engines

6. SUBJECT RELATED SYLLABUS

ANIMAL DIVERSITY I

UNIT 1

1.1 Protista: General characters and classification up to classes; Locomotion in Protozoa

1.2 Porifera: General characters and classification up to classes; Canal System

1.3 Cnidaria: General characters and classification up to classes; Polymorphism in Hydrozoa

1.4 Helminthes: General characters and classification up to classes of platyhelminthes and nemathelminthes; Life history of *Taenia solium and Ascaris lumbricoides;* parasitic adaptations

1.5 Annelida: General characters and classification up to classes; Filter feeding in Polycheats

ANIMAL DIVERSITY II

UNIT 2

2.1 Arthropoda: General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects

2.2 Mollusca: General characters and classification up to classes; Torsion in gastropods

2.3 Echinodermata: General characters and classification up to classes; Water-vascular system in Asteroidea

2.4 Urochordates: General features and classification; Phylogeny of Protochordata

2.5 Cephalochordates: General features and classification

ANIMAL DIVERSITY III

UNIT 3

3.1 Pisces: General features and Classification up to orders; Osmoregulation

3.2 Amphibia: General features and Classification up to orders; Parental care

3.3 Reptiles: General features and Classification up to orders; Poisonous and non-poisonous snakes

3.4 Aves: General features and Classification up to orders; Flight adaptations

3.5 Mammals: General characters and Classification up to orders; adaptive radiation

COMPARATIVE PHYSIOLOGY & ANATOMY

UNIT 4

4.1 Digestive System: Brief account of alimentary canal and digestive glands

4.2 Digestion: Physiology of digestion; Absorption of carbohydrates, proteins and lipids

4.3. Respiration & Respiratory System: Pulmonary respirstion, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood, types of respiratory pigments, oxygen dissociation curves; Brief account of Gills, lungs, air sacs and swim bladder

4.4 Excretion & Excretory System: Formation and excretion of nitrogenous wastes; Evolution of kidney and urinogenital ducts

4.5. Nervous System & Sense Organs: Comparative account of brain; Different types of potentials, action potential and its propagation in different nerve; Fibres; Different types of receptors, Physiology of vision; Physiology of hearing

EVOLUTION

UNIT 5

5.1 Introduction to Evolutionary Theories: Lamarckism, Darwinism, Neo-Darwinism

5.2 Evidences of Evolution: Types of fossils, Dating of fossils, Phylogeny of horse

5.3 Processes of Evolutionary Change: Organic variations; Isolating Mechanisms; Natural selection, Industrial melanism

5.4 Natural Selection: Directional, Stabilizing and Disruptive selection, Artificial selection

5.5 Species Concept: Biological species concept; Modes of speciation (Allopatric, Sympatric)

IMMUNOLOGY

UNIT 6

6. 1. Basic properties of antigens; B and T cell epitopes and adjuvants;

6.2. Structure, classes and function of antibodies, monoclonal antibodies;

6.3. Antigen antibody interactions as tools for research and diagnosis.

6.4. Structure and Functions of MHC; Exogenous and endogenous pathways of antigen presentation and processing;

6.5. Basic properties and functions of cytokines; Complement system: Components and pathways

Annexure "AV"

Time:02 Hours	SYLLABUS FOR THE POST OF RECEPTIONIST (JKSSB)	Marks: 120
Unit-1:	INTRODUCTION TO HOSPITALITY & HOTEL INDUSTRY- Origin & Evolution & Domestic & International hotel companies, Hotel organization- Full service/ limited service, Revenue & Non-revenue producing departments, Staff organization-Rooms division hierarchy	
Unit- 2:	CLASSIFICATION OF HOTELS- Size, Target market- (Location, clientele, facilities offered, facilities), Levels of Service, Star classification, HRACC guidelines), Ownership & affiliation. TYPES OF ROOMS-Room sizes (with reference to HRACC), SMART rooms & differently abled guest rooms, Basic of charging-Check-in-check out, 24 hours, Night/ Day, Day use, Types of Room rates (Special rates). Meal plans- (EP, BP, CP, AP, MAP etc.)	
Unit- 3:	GUEST CYCLE-Stages of Guest cycle, related front office function areas. Pre- arrival – Reservations -1 (Confirmed – Guaranteed / Non-guaranteed, Tentative/Waitlisted).Pre-arrival – reservations –II -Reservation procedure (FIT: DFIT & FFIT, group, VIP).Sources-Direct, CRS, GDS, Intersell agencies. Modes of reservations –Verbal & Written. Amendments &cancellations	
Unit-4:	ARRIVAL –I -Bell desk & valet services, Functions, Procedures, Arrival –II –a) Creating registration record b) Assigning room& rate c) Establishing the method of payment d) Issuing room key e) Fulfilling special requests, DFIT, FFIT, Walk-in, VIP & Group, express check –In, self-registration, Room selling techniques-Upselling	
Unit-5:	DURING THE STAY-Concierge, Mail & message handling, Room change procedure, Special procedure, Wake-up call, Newspaper delivery & transport arrangements. Service recovery - Guest relations, Handling complaints, Follow-up procedures, Complaint handling Apps/ escalation Matrix & Root cause analysis	
Unit-6:	GROOMING ETIQUETTE- Introduction to service culture, Service product, Guest Relationship-Business protocol & Professionalism. Moments of Truth, Creating a WOW factor (Guest delight) & Guest satisfaction SKILL SET & ATTITUDE OF FRONT OFFICE PERSONNEL, Job description & Job specifications, Layout of Front Office- FO equipment	
Unit-7:	RESERVATION PROCEDURES-Amendments, Cancellations, Formats-Arrival procedure, Bell desk activities, Pre-registration, Escorting guest & room orientation-Check-in procedure, Formats Telephone, Email, Texting etiquette, Reservation records/ Formats. APPLICABLE TAXES & CHARGES- Special rate calculations, Design a package.	
Unit-8:	DURING THE STAY ACTIVITY PROCEDURES- Mail handling, Message handling, Paging, Special requests, Room change procedure & Complaint handling. Discrepancy report, Arrival Notification, Amenity vouchers, Meal coupons & Mini bar	
Unit-9:	GUEST ACCOUNTING, FUNDAMENTALS (Folio, Voucher, Ledger, Accounts, POS).Creation & maintenance of Accounts (Charge privileges, Cash & credit monitoring, Account	

	maintenance & Record keeping systems) TRACKING TRANSACTIONS- Cash payments, Charge purchase, Account corrections, Account allowance , Account transfer Cash advance
Unit-10:	DEPARTURE- I -Check out& settlement, Departure procedure, DFIT, FFIT, Group, VIP, Modes of payment (Cash, Credit card, Bill to company, foreign currency & combined methods) DEPARTURE-II -Additional check out options , Express checkout , Self-check- out, kiosk, interactive checkout, mobile app checkout , Late checkout.
Unit- 11:	POST DEPARTURE- Unpaid account balances, Account collection, Account ageing & Record generation. NIGHT AUDIT –Importance, Role of night auditor & The night audit procedure
Unit-12:	SITUATION HANDLING -EMERGENCY procedures (Medical, Fire, Robbery/ theft, Accident , Natural calamity, Bomb threat & Terrorist attack) Guest safety & security- a) Electronic locking systems b) Surveillance & access systems. EMERGING TRENDS IN ROOM'S DIVISION- a) Use of technology b) Product innovation
Unit-13:	MIS- a) Importance b) Statistical ratios (Occupancy% , Multiple occupancy%, House count, Bed occupancy% , Domestic occupancy%, Foreign occupancy %, Occupancy multiplier, ARR/ADR, ARG/ Rev PAC, RevPAR, Yield
Unit- 14:	Introduction to checkout procedures, PMS, Formats used at check out Departure procedure –PMS, Formats used at check out Post departure procedures, Night audit procedure, PMS
Unit-15:	MANAGING RELATIONSHIP AND BUILDING LOYALTY-a) Importance b) Concept of customer loyalty c) Understanding guest-hotel relationship d) The wheel of Loyalty e) Foundation for Loyalty f) Strategies for developing Loyalty g) Strategies for reducing customer Defection. Artificial intelligence in the hospitality- a) Guest cycle b) Room design c) Public areas
Unit- 16:	BUDGETING: A. Types of budget & budget cycle B. Making front office budget C. Factors affecting budget planning D. Capital & operations budget for front office E. Refining budgets, budgetary control F. Forecasting room revenue G. Advantages & Disadvantages of budgeting

Unit-17:	YIELD MANAGEMENT: A. Concept and importance B. Applicability to rooms division □ Capacity management □ Discount allocation □ Duration control C. Measurement yield D. Potential high and low demand tactics E. Yield management software F. Yield management team
Unit-18:	TIMESHARE & VACATION OWNERSHIP □ Definition and types of timeshare options □ Difficulties faced in marketing timeshare business □ Advantages & disadvantages of timeshare business □ Exchange companies -Resort Condominium International, Intervals International □ How to improve the timeshare / referral/condominium concept in

Annexure "AW"

Government of Jammu and Kashmir
Transport Department, Civil Secretariat, J&K,
Jammu
****

Subject:- **Filling up of post of "Foreman" in Motor Garages Department and notification of syllabus thereof.**

Ref: **Letter No. SSB/COE/2021/865-870 dated 29.01.2021of J&K Services Selection Board, Letter No. RCD-704/2736/DSMG dated 19.02.2021 from Director, Motor Garages Department, J&K, Jammu and Letter No. DSD/Poly/101/ G-/347 dated 06.04.2021 from Director, Skill Development, J&K.**

Government Order No:- 40 **-JK (TR) of 2021**
D a t e d:- 28 **-04-2021**

Sanction is hereby accorded to notification of the syllabus for the post of "Foreman" in Motor Garages Department forming annexure "A" to this Government Order.

By order of the Government of Jammu and Kashmir.

Sd/-
(Hirdesh Kumar) IAS
Commissioner/Secretary to the Government,
Transport Department.

Dated:- 28 - 04-2021

No: - TR-9/SMG/2015

Copy to the: -

1. Joint Secretary (J&K), Ministry of Home Affairs, Government of India.
2. Secretary, J&K Services Selection Board, Jammu.
3. Director, Skill Development, J&K, Jammu.
4. Director, J&K, Motor Garages Department, Jammu.
5. Private Secretary to Hon'ble Advisor (Incharge Transport Department).
6. Pvt. Secretary to Commissioner/Secretary to Government, Transport Department.
7. I/c Website.
8. Government Order/Stock file (w.2.s.c).

25/4/21
(Raj Mohammad Malik)KAS
Deputy Secretary to Government,
Transport Department

Time: 02 Hours

Total Marks: 120

SYLLABUS FOR THE POST OF FOREMAN IN STATE MOTOR GARAGES

PART -I 20 MARKS

1.1 ENGLISH AND COMMUNICATION SKILLS - I

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RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this subject is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the subject, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

DETAILED CONTENTS

1. Facets of Literature (14 hrs)

   1.1 Short Stories

      1.1.1 Homecoming – R.N. Tagore
      1.1.2 The Selfish Giant - Oscar Wilde
      1.1.3 The Diamond Necklace- Guy- De Maupassantt

   1.2 Prose

      1.2.1 I Have A Dream – Martin Luther King
      1.2.2 On Habits – A. G. Gardiner
      1.2.3 My struggle for An Education- Booker T Washington

   1.3 Poems

      1.3.1 Ozymandias – P.B. Shelley
      1.3.2 Daffodils – William Wordsworth
      1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost

2. Grammar and Usage (10 hrs)

   2.1 Parts of speech

      2.1.1 Nouns
      2.1.2 Pronouns
      2.1.3 Adjectives
      2.1.4 Articles

2.1.5 Verbs
2.1.6 Adverbs
2.1.7 Prepositions
2.1.8 Conjunction
2.1.9 Interjection
2.1.10 Identifying parts of speech
2.1.11 Using a word as different parts of speech

2.2 Pair of words (Words commonly confused and misused)

2.3 Tenses

2.4 Correction of incorrect sentences

2.5 One word substitution

2.6. Forms of verbs (100 words)

3. Translation (04 hrs)

3.1 Glossary of Administrative Terms (English/ Hindi/Urdu)
3.2 Translation from Urdu into English

4. Paragraph of 100-150 words from outlines (08 hrs)

5. Comprehension (04 hrs)

Unseen passages of literature, scientific data/graph based for comprehension exercises

6. Communication (08 hrs)

6.1 Definition, Introduction and Process of Communication
6.2 Objectives of Communication
6.3 Essentials of Communication

1.2 APPLIED MATHEMATICS - I

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RATIONALE

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.

DETAILED CONTENTS

1. Algebra (35 hrs)

1.1 Complex numbers: Complex numbers, representation, modulus and amplitude,
Demovier's theorem and its applications in solving algebraic equation.

1.2 Geometrical progression, its nth term and sum of n terms and to infinity with application to engineering problems.

1.3. Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)

1.4 Concept of permutations and Combinations: Value of ${}^{n}p_{r}$ ${}^{n}c_{r}$.

1.5. Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof)

2. Trigonometry (20 hrs)

Review of ratios of some standard angles (0,30,45,60,90 degrees), T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

3. Co-Ordinate Geometry (25 hrs)

3.1 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines, perpendicular distance formula (without proof)

3.2 General equation of a circle and its characteristics. To find the equation of a circle, given:

* Centre and radius
* Three points lying on it
* Coordinates of end points of a diameter

3.3. Equations of conics (ellipse, parabola and hyperbola), simple problems related to engineering (standards forms only)

1.3 APPLIED PHYSICS – I

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RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Units and Dimensions (8 hrs)

1.1 Physical quantities

1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)

1.3 Dimensions and dimensional formulae of physical quantities

1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis

1.5 Error in measurement, random and systematic errors, types of errors, propagation of errors, significant figures

2. Force and Motion

(12 hrs)

2.1 Concept of Scalar and Vector quantities – examples, types of vectors.

2.2 Resolution and Composition of vectors, Vector multiplication (scalar product and vector product of vectors), addition of vectors (Parallelogram law)

2.3 Force: Newton's laws of motion, linear momentum and conservation of linear momentum, impulse and its application, simple numerical problem in brake system of vehicles and trains etc.

2.4 Friction: Types of friction and its application.

2.5 Circular motion: Angular displacement, angular velocity and angular acceleration

2.6 Relation between linear and angular variables (velocity and acceleration)

2.7 Centripetal force (derivation) and centrifugal force with application such as banking of roads and bending of cyclists

2.8 Application of various forces in lifts

3 Rotational Motion

(6 hrs)

3.1 Concept of translatory and rotating motion with examples
3.2 Definitions of torque, angular momentum and their relationship
3.3 Conservation of angular momentum (qualitative) and its examples
3.4 Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).
3.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.

4 Work, Power and Energy (8 hrs)

4.1 Work: definition and its SI units

4.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application

4.3 Power: definition and its SI units, calculation of power with numerical problems

4.4 Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation

4.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application

5 Properties of Matter (10 hrs)

5.1 Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications

5.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications

5.3 Surface tension: concept, its units, angle of contact, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension

5.4 Viscosity and coefficient of viscosity: Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity.

6 Thermometry (10 hrs)

6.1 Difference between heat and temperature
6.2 Principles of measurement of temperature and different scales of temperature and their relationship
6.3 Types of thermometers (Concept only)
6.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
6.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
6.6 Co-efficient of thermal conductivity
6.7 Engineering Application of conduction, convection and radiations

7. Waves and Vibrations (10

7.1 Simple Harmonic Motion(SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Equation of simple harmonic progressive wave

7.2 Wave motion: transverse and longitudinal wave motion with examples, sound and light waves, velocity, frequency and wave length of a wave (relationship $v = n\lambda$) and their applications

7.3 Free, forced and resonant vibrations with examples

7.4 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications

7.5 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

LIST OF PRACTICAL'S (to perform minimum ten experiments)

1.4 APPLIED CHEMISTRY-I

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RATIONALE

Every branch of engineering is expanding greatly. The contributions of chemicals and chemical products are playing important role in the field of engineering, biotechnology, agriculture and pharmacology etc. The numbers of such chemical products are exponentially increasing each successive year. This results in enhancing the responsibility of engineers while choosing engineering materials for converting them into finished products. Now a days, choosing engineering material is not only based on conventional qualitative and quantitative testing of their chemical composition and behavior under service conditions, but also based on environmental and eco-friendly factors. To achieve such objectives it is essential to know applied aspects of chemistry. Applied chemistry for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciation of physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the engineers by imparting essential knowledge required from this subject through demonstrations, and minor projects.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Basic Concepts of Chemistry (06 hrs)

- 1.1 S.I. Units of pressure, volume, density, specific gravity, surface tension, viscosity and conductivity.
- 1.2 Matter, element, compound and mixtures, atoms, molecules, ions, symbols and formulae, Atomic mass (A), atomic number (Z) isotopes, isobars, isotone (recapitulation only)
- 1.3 Chemical equations, thermo-chemical equations, balancing of chemical equations

2.Atomic Structure, Periodic Table and Chemical Bonding (10 hrs)

- 2.1 Fundamental particles- electrons, protons and neutrons
- 2.2 Orbit & orbital, electronic configuration of elements (upto Z=30)
- 2.3 Modern periodic law and periodic table, groups and periods.
- 2.4 Chemical bond and cause of bonding- Ionic bond, covalent bond, and its types

3. Water (10 hrs)

3.1 Sources of water
3.2 Types of water based on dissolved salts.
3.2.1 Hard water, soft water
3.2.2 Units to measure water hardness in ppm (mg/l) & simple numericals, degree Clark & degree French
3.3 Disadvantages of use of hard water in domestic and industrial applications (mainly boiler feed water)
3.4 Methods to remove water hardness by
3.4.1 Ion exchange process
3.4.2 Lime-soda process
3.4.3 Reverse Osmosis method
3.5 Quality criteria of drinking water as per BIS. (with special emphasis on hardness, total dissolved solids (TDS), Chloride, alkalinity present in water)

4. Solutions (08 hrs)

4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples
4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution.
4.3 Definition of pH, simple numericals and different industrial applications of pH.
4.4 Buffer solution and applications of buffer.

5. Electrolysis (08 hrs)

5.1 Definition of the terms: Electrolytes, Non-electrolytes with suitable examples
5.2 Faraday's Laws of Electrolysis and simple numericals
5.3 Different industrial applications of 'Electrolysis'
5.4 Applications of redox-reactions in battery technology such as (i) Dry cell (ii) lead acid battery and (iii) Ni-Cd battery

6. Environmental Chemistry (06 hrs)

6.1 Brief introduction to Environmental Chemistry & Pollution
6.2 Causes and effects of air, water & soil pollutions
6.3 Role of chemistry in controlling air, water & soil pollutions

1.5 ENGINEERING DRAWING – I

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RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis while imparting instructions should be to develop conceptual skills in the students.

Note: 1. First angle projection is to be followed
2. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Drawing Office Practice, Lines & Lettering (2 Sheets)

   1.1 Drawing instruments
   1.2 Sizes and layout of standard drawing sheets and drawing boards
   1.3 Different types of lines in engineering drawing as per BIS specifications
   1.4 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4

2. Dimensioning (2 Sheets)

   2.1 Necessity of dimensioning, Types of dimensioning (chain, parallel and progressive dimensioning, size and location dimensioning)
   Methods of placing dimensioning (Aligned and unidirectional system), use of leader lines. General principles of dimensioning.
   2.2 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches.

3. Simple Geometrical Constructions used in Engineering Practice (2 Sheets)

   3.1 Construction of regular polygons (triangle, square, pentagon, hexagon) and circles
   3.2 Ellipses (concentric circle method and Intersecting Arcs method)
   3.3 Parabola (rectangle and tangent method), cycloid

4. Scale (2 sheets)

4.1 Scale – their need and importance, Definition of representative fraction (R.F), find RF of given scale
4.2 Construction of plain and diagonal scales

5. Principle of Projections (7 sheets)

5.1 Principle of orthographic projection and introduction to first angle projection and third angle projection
5.2 Projection of points situated in different quadrants (1 Sheet)
5.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa (1^{st} &3^{rd} quadrants) (1 Sheet)
5.4 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and parallel to the other or vice versa (1^{st} & 3^{rd} quadrants) (1 Sheet)
5.5 Drawing 3 orthographic views of given objects (3 sheets, at least one sheet in 3^{rd} Angle Projection)
5.6 Identification of surfaces on drawn orthographic views from isometric object drawn (1Sheet)

6. Sectional Views (1 sheet)

6.1 Need for sectional views --Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections

7. Isometric Views (2 sheets)

7.1 Fundamentals of isometric projections (theoretical instructions) and isometric scales
7.2 Isometric views of combination of regular solids like cylinder, cone, cube, prism and pyramid

8. Development of Surfaces (2 sheets)

8.1 Parallel line method (Prism and cylinder)
8.2 Radial line method (Pyramid and Cone)

1.6 GENERAL WORKSHOP PRACTICE - I

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RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices.

This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-1
2. Fitting Shop
3. Welding Shop-I
4. Electric Shop –I
5. Smithy Shop or Electronic Shop-I
6. Sheet Metal Shop-I

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering, Wood Technology, Leather Technology, Food Technology, Quantity Surveying and Public Health Engineering will do **Smithy Shop** instead of Electronic Shop- I
2. The branches e.g. Electronics and Communication Engineering, Instrumentation and Control, Computer Engineering, Information Technology, and Medical Electronics will do **Electronic Shop-I** instead of Smithy Shop.

1. Carpentry and Painting Shop

1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).

1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.

Job I Marking, sawing, planning and chiseling & their practice

1.3 Introduction to various types of wooden joints, their relative advantages and uses.

Job II Preparation of half lap joint

Job III Preparation of Mortise and Tenon Joint

1.4 Demonstration of various methods of painting wooden items.

Job IV Preparation of surface before painting including primar coat

Job V Painting Practice by brush/roller/spray

2. Fitting Shop

2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.).Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.

2.2 Description and demonstration of various types of work benches. holding devices and files. Precautions while filling.

2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

Job I Marking of job, use of marking tools and measuring instruments.

Job II Filing a dimensioned rectangular or Square piece of an accuracy of ± 0.5mm

Job III Filing practice (Production of flat surfaces) Checking by straight edge.

Job IV Making a cutout from a square piece of MS Flat using Hand hacksaw.

2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count.

3. Welding Shop – I

3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.

3.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.

Job I Practice of striking arc while using electric arc welding set.

Job II Welding practice on electric arc welding for making uniform and Straight weld beads

3.3 Various types of joints and end preparation.

Job III Preparation of butt joint by electric arc welding.

Job IV Preparation of lap joint by electric arc welding.

Job V Preparation of corner joint by using electric arc welding.

Job VI Preparation of Tee joint by electric arc welding.

4. Electric Shop – I

4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, PVC Conduits, PVC Channels and allied items, tools and accessories.

4.2 Study of electrical safety measures and demonstration about use of protective devices. Such as fuses, MCBs and relays

Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.

Job II Preparation of a house wiring circuit on wooden board using fuse, Switches, socket, holder, ceiling rose etc. by PVC Conduit and PVC casing and capping.

4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, gas geyser, desert cooler, refrigerator, water purifier

4.4 Introduction to the construction of a Lead-acid battery and its working.

Job III Installation of inverter with battery and to connect two or more batteries in series and in parallel

Job IV Charging of a battery and testing it with the help of hydrometer and Cell Tester

5. Smithy Shop

5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.

5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.

5.3 Demonstration and description of tongs, fullers, swages etc.

Job I To forge a L-Hook.

Job II To prepare a job involving upsetting process

Job III To forge a chisel

Job IV To prepare a cube from a M.S. round by forging method.

OR

5. Electronic Shop – I

5.1 Identification and familiarization with the following tools used in electronic shop:
Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron, soldering wire, flux and their demonstration and uses.

5.2 Identification and familiarization with Multimeter analog and digital (Three and half digit)
Job I Practice in the use of above-mentioned equipment. For this small experimental as set up may be done

5.3 Various types of protective devices such as : Wire fuse, cartridge fuse etc. ,

5.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors (Audio, Video)

5.5 Safety precautions to be observed in the electronic shop

5.6 Identification and familiarization with soldering and desoldering practice.

NOTE: Demonstration boards for the electronics components such as resistor, Capacitor, diodes, transistors, FETs, IFT Coils, ICs should be made.

Job II Cut, strip, join an insulated wire with the help of soldering iron (repeat with different types of wires)

Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD Players, VCD/DVD Players, Cassette Recorder and Players, Hi-Fi equipment, Hand- set, microphone

6. Sheet Metal Shop –I

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

6.1 Introduction and demonstration of hand tools used in sheet metal shop.

6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, power press, sheet bending machine.

6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminum sheets etc.

6.4 Study of various types of Rivets, Steel Screw etc.

Job I Shearing practice on a sheet using hand shears.

a) Practice on making Single riveted lap joint/Double riveted lap Joint.
b) Practice on making Single cover plate chain type, riveted Butt Joint

PART -II **20 MARKS**

2.1 ENGLISH AND COMMUNICATION SKILLS – II

L T P
3 - 2

RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a communication skill laboratory for conducting practicals mentioned in the curriculum.

DETAILED CONTENTS

1. Facets of Literature (14 hrs)

   1.1 Short stories

      1.1.1 The Portrait of a Lady - Khushwant Singh
      1.1.2 The Doll's House – Katherine Mansfield
      1.1.3 The Refugees – Pearl S. Buck

   1.2 Prose

      1.2.1 Walking Tours – R.L. Stevenson
      1.2.2 A Dialogue on Civilization – C.E.M. Joad
      1.2.3 The Sign of Red Cross – Horace Shipp

   1.3 Poems

      1.3.1 All The World's A Stage – W. Shakespeare
      1.3.2 Say Not, The Struggle Nought Availeth – A.H. Clough
      1.3.3 Pipa's Song – Robert Browning

2. The Art of Précis Writing (04 hrs)

3. Grammar and Usage (08 hrs)

   3.1 Narration
   3.2 Voice
   3.3 Idioms and Phrases

4. Correspondence (04 hrs)

   4.1 Business Letters
   4.2 Personal letters

5. Drafting (06 hrs)

   5.1 Report Writing
   5.2 Inspection Notes
   5.3 Memos, Circulars and Notes
   5.4 Notices
   5.5 Press Release
   5.6 Agenda and Minutes of Meetings

5.7 Applying for a Job: Forwarding letter, Resume/C.V., follow up.

6. Glossary of Technical & Scientific Terms (04 hrs)

7. Communication (08 hrs)

7.1 Media and Modes of Communication
7.2 Channels of Communication
7.3 Barriers to Communication
7.4 Listening Skills
7.5 Body language
7.6 Humour in Communication

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RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

DETAILED CONTENTS

1. Differential Calculus (30 hrs)

1.1 Definition of function; Concept of limits.

Four standard limits $\lim_{x \to a} \frac{x^n - a^n}{x - a}$,

$\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to 0} \frac{a^x - 1}{x}$, $\lim_{x \to 0} (1+x)^{1/x}$

1.2 Differentiation by definition of x^n, sin x, cos x, tan x, e^x, $\log_a x$ only

1.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

1.4 Differentiation of trigonometric inverse functions . Logarithmic differentiation. Exponential differentiation Successive differentiation (excluding nth order).

1.5 Applications:
(a) Maxima and minima
(b) Equation of tangent and normal to a curve (for explicit functions only) – Simple problems only

2. Integral Calculus (30 hrs)

2.1 Integration as inverse operation of differentiation

2.2 Simple integration by substitution, by parts and by partial fractions (for linear factors only)

2.3 Evaluation of definite integrals (simple problems)-

Evaluation of $\int_0^{\pi/2} \sin^n x\, dx$, $\int_0^{\pi/2} \cos^n x\, dx$, $\int_0^{\pi/2} \sin^m x \cos^n x\, dx$

using formulae without proof (m and n being positive integers only)

3 Ordinary Differential Equations (10 hrs)

3.1. Definition and formation of Differential Equations

3.2. Solution of first order Differential Equations of the type:
(i) Variable separable form
(ii) Homogeneous Differential Equations
(iii) Linear Differential Equations

4. Statistics (10 hrs)

4.1 Measures of Central Tendency: Mean, Median, Mode

4.2 Measures of Dispersion: Mean deviation, Standard deviation

2.3 APPLIED PHYSICS – II

L T P
4 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology

DETAILED CONTENTS

1. Optics (10 hrs)
   - 1.1 Review of basic optics laws: reflection and refraction
   - 1.2 Refraction and refractive index, image formation in lenses, image magnification, lens formulae (thin lens only), power of lens, total internal reflection and their applications
   - 1.3 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case), Terrestrial and Galileo's telescope (Concept only) and their applications
2. Electrostatics (12 hrs)
   - 2.1 Coulombs law, unit of charge, electric potential and electric potential difference
   - 2.2 Electric field, electric field intensity, electric lines of force, electric flux Gauss's Law
   - 2.3 Applications of Gauss law in finding electric field of point charge, straight charged conductor, plane charged sheet and between two plane parallel charged sheets
   - 2.4 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down
   - 2.5 Application of electrostatics in electrostatic precipitator
3. DC Circuits (12 hrs)
   - 3.1 Concept of electricity, current and its units, direct and alternating current, voltage, resistance, potential difference and e.m.f,
   - 3.2 Ohm's law and its applications, concept of resistance, conductance, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors, introduction to super conductivity.
   - 3.3 Kirchhoff's laws, Wheatstone bridge principle and its applications (Slide Wire Bridge)
   - 3.4 Heating effect of current and concept of electric power, energy and their units, related numerical problems
   - 3.5 Application of electricity in various equipments, advantages of electrical energy over other forms of energy
4. Electromagnetism (13 hrs)
   - 4.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units, Right hand thumb rule, magnetic lines of force due to straight conductor, circular coil and solenoid
   - 4.2 Force on a charge, moving in a uniform magnetic field (Lorentz force). Force on a current carrying straight conductor. Torque on a current carrying rectangular coil.
   - 4.3 Moving coil galvanometer conductor, its principle, construction and working, conversion of a galvanometer into ammeter and voltmeter.
   - 4.4 Electromagnetic induction, Faradays Laws, Lenz's Law.
   - 4.5 Applications of Electromagnetism
5. Semiconductor physics (07 hrs)
   - 5.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
   - 5.2 Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)
6. Modern Physics (10 hrs)

6.1 Electro magnetic spectrum, photo electric effect and work function, X rays - properties, production and their applications in medicine and industries.

6.2 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, Helium- Neon and ruby lasers, their engineering and medical applications

6.3 Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

2.4 APPLIED CHEMISTRY-II

L T P
3 - 2

RATIONALE

The role of chemistry in every branch of engineering and technology is expanding greatly. Now a days, various chemical products are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstrations/ minor projects and with the active involvement of students.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

DETAILED CONTENTS

1. Metallurgy (08 hrs)

1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), ore, roasting, calcinations, smelting and refining of metal.

1.2 Metallurgy of (i) Aluminium (ii) Iron

1.3 Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico, stainless steel and invar.

2. Fuels (10 hrs)

2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples

2.2 Definition of Calorific value of a fuel and determination of calorific value of a solid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values

2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a coal. Importance of conducting the proximate and ultimate analysis of a fuel

2.4 Merits of gaseous fuels over those of other varieties of fuels

2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

2.6 Composition, calorific values and applications of (i) LPG (ii) CNG (iii) Power alcohol

2.7 Fuel rating

2.7.1 Octane number for petrol
2.7.2 Cetane number for diesel

3 Corrosion (06 hrs)

3.1 Definition of corrosion

3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory

3.3 Passivity

3.4 Prevention of corrosion by
1. (a) Alloying
(b) Providing metallic coatings
2. Cathodic protections:
(a) Sacrificial
(b) Impressed voltage method
3. Heat treatment (quenching, annealing, tempering & normalizing)

4 Lubricants (06 hrs)

4.1 Definition of (i) lubricant (ii) lubrication

4.2 Classification of lubricants

4.3 Principles of lubrication
(i) fluid film lubrication
(ii) boundary lubrication
(iii) extreme pressure lubrication

4.4 Properties of lubricants

4.4.1 Physical properties: viscosity, viscosity index, flash-point, fire-point, cloud-pour point, oiliness, volatility, emulsification

4.4.2 Chemical properties-Total acidity number (TAN) saponification and iodine value, coke number and aniline point.

5 Glass (04 hrs)

5.1 Glass: Chemical composition, types of glasses and their applications

5.2 Manufacture of ordinary glass and lead glass

6. Classification and Nomenclature of Organic Compounds (06 hrs)

Classification of Organic Compounds, functional group, Homogolus Series, IUPAC-Nomenclature of various homogolous series i.e. alcohols, aldehydes, ketones, carboxylic acids, and phenols.

7. Polymers & Plastics (08 hrs)

7.1 Definition of polymer, monomer & degree of polymerization
7.2 Brief introduction of addition & condensation polymers with suitable examples (PVC, Polyester, Teflon, Nylon 66, Bakelite)
7.3 Definition of plastic & type of plastics (thermo & thermo setting plastics) with suitable examples
7.4 Applications of polymers & plastics in daily life.

2.6 ENGINEERING DRAWING – II

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RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation SP 46 – 1988 should be followed

Note: 1. First angle projection is to be followed
2. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

1. Detail and Assembly Drawing (2 sheets)

1.1 Principle and utility of detail and assembly drawings

1.2 Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint

2. Screw threads and threaded fasteners (8 sheets)

2.1 Thread Terms and Nomenclature

2.1.1 Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads.

2.1.2 Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)

2.2 Nuts and Bolts

2.2.1 Different views of hexagonal and square nuts and hexagonal headed bolt
2.2.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer.
2.2.3 Assembly of square headed bolt with hexagonal and with washer.

2.3 Locking Devices

2.3.1 Different types of locking devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer.

2.3.2 Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.

2.4 Drawing of various types of machine screw, set screw, studs and washers

3. Keys and Cotters (3 sheets)

3.1 Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position

3.2 Various types of joints (3 sheets)
- Spigot and socket joint
- Gib and cotter joint
- Knuckle joint

4. Rivets and Riveted Joints (4 sheets)

4.1 Types of general purpose-rivets heads (4 Sheets)
4.2 Caulking and fullering of riveted joints
4.3 Types of riveted joints
(i) Lap joint-Single riveted, double riveted (chain and zig-zag type)
(ii) Butt Joint-
(a) Single cover plate
(i) Single riveted joint
(ii) Double riveted joint (Chain and zig-zag type)
(b) Double cover plate
(i) Single riveted joint
(ii) Double riveted joint (Chain and zig-zag type)

5. Couplings (2 sheets)

5.1 Flange coupling (Protected and non-protected)

6. Symbols and Conventions (2 sheets)

6.1 Civil engineering sanitary fitting symbols
6.2 Electrical fitting symbols for domestic interior installations
6.3 Building plan drawing with electrical and civil engineering symbols

7. AUTO CAD (for practical and viva-voce only)

7.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode

7.2 Drawing commands – point, line, arc, circle, ellipse

7.3 Editing commands – scale, erase, copy, stretch, lengthen and explode

2.7 GENERAL WORKSHOP PRACTICE - II

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RATIONALE

As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1. Carpentry and Painting shop-II
2. Plumbing Shop
3. Welding shop -II
4. Electric shop -II
5. Machine shop or Electronic shop-II
6. Sheet Metal Shop –II

Note:

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Automobile Engineering, Wood Technology, Food Technology, Quantity Surveying and Public Health Engineering will do Machine Shop instead of Electronic shop- II

2. The branches e.g. Electronics and Communication Engineering, Instrumentation and Control, Computer Engineering, Information Technology, and Medical Electronics will do Electronic shop–II instead of Machine shop.

3 The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

1. Carpentry and Painting Shop-II

1.1 Introduction to joints, their relative advantages and uses.
Job I Preparation of Dovetail joint and glued joint.
Job II Preparation of Mitre Joint
Job III Preparation of a lengthening Joint
Job IV Preparation of at least one utility job with and without lamination.

1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

1.3 Demonstration of job on Band Saw and Circular Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.

1.4 Importance and need of polishing wooden items, Introduction to polishing materials.

Job V Polishing on wooden items.

2. Plumbing Shop

2.1 Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right hand threads.

2.2 Description and demonstration of various types of drills, taps and dies Selection of dyes for threading, selection of drills, taps and reamers for tapping operations.

Job I Making internal and external threads on a job by tapping and dieing operations (manually)

2.3 Precautions while drilling soft metals, e.g. Copper, Brass, Aluminium etc.

Job II Drilling practice on soft metals (Aluminum, Brass and Copper)

Job III Preparation of a job by filing on non- ferrous metal up to an accuracy of ± 0.2mm

Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps, etc

3. Welding Shop – II

3.1 Introduction to gas welding, spot welding and seam welding and welding techniques. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment.

Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding practice on simple jobs.

3.2 Common welding joints generally made by gas welding.

Job II Preparation Butt joint by gas welding.

Job III Preparation of small cot frame from conduit pipe by electric arc welding/gas welding.

Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).

Job V Exercise of preparing a job on spot/seam welding machine.

3.3 Demonstration and use of TIG and MIG Welding equipment

4. Electric Shop – II

4.1 Importance of three-phase wiring and its effectiveness.

Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.

4.2 Estimating and costing of power connection.

Job II Connecting single-phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.

Job III Checking continuity of connection (with tester and series lamp) location of faults with a multimeter) and their rectification in simple machines and/or other electric circuits fitted with earthing.

4.3 Demonstration of dismantling, servicing and reassembling a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.

Job IV Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.

Job V Reversing the rotation of a motor.

5. Machine Shop

Introduction to various machines used in machine shop. Demonstration of Lathe, Milling Machine Shaper, Slotter, Radial drilling machine, Surface grinder and CNC machine

Job-1 Exercise on simple turning and facing

Job-II Exercise on taper turning

Job-III Marking and drilling practice on mild steel piece

OR

5. Electronic Shop- II

5.1 Demonstrate the jointing methods on general purpose PCB boards mounting and dismantling as well as uses of the items mentioned below:

a) Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables

b) Various types of plugs, sockets connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets, RF Plugs and Sockets.

Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

c) Various types of switches such as: normal/ miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.

d) Various types of protective devices such as : Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.

e) Materials: Conducting, insulating and magnetic materials.

f) Single beam simple CRO, Single Generator and function-Generator, function of energy knob on the front panel.

g) Regulated power supply-fixed and variable voltage, single output as well as dual output.

5.2 Identification and familiarization with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, read relays, transformers, Linear and Digital ICs, Thyristors, etc.

PART -III 20 MARKS

3.1 PRINCIPLES OF THERMAL ENGINEERING

L T P
3 - 3

RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the I.C engines, air compressors and air conditioning of automobiles. Therefore, it is essential to teach concepts, principles, applications and practices covering laws of thermodynamics, basic air cycles, types of fuel used and their properties and components of air conditioners. Hence this subject has been included in this course.

DETAILED CONTENTS

1. Thermodynamic terminology (06 hrs)

   Concept of thermodynamics, heat, temperature, intensive and extensive properties, path, process, system, surroundings, enthalpy, internal energy and thermodynamic work.

2. Gas Laws (06hrs)

   Boyle's law, Charle's law, Joule's law, Characteristic gas equation, gas constant, universal gas constant. Simple numerical problems based on above laws.

3. Laws of Thermodynamics (08 hrs)

   Zeroth law of thermodynamics, Irreversible process, First law of thermodynamics, Second law of thermodynamics (concept only),Thermal efficiency, Heat pump, heat engine and heat sink, concept of entropy, Constant volume, constant pressure, isothermal, adiabatic, polytropic, throttling and free expansion processes. Numericals based on above processes.

4. Air Cycles (08 hrs)

   Carnot cycle – concept only, Otto cycle, Diesel cycle, Dual combustion cycle , Numericals based on above cycles.

5. Air Compressors (06 hrs)

   Reciprocating air compressor,Centrifugal compressor, Rotary air compressor - its types. Working of single stage and double stage compressor and applications, Super charging

6 Heat Transfer (06 hrs)

Modes of heat transfer – Conduction, convection, radiation; Fourier's Law, Numericals based on Fourier's Law.

7. Refrigeration and Air Conditioning (08 hrs)

Concept of refrigeration, Unit of refrigeration, refrigerants, heat pump, coefficient of performance, rating of refrigeration machines

Principles of air conditioning, Concept of human comfort, Air-conditioning system, components of air conditioning system and their function

3.2 APPLIED MECHANICS

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3	-	2

RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

DETAILED CONTENTS

1. Introduction (04hrs)

   1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

   1.2 Definition, basic quantities and derived quantities of basic units and derived units

   1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

   1.4 Concept of rigid body, scalar and vector quantities

2. Laws of forces (09 hrs)

   2.1 Definition of force, measurement of force in SI units, its representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force

   2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position

   2.3 Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components

   2.4 Free body diagram

   2.5 Equilibrant force and its determination

   2.6 Lami's theorem (concept only)
   [Simple problems on above topics]

3. Moment (09 hrs)

3.1 Concept of moment

3.2 Moment of a force and units of moment

3.3 Varignon's theorem (definition only)

3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

3.5 Parallel forces (like and unlike parallel force), calculating their resultant

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (06 hrs)

4.1 Definition and concept of friction, types of friction, force of friction

4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

5. Centre of Gravity (08 hrs)

5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

[Simple problems on the above topics]

6. Simple Machines (06 hrs)

6.1 Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

6.2 Simple and compound machine (Examples)

6.3 Definition of ideal machine, reversible and self locking machine

6.4 Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

6.5 System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

6.6 Working principle and application of wheel and axle, Weston's Differential Pulley Block , simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application [Simple problems on the above topics]

7. Torsion (06 hrs)

7.1 Torsion in shafts/bars

7.2 Modulus of rigidity

7.3 Torsional Equation (simple numerical problems)

7.4 Power Transmission in shafts (simple numerical problems)

3.3 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

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4	-	2

RATIONALE

The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical and electronics engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

DETAILED CONTENTS

1. Application and Advantage of Electricity (06 hrs)

   Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

2. Basic Electrical Quantities (06 hrs)

   Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. Electromagnetic Induction (06 hrs)

   Production of e.m.f., idea of a transformer and its working principle

4. Transmission and Distribution System (10 hrs)

   Key diagram of 3 phase transmission and distribution system, Brief functions of accessories of transmission line. Difference between high and low voltage distribution system, identification of three-phase wires, neutral wire and earth wire in a low voltage distribution system. Identification of voltages between phases and between one phase and neutral. Difference between three-phase and single-phase supply. Arrangement of supply system from pole to the distribution board, function of service line, energy meter, main switch, distribution board

5. Domestic Installation (10 hrs)

Distinction between light-fan circuit and single phase power circuit, sub-circuits, various accessories and parts of domestic electrical installation. Identification of wiring systems.

6. Electric Motor s and Pumps (12 hrs)

Definition and various applications of single-phase and three-phase motors. Connection and starting of three-phase induction motors by star-delta starter. Changing direction of rotation of a given 3 phase induction motor. Conversion of horse power in watts or kilowatts, Type of pumps and their applications, Use of direct online starter and star delta starter

7. Electrical Safety (06hrs)

Electrical shock and precautions against shock, treatment of electric shock, concept of fuses and their classification, selection and application, concept of earthing and various types of earthing, applications of MCBs and ELCBs

8. Basic Electronics (08hrs)

Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, symbols, identification of terminals of transistor, of current flowing in a transistor their characteristics and uses. Characteristics and applications of a thyristor, characteristics and applications of servo motors.

3.4 BASIC WORKSHOP

L	T	P
4	-	6

RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various manufacturing processes is required to be imparted. Hence the subject of basic workshop is being included in the curriculum.

DETAILED CONTENTS

1. LATHE (10 hrs)

- 1.1 Concept of cutting tools and Cutting materials
- 1.2. Principles of Turning
- 1.3 Description and function of various parts of lathe
- 1.4 Classification of various ypes of lathe
- 1.5. Drives and transmission
- 1.6 Work holding devices
- 1.7 Lathe operations
- 1.8 Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time
- 1.9 Lathe accessories: centre dogs , different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment etc.
- 1.10 Brief description of capstan and Turret lathe, their comparison, work holding and tool grinding devices in capstan and Turret lathe

2. DRILLING (07 hrs)

- 2.1. Principles of drilling
- 2.2. Classification of drilling machines and their description
- 2.3 Various operation performed on drilling machines
- 2.4. Speeds and feeds during drilling, impact of these parameters on drilling, machining time.
- 2.5 Types of drills and their features; nomenclature of a drill
- 2.6. Drill holding devices
- 2.7 Types of reamers

3. BORING (05 hrs)

3.1 Principles of Boring

3.2 Classification of Boring machines

3.3 Specifications of boring machine

3.4 Boring tools, boring bars and boring heads

3.5 Description of Jig boring machine

4 SHAPING, PLANING AND SLOTTING (10 hrs)

4.1. Working Principles of shaper, planer and slotter

4.2. Types of shapers

4.3. Types of planers

4.4 Quick Return mechanism

4.5 Work holding devices used in shaper, planer and slotter

4.6 Specifications of Shaper, Planer and slotter

4.7 Speeds and feeds in above processes

5 JIGS AND FIXTURES (07 hrs)

5.1. Importance and use of jigs and fixures

5.2. Principle of location

5.3. Locating devices

5.4. Clamping devices

5.5 Types of jigs

5.6 Fixtures for milling, turning, welding and grinding

5.7 Advantages of jigs and fixtures

6 BROACHING (05 hrs)

6.1. Introduction

6.2. Types of Broaching machines

6.3. Elements of broach tool, broach tool details, nomenclature, types and tool material.

7. CUTTING FLUIDS AND LUBRICANTS (05 hrs)

7.1. Function of Cutting fluids

7.2. Types of cutting fluids

7.3. Difference between cutting fluids and lubricants

7.4. Selection of cutting fluids for different materials and operations

7.5. Common methods of lubrication of machine tools.

8 WELDING PROCESSES (15 hrs)

8.1. Principles of Weldings, Classification of Welding processes; advantages and limitations of welding; Industrial applications of welding; Welding positions and techniques, symbols.

8.2. Gas Welding – Principle of operation, types of gas welding flames and their applications; gas welding equipment – Gas welding torch; oxy-acetylene cutting torch, blow pipe, pressure regulators, filler rods and fluxes

8.3. Arc Welding – Principle of operation, Arc welding, machine and equipment; A.C & D.C. arc welding. Effect of polarity, current regulation and voltage regulation, Electrodes- classification; B.I.S specification and selection; flux for Arc welding

8.4. Other Welding Processes:- Resistance welding – principles , advantages and its limitations. Working and application of spot welding; seam welding, projection welding and percussion welding.

Atomic hydrogen welding; shielded metal arc welding; submerged arc welding, welding defects. Methods of controlling welding defects and inspection of welded joints.

8.5. Modern Welding Methods:- Method, Principle of operation, advantages, disadvantages and application of tungsten inert gas (TIG) welding, metal inert gas (MIG) welding, thermit, welding, electroslag welding, electron beam welding, ultrasonic welding, laser beam welding, robotic welding

L T P
4 - 2

RATIONALE

Engine forms the heart of an automobile. As the scope of auto engines is very wide, it has been divided into two subjects, Auto Engine –I and Auto Engine-II. This subject deals with engine terminology basic concept of 2 stroke and 4 stroke engine, classification of engines, constructional details of petrol engine, fuel system, cooling system, lubrication system and ignition system,.

DETAILED CONTENTS

1. Introduction (09 hrs)

- Engine as a power source
- Concept of internal combustion engine.
- Engine dimensions : Bore, stroke, dead centres, compression ratio, swept volume, clearance volume, engine capacity, engine torque engine power at the crank shaft.
- Classification of engines as per stroke, cycle, fuel, ignition, number and arrangement of cylinders, reciprocating and rotary engines.
- Concept of 2 stroke and 4 stroke engines and their comparison.
- Working principles of petrol and diesel engines.

2 Constructional details (09 hrs)

- Constructional details of cylinder block, cylinder head, cylinder liner piston, piston rings, gudgeon pin, connecting rod, crankshaft, camshaft, valve mechanisms, flywheel and damper.

3. Fuel System (08 hrs.)

3.1. Fuel system in spark ignition engine: Fuel feed system, fuel pumps-its types, fuel tank, fuel lines, fuel filters, concept of carburetion. Working and construction of a simple carburetor. Advantages of using fuel injection system in spark ignition engines. Concept of MPFI system, Constructional details of an MPFI system. Dry and wet air cleaners.

3.2 Fuel systems in compression ignition engines: Fuel feed system , fuel filters- its types, priming and fuel feed pump. Fuel injection pump-plunger and barrel type, distributor type. Fuel injectors. Concept of governing, Working principle of a governer. Concept of supercharging, Types of superchargers, Turbochargers

4. Ignition System in S.I. Engine and Combustion in C.I. Engine (10 hrs)

4.1. Ignition system in S.I. engines.

Concept of ignition system, battery and magneto types of ignition systems . Function of ignition coil, condenser, contact breaker point, distributors, spark plugs. Distribution less ignition system.

4.2. Combustion in C.I. Engines:

Combustion phenomenon, phases of combustion, squish and swirl, types of combustion chambers for C.I. engines

5 Cooling System (09 hrs)

Necessity of cooling system. Air cooling, Water cooling system. Components of water cooling system- Radiators, thermostat, water pump, fan, pressure cap, water jackets, antifreeze solution. Trouble shooting.

6 Lubrication System (09 hrs)

Necessity of lubrication system, pressure lubrication system. Splash lubrication. Components of lubrication system-oil pump, oil lines, oil filters, oil coolers, classification and service ratings of lubricating oil, additives for lubricants.

7 Special Types of Engines (10 hrs)

Wankel engines, Electrical/Hybrid system, Fuel Cell, Homogenous charge compression, Ignition engine, Wheel motors.

3.6 CHASSIS, BODY AND TRANSMISSION - I

L	T	P
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RATIONALE

Chassis, body and transmission form the core of automobile engineering. The subject focuses at imparting knowledge and skills regarding chassis and body viz, clutch system, transmission system, final drive, steering mechanism.

DETAILED CONTENTS

1. Chassis and Body (08 hrs)

Classification of vehicles, types of chassis, layout of conventional type of chassis, function and arrangement of major assemblies. Alternating arrangement used such as engine position, drive types, their merits and demerits., types of frame and body streamlining, cross members, brackets, materials of frame and body upholstery..

2. Clutch (10 hrs)

Necessity, function and requirements of clutch, types of clutch - single plate clutch, multi plate clutch, hydraulic power assisted and wet and dry plate clutch, clutch plate and lining material

Constructional details and working of centrifugal, semi centrifugal clutch, diaphragm clutch and fluid coupling.

3. Transmission (10 hrs)

Necessity, function and types of manual transmission- Sliding, constant mesh and synchromesh. Over drive, over running clutch, description and operation of transfer gear box. Common faults and remedies.
Types of automatic transmission and their main components
Epicyclic gear box – construction, working and determination of speed ratio.
Torque converter – construction, principle of working. Continuously variable transmission, Automated Manual Transmission

4. Final Drive (08 hrs)

Propeller shaft – function, construction details. Universal joints - functions and types. Types of final drive – hotchkiss drive, torque tube drive. Differential – principle, functions and its working. Rear axles – semi floating, , three quarter floating. fully floating . Common faults and remedies

5. Front Axle (04 hrs)

Types – Stub double drop, fully dropped, load distribution, effect of braking on axle shape, steering head, Elliot and reverse elliot, steering knuckle.

6. Steering (08 hrs)

Steering mechanism, function, Davis and Ackerman's Principle of steering. Working and constructional details of steering gear, steering linkages, sector arm, center arm, drag link and tie rod steering stops. Front wheel geometry-castor, camber, steering axis inclination, toe in and toe out. Cornering force, cornering power and self-righting torque. Over steering and under steering. Power steering – necessity, types, Construction features and working of hydraulic and electronic power steering systems, Common steering systems troubles and remedies

PART -IV 20 MARKS

4.1 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L	T	P
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RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aim at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager.

Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma passouts for enhancing their employability and self confidence.

DETAILED CONTENTS

1. Introduction to Generic Skills (4 hrs)

   1.1 Importance of Generic Skill Development (GSD)
   1.2 Global and Local Scenario of GSD
   1.3 Life Long Learning (LLL) and associated importance of GSD.

2. Managing Self (8 hrs)

   2.1 Knowing Self for Self Development
   - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

   2.2 Managing Self - Physical
   - Personal grooming, Health, Hygiene, Time Management

   2.3 Managing Self – Intellectual development

   - Information Search: Sources of information
   - Listening: Effective Listening
   - Speaking: Effective Oral Communication
   - Reading: Purpose of reading, different styles of reading, techniques of systematic reading; Note Taking: Importance and techniques of note taking
   - Writing: Correspondence - personal and business

   Note: Practical sessions should be coupled with teaching of effective listening, speaking, reading and writing.

2.4 Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)
- Techniques to manage the above

3. Managing in Team (6 hrs)

3.1 Team - definition, hierarchy, team dynamics
3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background
3.3 Communication in group - conversation and listening skills

4 Task Management (3 hrs)

4.1 Task Initiation, Task Planning, Task execution, Task close out
4.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (5 hrs)

5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
5.2 Different approaches for problem solving.
5.3 Steps followed in problem solving.
5.4 Exercises/case studies on problem solving.

6. Entrepreneurship

6.1 Introduction (22 hrs)

- Concept/Meaning and its need
- Competencies/qualities of an entrepreneur
- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale industry
- Procedures for registration of small-scale industry
- List of items reserved for exclusive manufacture in small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection
- Data collection for setting up small ventures.

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students

4.2 AUTO ENGINE - II

L	T	P
4	-	2

RATIONALE

This subject is in continuation to Auto Engine –I. It covers various fuels for automobiles and testing of engines. It also includes performance of engine. Brief description of emission control has also been included in this subject.

DETAILED CONTENTS

1. Prospective Gaseous Fuels (10 hrs)

   - Compressed natural gas,
   - Liquefied petroleum gas
   - Bio-gas/Bio-diesel,
   - Hydrogen
   - Recommendations to protect the environment in future.

2. Engine Exhaust and sources (10 hrs)

   - Exhaust gas constituents from S.I and C.I. engines
   - Emission norms and regulation in India
   - Factors responsible for exhaust - composition
   - Combustion temperature, spark timing or injection timing
   - CO emission and airfuel ratio
   - HC formation in SI and CI engines
   - Formation of oxides of Nitrogen and causes
   - Other problems

3. Emission Control (10 hrs)

   - Emission Control by Exhaust gas after treatment, Catalytic converters
   - Types of catalytic converters
   - Positive crankcase ventilation
   - Evaporative loss control
   - Particulate traps for diesel engine/soot formation
   - Exhaust gas recirculation
   - Ignition timing
   - Emission control by modifying design

4. Auto engines testing (14 hrs)

- Determination of indicated power, brake power ,mechanical efficiency volumetric efficiency, thermal efficiency, relative efficiency, Mean effective pressure, Specific fuel consumption,
- Heat balance sheets
- Morse test
- Numericals based on engine testing.

5. Performance of engines (10 hrs)

- Effect on engine performance due to atmospheric temperature and pressure, compression ratio, engine speed, dirt, desert, altitude and their remedial measures.
- Performance curves.

6. Combustion of Fuels (10 hrs.)

- Types of fuels
- Characteristics of fuels
- Combustion reactions
- Amount of oxygen required for complete combustion
- Stoichimetric ratio
- Air fuel ratio
- Analysis of products of combustion
- Conversion of volumetric analysis into gravimetric analysis

RECOMMENDED BOOKS

1 Automobile Engineering Vol. II by Dr. Kirpal Singh., Standard Publishers, Delhi
2 Automobile Engineering by RB Gupta, Satya Parkashan, New Delhi
3 IC Engines by ML Mathur and Sharma, Dhanpat Rai and Sons, Delhi
4 Automobile Engineer by Dr. Kirpal Singh.(in Hindi), Standard Publishers, Delhi
5 Automotive Engine by Srinivasan, TMH, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	10	16
2	10	16
3	10	16
4	14	20
5	10	16
6	10	16
Total	**64**	**100**

2.3 Concept of bending moment and shearing force

2.4 B.M. and S.F. Diagram for cantilever and simply supported beams with and without overhang subjected to concentrated and U.D.L.

3. Bending stresses (06 hrs)

3.1 Concept of Bending stresses

3.2. Theory of simple bending

3.3. Use of the equation $f/y = M/I = E/R$

3.4. Concept of moment of resistance

3.5. Bending stress diagram

3.6. Calculation of maximum bending stress in beams of rectangular, circular, and T section.

3.7 Permissible bending stress Section modulus for rectangular, circular and symmetrical I section.

4 Columns (08 hrs)

4.1. Concept of column, modes of failure

4.2. Types of columns

4.3. Buckling load, crushing load

4.4. Slenderness ratio

4.5. Factors effecting strength of a column

4.6 End restraints

4.7 Effective length

4.8 Strength of column by Euler Formula without derivation

4.9. Rankine Gourdan formula (without derivation)

5. Miscellaneous (06 hrs)

5.1. Stress concentration, Definition, Factors affecting stress concentration

5.2. Fatigue: -Definition, SN Curve, Factors affecting fatgue

5.3. Creep: - Definition, creep curves; effect of stress and temp. stress relation

6 Torsion (06 hrs)

6.1. Concept of torsion-difference between torque and torsion

6.2. Use of torque equation for circular shaft

6.3. Comparison between solid and hollow shaft with regard to their strength and Weight

6.4. Power transmitted by shaft

6.5. Concept of mean and maximum torque

7. Springs (08 hrs)

7.1. Closed coil helical springs subjected to axial load and impact load

7.2 Stress deformation

7.3 Stiffness and angle of twist and strain energy

7.4. Proof resilience

7.5. Laminated spring (semi elliptical type only)

7.6 Determination of number of plates

8. Hydraulics (04 hrs)

8.1. Fluid properties, Definition of Fluids, Properties of fluids with their units

8.2. Static Pressure: Definition and concept, Pascal's law, pressure head

9 Hydraulic Pumps (04 hrs)

9.1. Introduction to centrifugal, reciprocating and gear pumps

10. Hydraulic Devices (04 hrs)

10.1. Description and application of Hydraulic jack and hydraulic coupling

4.4 CHASSIS, BODY AND TRANSMISSION-II

L	T	P
3	-	2

RATIONALE

Chassis, body and transmission form the core of automobile engineering. The subject aims at imparting knowledge and skills regarding chassis and body viz, clutch system, transmission system, drive system, steering mechanism, suspension system, braking system and safety of vehicles

DETAILED CONTENTS

1. Suspension System (10 hrs)

Function, types- independent, rigid axle. Springs – functions, construction materials and types (coil spring, leaf spring and torsion bar) sprung and unsprung weight, characteristics of springs, spring eye, bushes, variable rate spring, helper leafs, leaf sections, camber grading and nippling spring seats, rubber pads, pressure blocks, spring cover, interleaf inserters. Function and construction of hydraulic dampers (shock absorbers). Pneumatic suspension system – lay out and working. Function and Construction of hydraulic damper (shock absorber). Diagnosis of common faults and their rectifications

2. Wheel and Tyres (08 hrs)

Wheels – types, constructional detail, material used for wheels. Types-classification of tyres. Construction of pneumatic tyres, composition of covers, tread breaker, bead and casing, comparison of cross-ply and radial-ply tyres. Causes of excessive tyre wear. Tyre care and maintenance. Static and dynamic balance. Tubeless tyres, Run flat tyres, retreading of tyers.

3. Braking System (08 hrs)

Purpose of brakes, layout of braking system, components, Types of brakes- mechanical, hydraulic, power. Principle of hydraulic brakes, braking action, master cylinder, wheel cylinder, leading and trailing shoes, self adjusting brakes, self applying and self releasing action, anti-skid devices, pedal travel, brake enclosures, heat generation and opening temperature, Drum brakes-Construction & Working, Disc. Brakes-Construction and Working. Common faults and their rectification.

4. Power Steering (06 hrs)

Power steering - necessity, types, Construction features and working of hydraulic and electronic power steering system, Four wheel steering, Common steering system troubles and remedies.

5 Power Brakes (6 hrs)

Air, air-hydraulic, hydro-vac brakes-their construction components and working details. Brake fluid and its characteristics, brake liner, hand brake, Antilock brake systems. Brake test, common faults and their rectification.

6 Automotive Safety Systems (4 hrs)

Preventive design, designing for minimum injury in accident, seat belts, air bags, electronic vehicle stability and occupant protection systems, pedestrian protection.

7. Miscellaneous (6 hrs)

History, leading manufacturers of automobiles, their market share, recent developments in automobile industry and automotive components industry in India. Specifications of various 2-wheelers and 4-wheelers, milestones in the development of automobiles

4.5 AUTOMOTIVE MATERIALS

L	T	P
3	-	2

RATIONALE

Materials play an important role in the manufacturing of automobiles and the equipment/tools used in repair of automobiles. Proper selection of materials adds to the life of machinery. A diploma holder must be conversant with the properties, uses, and availability of materials used in manufacturing of different types of vehicles to enable him to perform his functions confidently. The subject of Automotive Materials has been designed to cover the above aspects.

DETAILED CONTENTS

1. Properties of Materials (08 hrs)

   - Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys
   - Names of common metals, their alloys and non-metals used in Automobile Industry
   - Properties of metals and alloys
   - Physical properties - Appearance, luster, colour, density and melting point
   - Mechanical Properties: Strength, stiffness, elasticity, plasticity, toughness, ductility, malleability, brittleness, hardness, fatigue and creep.
   - Thermal and electrical conductivity and corrosion resistance.

2. Ferrous Metals and Alloys (16 hrs)

   - Classification, composition and uses of cast iron and plain carbon steels. IS, BS and SAE Grades
   - Effect of alloying elements such as Aluminium, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon, Sulphur and Phosphorus.
   - Composition, properties, grades and uses of alloy steels such as High speed steel, Stainless steel, Silicon steel, Heat resistant steel, Spring steel
   - Heat Treatment: Iron-carbon diagram, objectives and practical aspects of heat treatment. Description and uses of principal heat treatment processes Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding

and Cyaniding and applications. Examples in heat treating automobile engineering components

3. Non-ferrous Metals and Alloys (10 hrs)

- Copper: Properties and uses
- Composition, properties and uses of copper alloys.
- Brass: Cartridge brass, Nickel silver.
- Bronze: Phosphor bronze, Al-bronze, Mn-bronze, and Gun metal.
- Properties and uses of Aluminium and their grades
- Composition, properties and uses of Al-alloys e.g., Duralumin, Yellow metal, Magnalium and Hindalium
- Properties and uses of alloys of lead, tin and magnesium.
- Bearing Metal: Requisite qualities. Composition, properties and uses of white metal bearing. Copper based bearing metals. Aluminium based bearing metals. Use of nylon/PTFE for bushes/bearings, bi-metallic and tri-metallic bushes

4. Identification and Examination of Metals and Alloys (2 hrs)

Identification tests - Appearance, sound, filing, weight, magnetic, spark, bend and microstructure.

5. Other Important Materials (08 hrs)

- Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics with specific mention of their uses and grades
- Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica.
- Sound insulating materials: Cork, fibre boards.
- Fabrication materials: Wood, plywood, Rubber - natural and synthetic, Glasses – plate glass, toughened glass, safety glass.
- Insulating materials: Asbestos, mica
- Electrical insulating materials, properties and uses of china clay, leather baklite, ebonite, glasswool, rubber felt

- Refractory materials: General characteristics and uses of dolomite, ceramics.

- Protective coating materials: Auto paints, primers, varnishes, enamels, putti, electroplating materials, rubasil, teflon coating

6. Selection and Specifications of Materials (04 hrs)

- Practical considerations for selection of material for different Automobile Components.

4.6 AUTOMOBILE ENGINEERING DRAWING

L T P
- - 9

RATIONALE

An Automobile Engineering diploma holder, irrespective of his field of operation in an industry or transport undertaking, is expected to possess a thorough understanding of engineering drawing, which includes clear spatial visualization of the subject and the proficiency in reading and interpreting a wide variety of drawings. Besides this, he is also expected to have a certain degree of drafting skills depending upon his job functions to perform his day-to-day activities e.g. communicating and discussing the ideas with his superiors and passing on instructions to his subordinates in an unambiguous way. The teachers are recommended to lay emphasis on showing automobile components to students..

DETAILED CONTENTS

1. Limits and Fits (01 sheet)
   Limit, tolerance, deviation, allowance, its: clearance, interference, transition fit, Hole and shaft basis system.

Assembly Drawings of the following automotive components:

2. Joints and Bearings (04 sheets)

   - Universal joint,
   - Slip joint
   - Bush bearing
   - Plummer block or pedestal bearing
   - Ball bearing
   - Roller bearing- Straight and Needle type

3. Engine Components (06 sheets)

   - Four Stroke Petrol Engine Piston
   - Diesel Engine Piston
   - Connecting rod
   - Fuel injector
   - Fuel Pump –AC mechanical type
   - Overhead and side valve mechanism (free hand)
   - Crank shaft – 4 cylinder Engine
   - Spark Plug

4. Chassis components (06 sheets)

- Leaf Spring suspension
- Shock absorber
- Wheel cylinder
- Master Cylinder
- Brake drum (assembly)
- Singe plate clutch

5. Gears

- Nomenclature of gears (02 sheets)
- Profile of spur gear by 'Approximate method'
- Profile of spur gear by "Unwin's Method'

6. Cam Profile (03 sheets)

- Different types of cams and followers
- Drawing of cam profile for following motion of follower
  (a) Uniform velocity motion
  (b) Simple harmonic motion (SHM)
  (c) Uniformly accelerated and retarded motion.

7. Auto Electric Circuits(free hand sketches) (06 sheets)

- Battery ignition system
- Magneto ignition system
- Lighting system
- Wiring diagram of a car
- Startng system
- Charging system

8 Sketching of the following Auto Parts: (02 shets)

(i) Gear Box - Sliding, constant, synchromesh

(ii) Line diagram of petrol/Diesel Fuel system

PART -V 20 MARKS

5.1 COMPUTER AIDED DRAFTING IN AUTOMOBILE ENGINEERING

L	T	P
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RATIONALE

Competency in computer-aided drafting is essential for diploma holders in Automobile Engineering. Hence this subject is required.

DETAILED CONTENTS

1. Introduction to AutoCAD

1.1. Introduction to AutoCAD. Setting the drawing environment: Limits, Grid, Snap, Axis, Units, Ortho, Co- Ordinates ON, OFF Units and Color.

1.2. 2D Drawing entities - Point - Line - Arc - circle, Ellipse, Polygon, and Trace. Object Selection using Object Snap (OSNAP).

1.3. Editing commands: Selection of entities by different methods - copy, Move, Scale, Rotate, Fillet, Chamfer, and Mirror, Array-Polar, Rectangular. Measure, Divide, and Erase.

1.4. Drawing Display Methods: Zoom, Pan, and View.

1.5 Adding Texts and Dimensions: Text, Dimension-linear, continued, angular

1.6. Pedit commands. Working on multiple layers, Layer concepts in Auto CAD -Various options with layer command - Hatch command - Creating line types, library and user made library.

1.7. Preparing the schematic drawing of a workshop building in one layer, the blocks of machines in another Layer and Electrical connection on another layer.

2. Drawing of 2D views of following automotive components using AutoCAD (Any Six sheets)
   - V – belt pulley
   - Stepped cone pulley
   - Ball bearing
   - Sectional front view of screw jack
   - Spur gear
   - Poppet valve
   - Wheel cylinder (sketch)
   - Valve tappet
   - Piston
   - Semi-elliptic leaf spring
   - Internal expanding shoes brake (sketch)

3. Introduction to 3D features of AutoCAD

5.2 MECHANICS OF VEHICLES

L	T	P
4	-	-

RATIONALE

Understanding of the basic mechanism and motions, power transmission, vehicle braking, vibrations and balancing are essential for a diploma holder in automobile Engineering . Hence this subject.

DETAILED CONTENTS

1. Vehicle in motion (10 hrs)

Air resistance, gradient resistances and rolling resistance.

Tractive effort, traction, inertia load, draw bar pull, power required to propel a vehicle, calculations of acceleration and tractive effort required in case of front wheel drive, rear wheel drive and four wheel drive. Cenrifugal force and its effect on vehicle stability on banked and unbanked road.

2. Gyroscopic couple and stability of vehicles (10 hrs)

Introduction to gyroscopic couple. Precessional angular motion. Simple problems based on above. Stability of a four wheel drive moving in a curved path. Stability of a two wheel drive taking a turn

Simple problems based on above.

3. Turning moment diagrams and flywheels (10 hrs)

Introduction to turning moment diagrams
Turning moment diagram for a four stroke cycle internal combustion engine
Fluctuation of energy
Determination of maximum fluctuation of energy
Flywheel, coefficient of fluctuating of speed. Energy stored in a flywheel
Numericals based on above

4. Governors (10 hrs)

Introduction to governors
Types of Governors
Centrifugal governors
Terms used in governors
Watt governor
Porter governor
Sensitiveness of Governors
Stability of governors
Isochronous governors
Hunting

5. Brakes (12 hrs)

Introduction to braking,
Characteristics of materials used for braking,
Internal expanding brakes,
Braking of a vehicle when brakes are applied to rear wheels, when brakes are applied to front wheels, when brakes are applied to four wheels.
Numericals based on above

6. Vibrations (12 hrs)

Terms used in vibratory motion
Types of vibratory motion
Types of free vibrations
Natural frequency of free longitudinal vibrations
Natural frequency of free transverse vibrations
Effect of inertia of the constraint in longitudinal and transverse vibrations
Natural frequency of free transverse vibrations due to a point load acting over a simply supported beam
Frequency of free damped vibrations.
Damping factor or damping ratio, Logarithmic decrement

Numericals based on above.

5.3 AUTO ELECTRICAL EQUIPMENT

L	T	P
4	-	2

RATIONALE

Diploma holders in Automobile Engineering have to deal with different types of batteries, their charging and testing, regulators, ignition system, lighting system and various other electrical accessories used in Automobile Engineering. Hence the subject of automotive electric equipment is very essential for these technicians.

DETAILED CONTENTS

1. Introduction (04 hrs)

   Various Electrical components/systems in Automobile. Their functions and demands, earth return system, types of earthing, 6V, 12V system.

2. Batteries (16 hrs)

   2.1. Lead Acid Batteries: Construction, working, elements, types, materials used, electrolyte and its strength, effect of added plate area and temperature, rating, capacity, efficiency, temperature characteristics, terminal voltages, charging and discharging.

   2.2. Battery Testing: Electrolyte testing by hydrometer, voltage test, high discharge and cadmium test. (voltage)

   2.3. Battery Charging: Constant potential and constant current, initial charging, normal charging, trickle charging, intermittent charging, boost charging.

   2.4. Battery Defects: Stipulation, plates decay, working, erosion, cracking, sedimentation, separator defects, short circuits, overcharging

   2.5. Alkaline Batteries: Construction, working, merits and demerits of Ni-Fe, Ni-Cd, Ag-Zn cells

   2.6 Lithium ion battery: Construction and working

3. Charging System (12 hrs)

   3.1. Circuits, function and various components, dynamo and alternator, types, construction, working, advantages and disadvantages of dynamo and alternators, drives, cut out relay.

   3.2. Regulation: Functions of various components of two unit, three unit and heavy duty Regulators, Regulator adjustments, Regulators for alternators.

4. Starting System (10 hrs)

- Function of various components, torque terms, principle and constructional details of starter motor, switches, types, starter to engine drive and their types.

5. Lighting System (09 hrs)

5.1. Various lighting circuits, head lamp, type and constructional details, sealed beam, double filaments, asymmetric and dual units, vertical and side control of lamps, fog light, side light, brake light, instrument light, indicator lights, reversing light, lamp mounting.

5.2. Wiring: HT and LT, their specifications, cable colour codes, wiring Harness, Cable connections, Wiring diagrams of cars and two wheeler, Fuses, faults and rectification.

6. Electrical Accessories (09 hrs)

- Fuel gauges - bimetallic and balancing coil type, Air pressure gauges, temperature gauges, Ammeter, warning light, speedometer, wind screen wipers, horns, horn relay, electric fuel pump, Faults and rectification.

7. Miscellaneous Electrical Equipment (04 hrs)

- Impulse Speedometer, tachometer, heaters, defrosters, Air conditioner, and Electric door locks, window actuation, Seat adjusters.

5.4 GARAGE EQUIPMENT

L	T	P
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RATIONALE

Management of garage forms an important function of automobile technicians. To perform such functions, knowledge of service station equipment, tuning equipment, engine repair tools, electrical repair equipment and reconditioning and fabrication of equipment is very essential. Hence the subject.

DETAILED CONTENTS

1. General Tools (6 hrs)
   Specifications and applications of
   - Screw drivers
   - Spanners and wrenches
   - Pliers
   - Hammers
   - Chisels
   - Files
   - Hacksaw
   - Tools for tubes flaring
   - Taps and dies
   - Reamers
   - Soldering tools
   - Measuring tools- vernier calipers, inside and outside micrometers
   - Feeler gauge
   - Tommy bar
   - Nut runner
   - Cleaning tools
   - Nipple forming tools

2. General Equipment (12 hrs)
   Specifications and applications of
   - Drilling machine (portable) along with set of drills
   - Bench grinder
   - Air compressor and pneumatic gun
   - Hydraulic and electric hoists
   - High pressure washing equipment (Car washer)
   - Oil sprayers
   - Grease Guns-manual and bucket type, pneumatic
   - Tyre inflation gauge (Manual and Digital type automatic)
   - Tyre Changer (Manual and Automatic)
   - Creepers

- Electric and gas welding equipment
- Fire extinguisher
- First aid box

3. Tuning and Testing Equipment (6 hrs)
   Specifications and applications of

   - Vacuum Gauge
   - Compression Gauge (Pressure Gauge)
   - Distributor Tester, cam (dwell) angle tester, r.p.m. tester.
   - Battery Tester
   - Spark plug cleaner and tester
   - Ignition timing light
   - Fuel injector tester
   - Fuel consumption tester

4. Engine Repair Tools/Measuring and Testing Equipment (12 hrs)
   Specifications and applications of

   - Torque wrench, pneumatic wrench
   - Piston ring compressor
   - Valve lifter and valve spring tester
   - Piston ring files, groove cleaner
   - Scrappers
   - Piston ring remover
   - Cylinder Dial gauge
   - Smokemeter
   - Exhaust gas analyzer
   - Engine Analyser/Scanner

5. Electrical Repair Equipment (6 hrs)
   Specifications and uses of

   - Electrical Test Bench
   - Battery Charger
   - Head Lights Beam Aligner and Tester (Electronic and Digital type)
   - Growler

6. Reconditioning/Testing Equipment for Chassis and Body (6 hrs)

   Use of

   - Brake Efficiency Tester (Chassis Dynamometer) or brake testing equipment
   - Crane and Chain Pulley Block
   - Jacks – mechanical, hydraulic, trolley type
   - Paint chamber
   - Paint Spray Gun
   - Paint Drying Equipment
   - Tools for tyres, automatic tyre remover

- Trolleys
- Axle/chassis stands
- Steering work stands
- Jib crane
- Spring tester
- Computerized wheel balancer –static and dynamic
- Computerized wheel alignment equipment

7. Engine Reconditioning and Testing Equipment (16 hrs)
Specifications and use of

- Cylinder Boring Machine and Honing Machine
- Crankshaft Machine and Camshaft Grinding Machine
- Connecting Rod Aligner
- Line Boring Machine and Arbor Press
- Nozzle Grinding and Lapping Machine
- Fuel Injection Pump Calibrating Machine
- Valve Refacer, Valve Seat Cutting and Grinding
- Radiator Tester
- Cylinder head leakage testing fixture
- Fuel injector tester
- Nozzle cleaning equipment

5.5 AUTO REPAIR, MAINTENANCE AND DRIVING PRACTICE – I

L	T	P
-	-	12

RATIONALE

Testing and trouble shooting of various systems and components of automotive vehicle is an area where a diploma holder must have proficiency. He should be fully aware of the procedures of overhauling of engine, gearbox, and differential. He should be trained in using various controls while driving. That is why, this subject has been introduced.

LIST OF PRACTICALS

1. Testing of battery with hydrometer, high rate discharge tester, charging of batteries.
2. Testing and setting of ignition timing with timing light, cam angle tester, and dwell angle tester.
3. Testing and cleaning of spark plug.
4. Diagnosing electronic ignition system, magneto ignition system.
5. Colour codes and sketching of complete wiring circuits of an Indian automobile.
6. Inside and outside inspection/checking of vehicle, checking of engine oil, horn, starter, coolant before starting of engine.
7. Adjusting Clutch free play and cleaning clutch plate and assembly
8. Setting brake pedal free play and carry out bleeding.
9. Gear changing from low to high and high to low speed on the road.
10. Practice on general road safety, road and traffic signals and driving regulations.
11. Driving practice on road for steering control.
12. Starting of engine and warming up.
13. Overhauling of petrol engine.
14. Overhauling of gearbox.
15. Overhauling of differential.
16. Servicing of suspension system, leaf springs, independent suspension, coil spring, torsion bar, telescopic shock absorber.
17. Removal and fitting of wheels and tyres of a two wheeler and repairing of punctures
18. Cleaning, greasing, checking as per maintenance schedule of two wheelers
19. Cleaning, greasing, checking as per maintenance schedule for washing, wiping and polishing of jeep/car
20. Use of Orsat Apparatus or smoke meter to measure emission

21 Inspection of Turbo charger

22 Checking of rail pressure using pressure guage

23 Checking return and resistance in injectors

24 Inspection of boost pressure (in the turbo charger)

5.6 ELEMENTS OF AUTOMOBILE DESIGN

L	T	P
4	-	-

RATIONALE

Understanding of basic principles of components like cylinder liner, piston, crank shaft, connecting rod, simple mechanisms are essential for diploma holders in Automobile Engineering, hence this subject.

DETAILED CONTENTS

1. Introduction (12 hrs)

- Design consideration, design procedure
- Basic requirements, classification of design and principles of good economic design
- Standardization, interchangeability of automobile parts among industry and at global level.
- Limits, fits and tolerances
- Material Properties: elasticity, plasticity, ductility, malleability, toughness, hardness, fatigue, creep.
- Materials selection and ergonomics
- Designing for strength

2. Design of : (20 hrs)

- Friction Clutch.
- Flywheel
- Gears
- Brakes

3. Design of : (12 hrs)

(i) Design of shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of strength criteria, rigidity criterion

(ii) Types of keys, Functions of key, Failure of key, Design of key (determination of key dimensions)

4 Design of following Auto parts (20 hrs)

(i) Piston (ii) Cylinder (iii) Connecting rod (iv) Crankshaft

PART -VI 20 MARKS

6.1 BASICS OF MANAGEMENT

L T P
3 - -

RATIONALE

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

DETAILED CONTENTS

1. Principles of Management (06 hrs)

   1.1. Introduction, definition and importance of management.

   1.2. Functions of Management
   Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.

   1.3. Concept and Structure of an organization

   Types of industrial organization
   a) Line organization
   b) Functional organization
   c) Line and Functional organization

   1.4. Hierarchical Management Structure
   Top, middle and lower level management

   1.5. Departmentalization
   Introduction and its advantages.

2. Work Culture (06 hrs)

   2.1. Introduction and importance of Healthy Work Culture in organization
   2.2. Components of Culture
   2.3. Importance of attitude, values and behaviour
   Behavioural Science – Individual and group behaviour
   2.4. Professional ethics – Concept and need of Professional Ethics

3. Leadership and Motivation (06 hrs)

3.1. Leadership
a) Definition and Need of Leadership
b) Qualities of a good leader
c) Manager vs. leader

3.2. Motivation
a) Definition and characteristics of motivation
b) Factors affecting motivation
c) Maslow's Need Hierarchy Theory of Motivation

3.3. Job Satisfaction

4. Legal Aspects of Business: Introduction and need (06 hrs)

4.1. Labour Welfare Schemes
a) Wage payment : Definition and types
b) Incentives: Definition, need and types

4.2. Factory Act 1948

4.3. Minimum Wages Act 1948

5. Management Scope in different Areas (12 hrs)

5.1. Human Resource Development

a) Introduction and objective
b) Manpower Planning, recruitment and selection
c) Performance appraisal methods

5.2. Material and Store Management

a) Introduction, functions and objectives of material management
b) Purchasing: definition and procedure
c) Just in time (JIT)

5.3. Marketing and Sales

a) Introduction, importance and its functions
b) Difference between marketing and selling
c) Advertisement- print media and electronic media
d) Market-Survey and Sales promotion.

5.4. Financial Management – Introduction

a) Concept of NPV, IRR, Cost-benefit analysis

b) Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund

5.5 Maintenance Management

a) Concept

b) Preventive Maintenance

6. Miscellaneous topics (12 hrs)

6.1. Customer Relationship Management (CRM)

a) Definition and Need

b) Types of CRM

c) Customer satisfaction

6.2. Total Quality Management (TQM)

a) Inspection and Quality Control

b) Concept of Quality Assurance

c) TQM

6.3. Intellectual Property Rights (IPR)

a) Introduction, definition and its importance

b) Infringements related to patents, copyright, trade mark

6.2 AUTO REPAIR, MAINTENANCE AND DRIVING PRACTICE - II

L T P
- - 8

RATIONALE

A diploma holder in Automobile Engineering, should have reasonable practice on fault diagnosis with the help of latest machines like engine analyzer etc. Stress has also to be laid on the use of exhaust gas analyzer and other machines for the maintenance of automobiles. Student should also be proficient in driving and maintenance of vehicle. Hence this subject.

LIST OF PRACTICALS

1 -6 Trouble shooting of engine: Diagnosing and rectifying the following troubles- Engine overheating, high oil consumption, engine noises and knock, high fuel consumption, starter turns the engine but engine doesn't start, engine fires but dies out, engine misfires, lack of power, poor acceleration, engine produces black and white smoke; use of computerized engine analyzer, exhaust gas analyzer. Bringing exhaust gas contents within emission norms.

7. Engine testing and finding out all parameters using computerized engine analyzer

8. Emission test using exhaust gas analyzer

9. Decarbonising of engine - removing carbon deposits from engine combustion chamber, piston crown, valve parts.

10. Valve servicing:

Refacing, seat reconditioning, lapping , testing, replacing worn out parts and tappet adjustment.

11. Reconditioning of engine - Measuring of bore for wear and ovality, servicing the cylinder bore, replacing of piston and piston rings.

12. Inspection of crank shaft – bearing replacement and setting of journal bearing. Crank pin bearings and crank shaft bearings, measuring bearing clearances by gauges. Inspection of bearing with plastic gauge.

13. Servicing of valves and valve mechanism – Replacement of valves, valve seats. valve guides, checking and replacement of defective springs, refacing of valves, tappet and rocker arm and adjusting valve tappets. Placement of shims in overhead valves.

14. Surfacing of cylinder head, cylinder block and manifolds with cylinder head refacing machine.

15. Practice in piston ring removal.

16. Practice in honing cylinder block, keeping allowance of clearances.

17 Engine diagnosis using engine control module (ECM)

18	Testing of sensors using Laptop/Replacement if needed
19	Servicing of Hydraulic systems in tractors
20	Servicing of components of tractors and heavy earth machines
21	Onboard diagnosis of car
22.	Practice in fitting cylinder liners – sleeving and desleeving.
23	Practice in nozzle grinding and lapping, setting of injection pressure and nature of spray.
24	Practice in bending and nipple forming of fuel pipes.
25	Overhauling of wheel and axles.
26.	Overhauling of power brakes. Bleeding of brakes.
27.	Practice in brake drum turning, measuring ovality, skimming the brake drum.
28.	Tyre retreading. (The students may be taken to a service industry).
29.	Practice in wheel balancing
30.	Practice in wheel alignment
31.	Practice in automatic tyre changers
32.	Service of injectors (petrol)
33.	Crank shaft regrinding
34	Practice in preparing preventive maintenance schedule
35-40	Driving Practice on the road to gain proficiency in driving. 50% of the time of the subject should be given to driving.

6.3 MOTOR VEHICLE ACT AND TRANSPORT MANAGEMENT

RATIONALE

A diploma holder in Automobile Engineering is supposed to have knowledge about significance of vehicle accident, accidental vehicle claim procedure from insurance company and about Motor Vehicle Act. Therefore, it is essential to teach Motor Vehicle Act features and appropriate practices covering Motor Vehicle Act. Further, knowledge of transport management systems and techniques would also be an asset to him.

DETAILED CONTENTS

1. Motor Vehicle Act (12 hrs)

   1.1 .Motor Vehicle Act - Main Provisions
   1.2. Salient features of Motor Vehicle Act. Requisites and formalities for following:

   - Licensing of drivers and conductors of motor vehicles.
   - Registration of old and new vehicles
   - Control of transport vehicles
   - Transfer of vehicle - Local and State to State
   - Different forms, application for various uses
   - Traffic offences, penalties and procedures

2. Inspection and Fitness of Vehicle (06 hrs)

   2.1. Fitness of vehicle -meaning and purpose, provisions in the act,
   2.2. Detailed procedure and requirements for vehicle inspection

3. Insurance of Vehicles (06 hrs)

   3.1. Meaning of Insurance and its necessity
   3.2. Different types - comprehensive and third party insurance
   3.3. Procedure to get Accidental claim and compensation
   3.4. Surveyor duties
   3.5 Relation between company and surveyor
   3.6 Duties of driver in case of accident and injury to a person

4. Vehicle Finance (04 hrs)

   4.1. Sources and types of finance
   4.2. Rate of interest, incentives

4.3. Net borrowing rate, documents required.

5. Driving (08 hrs)

5.1. Principle of driving
5.2. Driving procedure
5.3. Driving precautions
5.4. Driving in abnormal conditions, like hilly area, night, fog, heavy traffic and rain
5.5. Emergency Driving situations
5.6. Driving License - purpose, importance and requirements
5.7. Different types of driving license
5.8 Procedure to get driving license

6. Road Safety (06 hrs)

6.1. Road Signs/signals
6.2. Traffic rules
6.3. Imposition of Penalties for violation of rules
6.4. Duties of Driver, Conductor and Helper towards safety of vehicles/ passengers/ goods and self

7. Pollution Control (06 hrs)

7.1. Different contents of exhaust from vehciles
7.2. Prescribed standards for pollution
7.3. Status and Schedule for Enforcement of emission norms
7.4 Measurement of emission levels remote sensing of emission

8. Transport Management (16 hrs)

8.1. History of transport with special reference to road transport in India
8.2. Modes of Road transport
8.3. Organization- Service station and its functions, General layout of modern service station, Spare parts section and dealership service section, Accounts and books, Different types of cards and their use in maintaining service station records
8.4. Structure of fleet organization
8.5. State transport - optimum utilization of fleet.
8.6. Roadworthiness requirement,
8.7. Maintenance of logbook, History sheet, Causes, and prevention of Road Accident, Analysis of Accident, Economy of replacement, Assessment of used vehicles for sale and purchase, Training of Drivers and Mechanics.
8.8. Central Motor Vehicle Rules – Main features
8.9. Vehicle safety standards and regulations

6.4. AUTO SENSORS AND MECHATRONICS

L T P
4 - 2

RATIONALE

A diploma holder in Automobile Engineering must have knowledge of microprocessors, microcontrollers and other electronic systems which are used in automobiles. Hence this subject.

DETAILED CONTENTS

1. Basic electronics (06 hrs)

   Introduction, electronic devices and circuits, circuits, amplifiers, converters and digital electronics..

2. Microprocessors (10 hrs)

   Block diagram of microcomputer, Architecture of intel 8085, importance of data, Address and control buses. Instruction formats, Addressing modes and types of instructions in Intel 8085. Instruction set of 8085. Memory devices.

3. Micro Controllers (08 hrs)

   Comparison of microprocessor and microcontrollers. Survey of 4,8,16 and 32 bit microcontrollers, Architecture of 8051

   DC motor and stepper motor controls.

4. Electronic fuel control system (08 hrs)

   Introduction, components, open loop and closed loop control system. Intake manifold pressures, mass air flow rate, sensor, throttle body injection and multiport or point fuel injection. Fuel injection system control.

5. Digital engine control system (08 hrs)

   Concept, parameters, variables, engine mapping, control strategy, enrichment, Deceleration, leaning and idle speed control. EGR control, variable valve timing control, electronic ignition control, electronic spark timing control.

6. Transmission Control System (08 hrs)

   Electronic transmission management, layout, electronic control of automatic transmission, valve actuating control system, two wheel drive control, four wheel drive control.

7 Chassis Control System (08 hrs)

Electronic management of chassis system. Cruise control systems, electronic suspension system, antilock braking control system, traction control system and vehicle stability control system. Electronic steering control.

8 Body Control and security (08 Hrs)

Body control system, remote control locking, keyless entry, automatic air conditioning system, security systems – immobilizer and warning system, GPS system, Electronic control diagnosis , usage of multimeter. Immobilizer and oscilloscope and their uses. Coding.

6.5.1 AUTO BODY
(ELECTIVE)

L	T	P
4	-	-

RATIONALE

A diploma holder in Automobile Engineering must have complete knowledge of automobile body construction, material used, safety aspects and other features. Hence this subject.

DETAILED CONTENTS

1. Introduction (10 hrs)

Classification of automobiles on different basis. Types of vehicles, Car body details, Types , Salerris, convertibles, limousine, eastern van, racing and sports cars. Car body construction types-frame and unitary (manocoque) . Various body panels and their constructional details. Methods of improving space in cars.

2. Commercial Vehicle Details (06 hrs)

Types of commercial vehicles, Commercial vehicle body details –flat flatform, drop side, fixed side, tipper body, tanker body, tractor trailer.

3. Body Materials (08 hrs)

Steel sheet, timber, FRP, Plastic, GRP, Corrosion and anti corrosion methods, scalation of paint and painting process, body trim items and body mechanisms

4 Safety (10 hrs)

Safety aspects in vehicle bodies, Safety equipments in cars- anti roll bars, roll over bar, collapsible steering, multistage bumper, seat belts, collision crumble zones..

5 Special Purpose Vehicles (08 hrs)

Various types, Needs & constructional details – Fire station vehicle, tankers, ladder vehicle, concrete mixer, transport vehicles-Ambulance..

6. Vehicle Aerodynamics (14 hrs)

Objectives, vehicle drag and types of force and moments – Effect of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for reducing drag. Tunnel testing, Flow visualization techniques. Scale model testing.

7 Ergonomics (08 hrs)

Man machine system. Anthropometry data and considerations in design of seat, controls and displays, gear lever, steering wheel, foot controls etc. Dimensions of driver's seat in relation to control, visibility. Methods of improving visibility. Effect of noise, vibration and heat on human body and their control. Driver cab design.

6.5.2 TRACTORS AND HEAVY EARTH MOVING MACHINERY (ELECTIVE)

L	T	P
4	-	-

RATIONALE

Diploma holders in Automobile Engineering may have to deal with repair and maintenance of tractors and earth moving machinery. This subject provides knowledge about such vehicles and equipment

DETAILED CONTENTS

1. Tractor (12 hrs)

Classification of tractors, main tractor assemblies, functions of farm tractors, types of engine used, power requirement, human factor in tractor design, applications of tractors, Basics trends in tractor design, forces acting on a tractor on move, parallel pull and rolling resistance, tractor stability and weight distribution

2 Hydraulic System (08 hrs)

Functions of hydraulic system, hydraulic components, method of attaching implements, classification of hydraulic controls for hitches, integral hitch system, draft control system. Position control and Mixed control

3 Tractor Chassis (08 hrs)

Salient features of engine, clutch, power transmission, final drive, brakes and steering of Indian tractors.

4. Supplementary System (06 hrs)

Power take off shaft, draw bar working, belt pull traction control unit, three point linkages

5. Tractor Wheels and Tyres (10 hrs)

Salient features of wheels, tyres and wheel base/wheel tracks. Specifications of wheels and tyres, dual versus tendum tyres, tread design, effect of tyre inflation. Prominent make of Indian – Tractors. Selection criteria, maintenance and operation of tractors, differential lock.

6 Earth Moving Machinery (12 hrs)

Description and working principle of:

- Bull Dozer
- Leveller
- Front end loader
- Cranes
- Scrapper

6. Repair and Maintenance (8 hrs)

Faults and their rectification in tractor and maintenance of tractor.

Annexure "AX"

Syllabus for Psychiatric Social Worker and Drug De- Addiction Councilor

Time: 02 Hours
Total Marks: 120

Master of Sociology

SEMESTER – I (Marks 30)

- General Sociology
- Classical Sociological Thinkers
- Perspectives on Indian Society
- Methodology of Social Research
- Social Stratification

SEMESTER II (Marks 30)

- Theoretical Perspectives in Sociology
- Contemporary Sociological Thinkers
- Gender and Society
- Sociology of Sanitation
- Data Analysis and Social Statistics

SEMESTER – III (Marks 30)

- Sociology of Northeast India
- Environmental Sociology
- Religion and Society
- Rural Sociology
- Sociology of Movement
- Ethnicity, Pluralism and Nation
- Sociology of Education
- Population Problems and Policies
- Sociology of Health and Sanitation.

SEMESTER – IV (Marks 30)

- Sociology of Development
- Sociology of Health
- Urban Sociology
- Criminology and Penology
- Globalization and Society
- Sociology of Marginalized Communities
- Contemporary Trends in Indian Society
- Industrial Sociology

OR

MA Psychology

SEMESTER - I (Marks 30)

- **Theoretical Foundations of Psychology.**
- **Experimental Psychology**
- **Social Psychology**
- **Research Methodology in Psychology**

SEMESTER - II (Marks 30)

- **Cognitive Psychology.**
- **Bio-Psychology**
- **Psychology of Personality.**
- **Statistics in Psychology**

SEMESTER - III (Marks 30)

- **Psychopathology**
- **Psychometrics**
- **Health Psychology**
- **Organisational Psychology**

SEMESTER - IV (Marks 30)

- **Clinical Psychology**
- **Developmental Psychology**
- **Educational Psychology**
- **Counselling Psychology**
- **Rehabilitation Psychology**
- **Industrial Psychology**

OR

Syllabus for Psychiatric Social Worker and Drug De-Addiction Councillor

MASTER OF ARTS in SOCIAL WORK

SEMESTER - I **(Marks 30)**

a) Social Work Education and Profession
b) Social Work with Individuals
c) Community Practice in Social Work
d) Sociological Concepts and Contemporary Concerns
e) Psychology for Social Workers: Theories and Applications
f) Field Work Practicum

SEMESTER - II **(Marks 30)**

a) Social Work with Groups
b) Research in Social Work
c) Social Justice & Human Rights in Social Work Practice
d) State, Political Economy and Governance
e) Social Development
f) Field Work Practicum

SEMESTER - III **(Marks 30)**

a) Administration of Welfare and Development Services
b) Social Policy and Social Planning
c) Urban Community Development
d) Social Work Practice in Mental Health
e) Social Work with Families and Children
f) Corporate Social Responsibility & Social Entrepreneurship
g) Criminal Justice Social Work
h) Conflict Mitigation and Peace Building
i) Counselling :Theory and Practice
j) Management of Human Resources
k) Information Communication & Technology for Social Work Practice
l) Indigenous Communities and Development Discourse
m) Field work Practicum
n) Block Field Work Practicum

SEMESTER - IV **(Marks 30)**

a) Social Action and Social Movements
b) Social Legislation and Social Work
c) Social Work Practice in Health Settings
d) Environment, Sustainable Development and Social Work
e) Social Work with Older Persons
f) Gender and Development
g) Dissertation
h) Social Work and Disaster Management

i) Occupational Social Work
j) Social Work with Persons with Disabilities
k) Rural Community Development
l) Child Rights and Action
m) Social Work Practice with PLHIV
n) Field work Practicum.

Annexure "AY"

Time: 02 Hours
Total Marks: 120

SEMESTER 1st
MAJOR COURSE

MCM122J: MASS COMMUNICATION AND MULTIMEDIA PRODUCTION (INTRODUCTION TO JOURNALISM)
CREDITS: THEORY – 04; PRACTICALS - 02

COURSE OBJECTIVES:

1. *To introduce students to the basics of journalism.*
2. *To acquaint them with basic process of journalism.*
3. *To develop the basic skills of journalism.*
4. *To introduce students to the technical terms/jargon of Journalism.*

THEORY (4 CREDITS)

UNIT I

- Journalism as a profession: Concept, nature and scope
- Journalism and democracy; Concept of Fourth Estate
- Job of a journalist, Qualities and skills of a journalist

UNIT II

- What is News, Understanding what makes news; News Values
- Types of News
- Features or components of a news story

UNIT III

- Five 'W's and One 'H': the Main Elements of News
- Generating story ideas
- Sources of news

UNIT IV

- Gathering information: Observation, Interviews, Documents, Internet
- Attribution & Verification; Multi-Sourcing
- Changing trends in Journalism
- Basic journalism terminology

PRACTICALS (2 CREDITS)

Practical work based on relevant theory topics

SUGGESTED READINGS

1. *Elements of Journalism. Bill Kovach & Tom Rosenstiel*
2. *Hough, George (1994). News Writing. Houghton Mifflin College.*
3. *Harcup, Tony (2009). Journalism Principles & Practices. London: Sage.*
4. *Smith, John (2007). Essential Reporting. London: Sage.*
5. *Mencher, Melvin (2011). News Reporting and Writing. New York: McGraw-Hill.*

SEMESTER 2nd
MAJOR COURSE

MCM222J: MASS COMMUNICATION AND MULTIMEDIA PRODUCTION (INTRODUCTION TO COMMUNICATION)
CREDITS: THEORY – 04; TUTORIALS - 02

COURSE OBJECTIVES:

1. *To introduce students to the concepts of communication.*
2. *To acquaint them with models of communication.*
3. *To introduce students to the theories of communication.*

THEORY (4 CREDITS)

UNIT I

- Defining Communication
- Need and functions of Communication
- Elements of Communication

UNIT II

- 7 C's of Communication; Barriers to Communication
- Communication Types: Verbal and Non-Verbal; Formal and Informal; Mediated and Non-Mediated
- Forms of Communication: Intrapersonal, Interpersonal, Group, Public, Mass Communication

UNIT III

- Communication as a process
- Linear and Non-linear models
- Basics concepts of models: Aristotle, Lasswell, Berlo, Shannon & Weaver, Schramm, Dance, Osgood, Westley& MacLean, Kincaid

UNIT IV

- Introduction Communication theory
- Theories of Powerful and Limited Effects, Normative theories of Press
- Functions of Mass Communication: Surveillance, Correlation, Entertainment, Cultural Transmission
- Dysfunctions of Mass Communication

TUTORIALS (2 CREDITS)

Tutorial based on relevant theory topics

SUGGESTED READINGS

1. Mass Communication Theory: An Introduction by Denis McQuail (2005)
2. Understanding Media by Marshall McLuhan
3. Mass Communication Theory and Practice by Uma Narula
4. Introduction to communication studies by John Fiske.
5. Theories of mass communication by Defluer and Ball Rockech

Bachelors with Mass Communication and Multimedia Production as Major

3rd SEMESTER

MCM322J: MEDIA ETHICS CREDITS: THEORY – 4, TUTORIAL: 2

THEORY (4 CREDITS: 60 HOURS) MAXIMUM MARKS: 100

MINIMUM MARKS: 36

Course Learning Outcomes:

To focus on ethical dimensions of issues related to media and understand ethical and moral standards of media professionalism. Students will be able to explore various ethical dilemmas that confront media professionals and know code of ethics of the profession.

UNIT – 1 (15 HOURS)

- Ethics in Journalism: An Introduction
- Understanding Truth and Accuracy
- Conflict of Interest, Freebies
- Sensationalism, Privacy

UNIT – 2 (15 HOURS)

- Media bias, Plagiarism
- Sting Operation, Phone tapping
- Misinformation, Disinformation
- Paid News, Fake News

UNIT – 3 (15 HOURS)

- Ethical aspect of live reporting
- Obtaining Consent, Anonymity
- Ethical considerations in covering marginalized groups, children and gender
- Ethical dilemmas while covering violence and disability

UNIT – 4 (15 HOURS)

- Media Trial, Accountability and Transparency
- Social Media Ethics: Ethical Practices while using Social Media
- SPJ Code of conduct for journalists

TUTORIALS (2 CREDITS: 30 HOURS) MAXIMUM MARKS: 50

MINIMUM MARKS: 18

Case Studies based on Media Ethics

Suggested Reading:

Merino, Noel. (2012). Media Ethics, Greenhaven

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4th SEMESTER

MCM423J1: VISUAL COMMUNICATION CREDITS: THEORY – 3, TUTORIAL: 1

THEORY (3 CREDITS: 45 HOURS)

Course Learning Outcomes:

Students will be able to effectively convey ideas, emotions and messages through the skilful use of visual elements and principles of design.

UNIT – 1 (15 HOURS)

- Visual communication principles and significance
- Overview of historical development
- Elements: Line, Shape, Colour, Texture, Form
- Design principles: Balance, Contrast, Emphasis, Rhythm, Unity, Proportion

UNIT – 2 (15 HOURS)

- Graphic design essentials and applications
- Layout design for print and digital media
- Creating logos, posters, brochures
- Software tools: Adobe Creative Suite (Photoshop, Illustrator, InDesign)

UNIT – 3 (15 HOURS)

- Introduction to digital media
- Multimedia elements: images, audio, video, animation
- Interactive design for web, apps, social media
- Basics of video editing, animation, motion graphics

TUTORIALS (1 CREDIT: 15 HOURS) **MAXIMUM MARKS: 25**

MINIMUM MARKS: 9

- Discussing narrative techniques in visuals and using visuals to convey emotions, ideas
- Ethical considerations and cultural sensitivity in visuals and successful case studies

Suggested Reading:

- *Lester, P. M. (2014). Visual Communication: Images with Messages. Routledge.*
- *Lupton, E. (2014). Thinking with Type: A Critical Guide for Designers, Writers, Editors, & Students. Princeton Architectural Press.*
- *Krug, S. (2014). Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability. New Riders.*
- *Flaherty, F. (2000). The Elements of Story: Field Notes on Nonfiction Writing. Harper Perennial.*
- *Sherwin, R. (2017). Visual Storytelling: Inspiring a New Visual Language. Focal Press*

Bachelors with Mass Communication And Multimedia Production as Major
4th SEMESTER

MCM423J2: RADIO PRODUCTION
THEORY (4 CREDITS: 60 HOURS)

CREDITS: THEORY – 4, TUTORIAL: 2
MAXIMUM MARKS: 100
MINIMUM MARKS: 36

Course Learning Outcomes:
This course enables the students to describe various formats of radio formats and the production process of radio program

UNIT – 1 (15 HOURS)
- Radio as a medium of broadcasting
- Radio Broadcasting in India (Pre and Post-Independence)
- Different types of radio stations and transmissions
- Organizational structure and functionaries of a radio station

UNIT – 2 (15 HOURS)
- Programme formats (Interviews, Discussion and Drama)
- Radio News
- Radio Features

UNIT – 3 (15 HOURS)
- Writing for Radio
- Principles of scripting
- Writing links and announcements

UNIT – 4 (15 HOURS)
- Voice modulation, Pronunciation
- Presentation Styles
- Types of Microphones

TUTORIALS (2 CREDITS: 30 HOURS) **MAXIMUM MARKS: 50**

Group Assignment: Write, Record and Edit any radio programme.

Suggested Readings:

- *Mc Leish, R & Link, J. (2016). Radio production. Focal Press.*
- *Fleming, C. (2009) The radio handbook. Routledge.*

- *Ford, M. (2013). Radio production. digital broadcast art. Create Space.*
- *Gilmurray, B. (2010). The media student's guide to radio production. Mightier Pen Pub.*
- *Hausman, C. et al. (2012). Modern radio production: production, programming and performance. Wadsworth.*
- *Keith, C. M. (2010). The radio station: broadcast satellite and internet. Focal Press.*
- *Alten, S.R. (2008). Audio in media (8th ed.). Belmont, CA: Thompson Wadsworth.*
- *McCoy, Q. (1999). No static: A guide to creative radio programming. San Francisco: Backbeat Books.*

Bachelors with Mass Communication And Multimedia Production as Major

4th SEMESTER

MCM423J3: DEVELOPMENT COMMUNICATION CREDITS: THEORY-4
TUTORIAL: 2
THEORY (4 CREDITS: 60 HOURS) **MAXIMUM MARKS: 100**
MINIMUM MARKS: 36

Course Learning Outcomes:
During the course of the study the student will be given an understanding of the process of development and the role of communication in it.

UNIT – 1 (15 HOURS)
- Development: Definition, Meaning and Process
- Human development
- Role of UN and its allied agencies.
- MDG's SDG's.

UNIT – 2 (15 HOURS)
- Theories and Models of development: Dominant paradigm, Dependency model, Alternative paradigm
- Basic needs models
- Nehruvian model
- Gandhian model

UNIT – 3 (15 HOURS)
- Development communication: Definition, Concept, Purpose
- Dev comm. approaches – Diffusion of Innovation, Empathy and Magic Multiplier
- Alternative Dev comm. approaches: Participatory Approach
- Designing messages for Development Communication.

UNIT – 4 (15 HOURS)
- Cyber Media and Development –e-governance, e-chaupal
- ICT for development
- Development Support Communication (DSC),
- Development support communication in India in the areas of: Agriculture, Health & Family Welfare, Women Empowerment.

TUTORIALS (2 CREDITS: 30 HOURS)

MAXIMUM MARKS: 50
MINIMUM MARKS: 18

Practical: Critical analysis of mainstream media's reportage of development issues in India. Analysis of mainstream TV news media reportage on rural problems and issues in India.

Suggested Reading:

- *Hamelink, J. &Mehra, A. (eds.) Communication Development and Human Rights in Asia.Singapore: AMIC.*
- *McPhail, T. L. Development Communication: Reframing the Role of the Media.Sussex: Wiley-Blackwell.*
- *Melkote, S. &Steeves, H. L. Communication for Development in the Third world. Theory and Practice for Empowerment. Thousand Oaks, CA : Sage.*
- *Mies, M. & Shiva, V. Ecofeminism.London: Zed Books.*
- *Mody, B., Designing Messages for Development Communication: An Audience Participation-Based Approach. London: Sage*
- *Neuzil, M. Mass Media and Environmental Conflict: America's Green Crusades.Thousand Oaks, CA: Sage.*

MARKS: 50
RKS: 18

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I)
5th SEMESTER

MCM522J1 MCMP _ NEW MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to critically analyse and navigate the evolving landscape of New Media, demonstrating an understanding of its impact on society, communication, and culture.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- New Media: Meaning Characteristics, Principles
- New Media Interface
- New Media Economy
- Impact of New Media on Journalism

UNIT – 2 (15 HOURS)

- New Media Ecology, Installations
- Elements of Transmedia Narratives across multiple media
- Online Story Construction, Blog, Trends in web/online Journalism
- Artificial Intelligence, Augmented Reality

UNIT – 3 (15 HOURS)

- Tools and Techniques for Online Journalism
- New Media Ethics: Copyright and Legal issues in cyber space,
- Editing online content
- Dark Side of New Media

TUTORIALS (1 CREDIT: 15 HOURS)

- Producing a digital story.
- Constituents of new media- Web 2.0-3.0, Blogs, Micro Blogs, Wikis, social media.
- Using Facebook, Twitter, WordPress, Blogger, YouTube, Docs, Drive, Hangouts

SUGGESTED READINGS:

- Humphreys, Ashlee. Social Media. New York: Oxford University Press
- Levinson, Paul. New Media (2nd Edition). Boston: Pearson.
- Manovich, L. (2001). The language of new media. MIT press.
- Jenkins, H. (2006). Convergence culture: Where old and new media collide. NYU press.
- Flew, T. (2007). New media: An introduction. Oxford: Oxford University Press.
- Gerbaudo, P. (2018). Tweets and the streets: social media and contemporary activism. Pluto Press.
- Castells, M. (2004). The network society A cross-cultural perspective. Edward Elgar Lev Manovich.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – BACHELORS WITH MASS COM

5th SEMESTER

MCM522J2 MCMP _ MEDIA HISTORY

CREDITS: THEORY – 4, TUTORIAL – 2 CM522N MCMP – NEW MEDIA

COURSE LEARNING OUTCOMES:

To trace historical growth and development of media in India and abroad and develop awareness about major landmark events that have helped in shaping the media scenario around

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Traditional Media: Introduction
- History and Origin of Printing
- Evolution of press in India: pre- and post-independence era
- Language Press in India

UNIT – 2 (15 HOURS)

- History of broadcasting at global level
- Growth of Radio in India
- Television in India
- Growth of Digital Media

UNIT – 3 (15 HOURS)

- Origin and development of Folk Media
- Evolution of Cinema in India
- Parallel and Commercial Cinema
- Role of Media in Development

UNIT – 4 (15 HOURS)

- Press in Jammu and Kashmir: Early period
- Growth and Development of Press in Jammu and Kashmir
- Radio and Television in Jammu and Kashmir
- Challenges faced by media professionals

INTERNSHIP

OR

TUTORIALS (2 CREDITS: 30 HOURS)

Group Assignments and class presentations about various aspects of Media History.

SUGGESTED READINGS:

- Ahuja, B.N. (2015). History of Indian Press: Growth of Newspapers in India
- Khanna, Amit. (2019). Words. Sounds. Images: A History of Media and Entertainment in India. HarperCollins India
- Melkote, Srinivas. R. (1998). In International satellite broadcasting in South Asia: Political, economic, and cultural implications. Peter Shields, Binod C. Agrawal (Eds). University Press of America
- Natarajan, J. History of Indian Journalism. Creative Media Partners
- Parthasarathy, Rangaswami. (2017). Journalism in India: From the Earliest Times to the Present Day. New Delhi: Sterling Publishers
- Saraf, Mulk Raj. (1967). Fifty Years as a Journalist. Raj Mahal Publishers

(CT – II)

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT – I)

5th SEMESTER

MCM522N MCMP _ NEW MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to critically analyse and navigate the evolving landscape of New Media, demonstrating an understanding of its impact on society, communication, and culture.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- New Media: Meaning Characteristics, Principles
- New Media Interface
- New Media Economy
- Impact of New Media on Journalism

UNIT – 2 (15 HOURS)

- New Media Ecology, Installations
- Elements of Transmedia Narratives across multiple media
- Online Story Construction, Blog, Trends in web/online Journalism
- Artificial Intelligence, Augmented Reality

UNIT – 3 (15 HOURS)

- Tools and Techniques for Online Journalism
- New Media Ethics: Copyright and Legal issues in cyber space,
- Editing online content
- Dark Side of New Media

TUTORIALS (1 CREDIT: 15 HOURS)

- Producing a digital story.
- Constituents of new media- Web 2.0-3.0, Blogs, Micro Blogs, Wikis, social media.
- Using Facebook, Twitter, WordPress, Blogger, YouTube, Docs, Drive, Hangouts

SUGGESTED READINGS:

- Humphreys, Ashlee. Social Media. New York: Oxford University Press
- Levinson, Paul. New Media (2nd Edition). Boston: Pearson.
- Manovich, L. (2001). The language of new media. MIT press.
- Jenkins, H. (2006). Convergence culture: Where old and new media collide. NYU press.
- Flew, T. (2007). New media: An introduction. Oxford: Oxford University Press.
- Gerbaudo, P. (2018). Tweets and the streets: social media and contemporary activism. Pluto Press.
- Castells, M. (2004). The network society A cross-cultural perspective. Edward Elgar Lev Manovich.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – III)
5th SEMESTER

MCM522J3 MCMP _ ADVERTISING **CREDITS: THEORY – 4, TUTORIAL: 2**

COURSE LEARNING OUTCOMES:
To introduce students to the concept and process of advertising and to outline the importance of advertisements for the success of brands.

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Advertising: Definition and Concept
- History and Evolution of Advertising in India
- Functions and Types of Advertising

UNIT – 2 (15 HOURS)

- Importance of Advertising as a Marketing Strategy
- Understanding Brand, Brand Image and Brand Equity
- Role of Advertising in building Brand Image and Brand Equity

UNIT – 3 (15 HOURS)

- Target Audience: Importance and Scope
- Various Media for Advertising
- Print, Electronic and Digital advertising

UNIT – 4 (15 HOURS)

- Advertising Agency: Definition and Types
- Structure and Function of an Advertising Agency
- Creativity: Concept and Importance in Advertising
- Creative Brief

TUTORIALS (2 CREDITS: 30 HOURS)

- ***Group Assignments and class presentations, especially designing of ads.***

SUGGESTED READING:

- Contemporary Advertising, 2017, 15th Edition, William Arens, Michael Weigold and Christian Arens, Hill Higher Education
- Brand Equity & Advertising- Advertising's role in building strong brands, 2013- David A. Aker, Alexander L. Biel, Psychology Press

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I)
6th SEMESTER

MCM622J1 MCMP _ FOLK MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to appreciate the cultural significance and artistic expressions of Folk Media, understanding its role in preserving traditions, promoting community identity, and fostering social cohesion.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Introduction to traditional folk media
- Different forms of popular traditional media
- Characteristics of folk media
- Various popular forms of folk media in India (Folk Theatre, Folk Songs, Puppet Shows)

UNIT – 2 (15 HOURS)

- Folk Media vs Electronic Media
- Limitations of mass media and advantages of folk media
- Role of traditional folk media in communicating modern themes
- Folk Media and community engagement: Understanding the nature and style of folk media

UNIT – 3 (15 HOURS)

- Integrated use of Folk Media and Mass Media
- Song and Drama Division and Field Publicity Units
- Field Publicity Units
- Use of Folk media for developmental messages

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Practical work based on Kashmiri Folk Traditions (Bandpather, PadshaDaleel, Ladi Shah)***

SUGGESTED READINGS:

- Parmer, Shyam. Traditional Folk Media in India. New Delhi: Geka Books.
- Sitaram, K.S. Culture and Communication, Associate Printers, Mysore.
- Ranganath, H.K. Folk Media and Communication, Chintam Prakashana, Mysore.
- Vijaya, N. The Role of Traditional Folk Media in Rural Areas, Gian Publishing, House, Delhi.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – BACHELORS WI

6th SEMESTER

MCM622J2 MCMP _ CINEMA STUDIES

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will understand evolution and significance of cinema and various technicalities in film making

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Concept and Significance of Cinema
- Evolution of Cinema
- Indian New Wave Cinema or Parallel Cinema
- Culture and Cinema: Characteristics and portrayal

UNIT – 2 (15 HOURS)

- Stages of Production – Pre-production, production and post-production
- Technicalities in Cinema: Semiotics, Narratives, Intertextuality, Mise-en-scene
- Shots and scene, camera movements and angles
- Light, Sound and Composition

UNIT – 3 (15 HOURS)

- Film Genre: Action, Thriller, Comedy, Tragedy, Horror, Scientific Fiction
- Film Narrative: Structural Analysis (Exposition, Rising action, Falling action)
- Film Budgeting
- Pioneers in film making

UNIT – 4 (15 HOURS)

- Film Reviews
- Film Festivals
- Theories of Film making
- Screening of any two national/international award-winning films

PRACTICALS (2 CREDITS: 30 HOURS)

Short Films to be produced by students in groups as part of Practical

SUGGESTED READINGS:

- Ascher, Steven and Pincus, Edward. (2013). The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age (Fifth Edition). Penguin
- Belavadi, Vasuki. (2007). Video Production. Oxford University Press
- Hayward, Susan. (2022). Cinema Studies: The Key Concepts (6th Edition). Routledge
- Hunt, Robert Edgar , Marland, John , Rawle, Steven. (2018). The Language of Film. Bloomsbury. London
- Monaco, James. (2000). How to Read a Film: The World of Movies, Media and Multimedia (Language, History, Theory). Oxford University Press

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT – I)

6th SEMESTER

MCM622N MCMP _ FOLK MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to appreciate the cultural significance and artistic expressions of Folk Media, understanding its role in preserving traditions, promoting community identity, and fostering social cohesion.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Introduction to traditional folk media
- Different forms of popular traditional media
- Characteristics of folk media
- Various popular forms of folk media in India (Folk Theatre, Folk Songs, Puppet Shows)

UNIT – 2 (15 HOURS)

- Folk Media vs Electronic Media
- Limitations of mass media and advantages of folk media
- Role of traditional folk media in communicating modern themes
- Folk Media and community engagement: Understanding the nature and style of folk media

UNIT – 3 (15 HOURS)

- Integrated use of Folk Media and Mass Media
- Song and Drama Division and Field Publicity Units
- Field Publicity Units
- Use of Folk media for developmental messages

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Practical work based on Kashmiri Folk Traditions (Bandpather, PadshaDaleel, Ladi Shah)***

SUGGESTED READINGS:

- Parmer, Shyam. Traditional Folk Media in India. New Delhi: Geka Books.
- Sitaram, KS. Culture and Communication, Associate Printers, Mysore.
- Ranganath, H.K. Folk Media and Communication, Chintam Prakashana, Mysore.
- Vijaya, N. The Role of Traditional Folk Media in Rural Areas, Gian Publishing, House, Delhi.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – III)
6th SEMESTER

MCM62233 MCMP _ PUBLIC RELATIONS

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will be able to strategically manage and enhance the reputation and communication of organizations in diverse media environments

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Public Relations: Definitions, Meaning, Scope
- Concept of Publics in PR
- Ethics in PR

UNIT – 2 (15 HOURS)

- Origin and Growth of PR as a Profession
- Public Relations in India: A Brief Historical Perspective
- Top PR Firms in India

UNIT – 3 (15 HOURS)

- Public Opinion: Meaning and Definitions
- Propaganda: Concept
- Public Relation Tools

UNIT – 4 (15 HOURS)

- Public Relation Campaign
- Public Relations and Advertising
- New Media in Public Relations

TUTORIALS (2 CREDITS: 30 HOURS)

Group Assignments and class presentations based on PR Campaigns.

SUGGESTED READINGS:

- Smith, R. (2013). Public Relations: The Basics. United Kingdom: Taylor & Francis.
- Bernays, E. L. (2013). Public Relations. (n.p.): University of Oklahoma Press.
- Vilanilam, J. V. (2011). Public Relations in India: New Tasks and Responsibilities. India: SAGE.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I)
7th SEMESTER

MCM722J1 MCMP_ EXPLORING HINDI CINEMA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

To provide comprehensive understanding about growth and development of Hindi Cinema and to gain expertise in film-making.

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Historical Overview and Development of Hindi Cinema
- Early period and Silent Era in Indian Cinema
- Emergence of Film Studios: New Theatres, Bombay Talkies, Imperial theatre, R.K. Studio
- The Golden Age

UNIT – 2 (15 HOURS)

- Contemporary Hindi cinema
- Themes, Representation, Gender and Identity in Hindi Cinema
- Stalwarts of Indian cinema: Satyajit Ray, Mehboob, Shyam Benegal, Guru Dutt, Raj Kapoor, Dilip Kumar
- Reference films: Raja Harishchandra, Alam Ara

UNIT – 3 (15 HOURS)

- Screenplay: Concept and Purpose
- Elements and Structure of Screenplay
- Films and Digital platforms
- Challenges and Opportunities for Hindi Cinema

TUTORIALS (1 CREDIT: 15 HOURS)

Short Films to be produced by students in groups as part of practical exercise

SUGGESTED READINGS:

- Ascher, Steven and Pincus, Edward. (2007). The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age, Plume
- Ganti, Tejaswini. (2013). Bollywood: A Guidebook to Popular Hindi Cinema (Second Edition). Routledge
- Gehlawat, Ajay and Dudrah, Rajinder. (2019). The Evolution of Song and Dance in Hindi Cinema. Routledge
- Rabinger, Michael and Hurbis-Cherrier, Mick. (2020). Directing: Film Techniques and Aesthetics (6th Edition), Routledge
- Rajadhyaksha, Ashish. (2016). Indian Cinema: A Very Short Introduction. OUP Oxford

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I

7th SEMESTER

MCM722J2 MCMP _ INTERNATIONAL COMMUNICATION

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will develop a comprehensive understanding of the key concepts, theories and challenges in International Communication, enabling them to critically analyse and effectively navigate the complexities of global media landscapes

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- International communication: Significance
- Brief history of international communication
- Communication and Global interactions
- Understanding Different Cultures in communication

UNIT – 2 (15 HOURS)

- Key communication theories for cross-cultural situations
- Different Cultures: Communication Interface
- Media and technology for global connections
- Ethics in cross-cultural communication

UNIT – 3 (15 HOURS)

- Media outreach across globe
- Impact of global media on cultures and societies
- Social media's role in connecting people internationally
- Challenges in media accessibility

UNIT – 4 (15 HOURS)

- International diplomacy and role of communication.
- Using communication for building positive relationships
- Real examples in global communication

TUTORIALS (2 CREDITS: 30 HOURS)

Group assignments and presentations about various aspects of International Communication.

SUGGESTED READINGS:

- Thussu, D. K. (2018). International communication: Continuity and change. Bloomsbury Publishing.
- DeFleur, M. L., & Dennis, E. E. (2018). Understanding mass communication: A liberal arts perspective. Routledge.
- Samovar, L. A., & Porter, R. E. (2010). Communication between cultures. Cengage Learning.
- Castells, M. (2010). The rise of the network society: The information age: Economy, society, and culture (Vol. 1). John Wiley & Sons.
- Seib, P. (2016). Real-time diplomacy: Politics and power in the social media era. Springer.

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BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – III)
7th SEMESTER

MCM722J3 MCMP _ GRAPHIC DESIGNING

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will develop understanding about graphic designing and its functions and applications, besides knowing about different softwares and techniques used to create an engaging content

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Graphic Designing: Concept and Purpose
- Evolution and Scope of Graphic Designing
- Significance of graphic design in contemporary media scenario
- Role of a Graphic Designer

UNIT – 2 (15 HOURS)

- Elements of Design: Line, Shape, Form, Space, Colours etc
- Principles of Design: Unity, Harmony, Balance, Rhythm, Perspective, Emphasis, Proportion, Repetition
- Composition and Layout
- Qualities of a Graphic Designer

UNIT – 3 (15 HOURS)

- Importance of Visual Communication
- Skills and Techniques in Graphic Design
- Digital and interactive media design
- Visualization and Animation: An Overview

UNIT – 4 (15 HOURS)

- Adobe Photoshop
- Illustrator
- InDesign
- Prepare a business plan for an enterprise in graphic design

PRACTICAL (2 CREDITS: 30 HOURS)

Group Assignments and class presentations based on theory inputs

SUGGESTED READINGS:

- *Albers, Josef. (2013). Interaction of Colour. Yale University Press*
- *Franchi, Francesco. (2013). Designing News: Changing the World of Editorial Design and Information Graphics. Gestalten*
- *Hara, Kenya. (2014). Designing Design. Lars Muller Publishers*
- *Roberts, Lucienne & Wright, Rebecca. (2010). Design Diaries: Creative Process in Graphic Design. Laurence King Publishing*
- *Wheeler, Alina. (2012). Designing brand identity: As essential guide for the whole branding team (Fourth edition)*

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT_ BACHELORS WITH M

7th SEMESTER

MCM722N MCMP _ EXPLORING HINDI CINEMA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

To provide comprehensive understanding about growth and development of Hindi Cinema and to gain expertise in film-making.

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Historical Overview and Development of Hindi Cinema
- Early period and Silent Era in Indian Cinema
- Emergence of Film Studios: New Theatres, Bombay Talkies, Imperial theatre, R.K. Studio
- The Golden Age

UNIT – 2 (15 HOURS)

- Contemporary Hindi cinema
- Themes, Representation, Gender and Identity in Hindi Cinema
- Stalwarts of Indian cinema: Satyajit Ray, Mehboob, Shyam Benegal, Guru Dutt, Raj Kapoor, Dilip Kumar
- Reference films: Raja Harishchandra, Alam Ara

UNIT – 3 (15 HOURS)

- Screenplay: Concept and Purpose
- Elements and Structure of Screenplay
- Films and Digital platforms
- Challenges and Opportunities for Hindi Cinema

TUTORIALS (1 CREDIT: 15 HOURS)

Short Films to be produced by students in groups as part of practical exercise

SUGGESTED READINGS:

- Ascher, Steven and Pincus, Edward. (2007). The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age, Plume
- Ganti, Tejaswini. (2013). Bollywood: A Guidebook to Popular Hindi Cinema (Second Edition). Routledge
- Gehlawat, Ajay and Dudrah, Rajinder. (2019). The Evolution of Song and Dance in Hindi Cinema. Routledge
- Rabinger, Michael and Hurbis-Cherrier, Mick. (2020). Directing: Film Techniques and Aesthetics (6th Edition), Routledge
- Rajadhyaksha, Ashish. (2016). Indian Cinema: A Very Short Introduction. OUP Oxford.

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BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – 1)
8th SEMESTER

MCM822J1 MCMP _ COMMUNICATION RESEARCH

COURSE LEARNING OUTCOMES:

CREDITS: THEORY – 3, TUTORIAL: 1

- *The course aims to equip students with the skills necessary to critically evaluate communication research and to plan and execute their own research projects.*

UNIT – 1 (15 HOURS)

- Role of research in communication studies
- Exploring research process from conceptualization to dissemination
- Qualitative and quantitative research approaches
- Ethical considerations in communication research

UNIT – 2 (15 HOURS)

- Types of research designs: Exploratory, Descriptive, Experimental, And Correlational
- Sampling techniques and considerations
- Constructing research questions and hypotheses
- Data collection methods: surveys, interviews, content analysis, focus groups, etc.

UNIT – 3 (15 HOURS)

- Literature review: sourcing, reviewing, and synthesizing existing research
- Developing a research proposal
- Data analysis and interpretation
- Writing research papers and presenting results.

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Group work to prepare a research paper.***

SUGGESTED READINGS:

- Deacon, D., Golding, P., Green, L., & Sweeney, M. (2021). Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis. Bloomsbury Academic USA; 3rd edition. ISBN: 9781501316968
- Plooy, G. (2007). Communication Research: Techniques, Methods, and Applications. Juta Academic ISBN: 0702156418

NOR (CT – 1)

AL: 1

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – 1)
8th SEMESTER

MCM822J1 MCMP _ COMMUNICATION RESEARCH

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *The course aims to equip students with the skills necessary to critically evaluate communication research and to plan and execute their own research projects.*

UNIT – 1 (15 HOURS)

- Role of research in communication studies
- Exploring research process from conceptualization to dissemination
- Qualitative and quantitative research approaches
- Ethical considerations in communication research

UNIT – 2 (15 HOURS)

- Types of research designs: Exploratory, Descriptive, Experimental, And Correlational
- Sampling techniques and considerations
- Constructing research questions and hypotheses
- Data collection methods: surveys, interviews, content analysis, focus groups, etc.

UNIT – 3 (15 HOURS)

- Literature review: sourcing, reviewing, and synthesizing existing research
- Developing a research proposal
- Data analysis and interpretation
- Writing research papers and presenting results.

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Group work to prepare a research paper.***

SUGGESTED READINGS:

- Deacon, D., Golding, P., Green, L., & Sweeney, M. (2021). Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis. Bloomsbury Academic USA; 3rd edition. ISBN: 9781501316968
- Plooy, G. (2007). Communication Research: Techniques, Methods, and Applications. Juta Academic ISBN 0702156418

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR
8th SEMESTER

MCM822J2 MCMP _ VIDEO PRODUCTION

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

To blend theoretical dialogues by hands-on activities and imaginative endeavors, students will acquire a comprehensive understanding of video production, spanning from meticulous pre-production strategizing to skillful post-production editing.

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Understanding significance of video as a communication medium
- Basics of visual storytelling and narrative structures.
- Introduction to video equipment, cameras, tripods, and accessories.
- Composition and Framing Techniques.

UNIT – 2 (15 HOURS)

- Importance of lighting
- Controls for exposure, focus, and white balance.
- Three-point lighting setup and its variations.
- Types of lights. Indoor and outdoor lighting.

UNIT – 3 (15 HOURS)

- Script writing, story boarding, and short lists.
- Understanding the elements of a compelling story.
- Planning for different video genres: documentaries, interviews, narratives
- Editing techniques.

UNIT – 4 (15 HOURS)

- Role and responsibilities of production team.
- Video editing software and process.
- Copyright and fair use in video production.
- Ethical considerations in video journalism and documentary film-making

TUTORIALS (2 CREDITS: 30 HOURS)

Group Assignments related to Video Production

SUGGESTED READINGS:

- *Compesi, R., Gomez, J. (2017) Introduction to Video Production :Studio, Field, and Beyond. Taylor & Francis.ISBN:9781351784177.*
- *Diefenbach, D., Slatton, A (2019). Video Production Techniques: Theory and Practice from Concept to Screen. Taylor & Francis.ISBN:9781351051682.*
- *Donald, R. (2000). Fundamentals of Television Production. John Wiley & Sons. ISBN:0813827396*

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR
8th SEMESTER

MCM822J3 MCMP _ MEDIA APPRECIATION

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will be able to produce engaging videos that demonstrate a thorough understanding of key concepts and techniques in video production

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Importance of Media in society
- Different media types: print, digital, visual, audio
- Basics of media literacy and critical thinking

UNIT – 2 (15 HOURS)

- Techniques to analyse visuals (photography, film)
- Elements of visual composition: framing, lighting, colour

UNIT – 3 (15 HOURS)

- Analysing audio media (music, podcasts)
- Recognizing narrative in visual and audio media

UNIT – 4 (15 HOURS)

- Media's impact on culture, identity, trends
- Discussing media's role in social and political issues
- Ethical considerations in media consumption

TUTORIALS (2 CREDITS: 30 HOURS)

- Critiquing print media: newspapers, magazines, ads
- Assessing digital media: websites, social platforms

SUGGESTED READINGS:

- *Baran, S. J., & Davis, D. K. (2015). Mass communication theory: Foundations, ferment, and future. Cengage Learning.*
- *Messaris, P. (2014). Visual persuasion: The role of images in advertising. SAGE Publications.*

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT – 1)
8th SEMESTER

MCM822N MCMP _ COMMUNICATION RESEARCH

CREDITS: THEORY – 3, TUTORIAL : 1

COURSE LEARNING OUTCOMES:

- *The course aims to equip students with the skills necessary to critically evaluate communication research and to plan and execute their own research projects.*

UNIT – 1 (15 HOURS)

- Role of research in communication studies
- Exploring research process from conceptualization to dissemination
- Qualitative and quantitative research approaches
- Ethical considerations in communication research

UNIT – 2 (15 HOURS)

- Types of research designs: Exploratory, Descriptive, Experimental, And Correlational
- Sampling techniques and considerations
- Constructing research questions and hypotheses
- Data collection methods: surveys, interviews, content analysis, focus groups, etc.

UNIT – 3 (15 HOURS)

- Literature review: sourcing, reviewing, and synthesizing existing research
- Developing a research proposal
- Data analysis and interpretation
- Writing research papers and presenting results.

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Group work to prepare a research paper.***

SUGGESTED READINGS:

- Deacon, D., Golding, P., Green, L., & Sweeney, M. (2021). Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis. Bloomsbury Academic USA; 3rd edition. ISBN: 9781501316968

Plooy, G. (2007). Communication Research: Techniques, Methods, and Applications. Juta Academic ISBN: 0702156418

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR
8th SEMESTER

MCM822J2 MCMP _ VIDEO PRODUCTION

CREDITS: THEORY – 4, TUTORIAL : 2

COURSE LEARNING OUTCOMES:

To blend theoretical dialogues by hands-on activities and imaginative endeavors, students will acquire a comprehensive understanding of video production, spanning from meticulous pre-production strategizing to skillful post production editing.

THEORY (4 CREDITS: 60 HOURS)

B Tech - Electronics

3rd Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCMTH31	**Engineering Mathematics - III**	2	1	3

Section	Course contents	Hours
1.	Laplace transform, shifting theorem	4
2.	Laplace transform of differential functions	4
3.	Heaviside's unit step function	2
4.	Dirac-delta function and its Laplace transform	2
5.	Heaviside's expansion theorem	2
6.	Inverse Laplace transform	4
7.	Initial and final value theorem	3
8.	Convolution theorem	1
9.	Applications of Laplace transform in the solution of linear differential equations	4
10.	Fourier series, Harmonic Analysis	4
11.	Definition of Fourier transform, Fourier sine and Cosine Transform	3
12.	Fourier integral formula	4
13.	Applications to solutions of BVP	4
14.	Data modeling , types, tools and techniques	4
15.	Data interpretation , types methods and tools	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Laplace Transforms by Murray R. Speigal
2. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
3. Higher Engg. Mathematics: B.S. Grewal - Khanna publishers.
4. Advanced Engineering Mathematics: Michael D Greenberg-PHI.
5. Higher engineering mathematics: H. K. Dass, Rajnish Verma-S. Chand

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE36L	**EDA Tools Lab – I**	2	1

Introduction to ARDUINO

Section	Course Contents
1	**Basic IDE:** Creating and Saving a Sketch-Structuring an Arduino Program-Using Simple Primitive Types- Using Floating-Point Numbers Working with Groups of Values Using Arduino -Structuring Your Code into Functional Blocks Returning More Than One Value from a Function-Taking Actions Based on Conditions-Repeating a Sequence of Statements-Repeating Statements with a Counter-Breaking Out of Loops-Taking a Variety of Actions Based on a Single Variable-Comparing Character and Numeric Values-Comparing Strings -Performing Logical Comparisons Performing Bitwise Operations-Combining Operations and Assignment.
2	**Using Mathematical Operators:** Finding the Remainder After Dividing Two Values-Determining the Absolute Value Constraining a Number to a Range of Values Finding the Minimum or Maximum of Some Values Raising a Number to a Power Taking the Square Root Rounding Floating-Point Numbers Up and Down Using Trigonometric Functions Generating Random Numbers Setting and Reading Bits Shifting Bits Extracting High and Low Bytes in an int or long Forming an int or long from High and Low Bytes.
3	**Serial Communications:** Sending Debug Information from Arduino to Your Computer Sending Formatted Text and Numeric Data from arduino , Receiving Serial Data in Arduino Sending Multiple Text Fields from Arduino in a Single Message, Receiving Multiple Text Fields in a Single Message in Arduino Sending Binary Data from Arduino Receiving Binary Data from Arduino on a Computer Sending Binary Values from Processing to Arduino Sending the Value of Multiple Arduino Pins Logging Arduino Data to a File on Your Computer.
4	**Digital and Analog input/Output**: Using a Switch Using a Switch Without External Resistors Reliably, Detecting the Closing of a Switch Determining How Long a Switch Is Pressed Detecting Movement Detecting Light Detecting Motion (Integrating Passive Infrared Detectors) Measuring Distance Measuring Distance Accurately Detecting Vibration Detecting Sound Measuring Temperature Connecting and Using LEDs Adjusting the Brightness of an LED Driving High-Power LEDs Adjusting the Color of an LED Sequencing Multiple LEDs: Creating a Bar Graph Sequencing Multiple LEDs: Driving a 7-Segment LED Display Driving Multidigit, Increasing the Number of Analog Outputs Using PWM Extender Chips (TLC5940) Controlling Servos from the Serial Port.

Tools Required: Matlab, Labview, Arduino IDE and Supported Hardware

Course No.	Subject	Teaching Periods	Credits
		P	
ESCECE35L	**Data Structures Lab**	2	1

List of Experiments

1. Basic concepts of data, linear lists, strings, arrays and orthogonal lists, representation of trees & graphs, storage systems, Arrays, Recursion, Stacks, Queues, Linked lists, Binary trees, General Trees, Tree Traversal, Symbol Table and Searching Techniques, Sorting Techniques, graphs.
2. Implement singly and doubly linked lists.
3. Represent a polynomial as a linked list and write functions for polynomial addition.
4. Implement stack and use it to convert infix to postfix expression.
5. Implement array-based circular queue and use it to simulate a producer consumer problem.
6. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
7. Implement binary search tree.
8. Implement priority queue using heaps.
9. Implement hashing techniques.
10. Implement various sorting techniques as taught in class.
11. Implement Dijkstra's algorithm using priority queues.
12. Implement Prim's and Kruskal's algorithms.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE34L	Digital System Design Lab – I	2	1

List of Experiments

1. To do the following:
   A. To verify the truth table of following logic gates:
      a. AND OR and NOT
      b. NAND, NOR, XOR and XNOR
   B. Design of Basic NOT, OR, AND, NAND, NOR Gates using DDL, RTL, DTL, TTL, and CMOS integrated circuits. Study of Open Collector, Open Drain and Totem-Pole Logic Family Configurations.
2. To implement XOR and XNOR using universal logic gates.
   A. To verify De-Morgan's law using logic gates.
   B. To implement certain Boolean expressions and check their equality.
3. To design and realize:-
   A. Half adder and verify its truth table.
   B. Full adder and verify its truth table.
   C. Half Subtractor and verify its truth table
   D. Full Subtractor and verify its truth table.
4. To design a multiplexer/demultiplexer using two input NAND gates
5. To design a 4 bit binary to decimal converter.
6. Design and realize the following flip flops using logic gates.
   A. RS flip flop
   B. JK flip flop
   C. D flip flop
   D. T flip flop

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE33L	**Analog Electronic Circuits Lab – I**	2	1

List of Experiments

1) Introduction about basic equipments in Analog electronics lab.
2) Study of CRO & DSO - Measurement of Voltage, frequency and Phase of a given waveform.
3) Study of Function Generator and working with various signals and their attributes.
4) To study VI characteristics of a silicon rectifier Diode, Shottky barrier Diode, LED and Zener Diode using Multisim and Hardware Test bench.
5) Halfwave, Full-wave rectifier circuits and to study their performance using Multisim and Hardware Test bench.
6) To study clipping and clamping circuits on Multisim and Hardware Test bench.
7) To study voltage regulation using Zener diode.
8) Study V-I characteristics of transistor (PNP and NPN) and calculate the performance parameters of a transistor in CB and CE Configurations.
9) To assemble a CB amplifier with various biasing configurations and observe its performance.
10) To assemble a CE amplifier with various biasing configurations and observe its performance.
11) To design a practical amplifier using transistors with given specifications and parameters.
12) To Study V-I characteristics of JFET and MOSFET and determine their performance parameters.
13) To Study various FET and MOSFET configurations and their practical application circuits.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE32L	Network Analysis and Synthesis Lab	2	1

List of Experiments

1) Lissajous Patterns- Measurement of Voltage frequency and Phase of a different waveform.
2) To assemble LCR circuits and find time constant of each. Observe their performance in low pass and high pass mode.
3) For a given two port network measure:
   a. z parameters.
   b. y parameters.
   c. ABCD parameters.
   d. h parameters.
4) To experimentally determine the characteristic impedance and to plot the attenuation characteristics of the following circuits.
   a. Constant-k Low Pass Filter.
   b. Constant-k High Pass Filter.
   c. m-derived Low Pass Filter.
   d. m-derived High Pass Filter.

Course No.	Subject	Teaching Periods		Credits
		L	T	
ESCECE35	**Data Structures**	2	1	3

Section	Course contents	Hours
1	**Introduction:** Basic concept of data, structures and pointers	5
2	**Arrays:** Representation, implementation, polynomial representation. Limitations	4
3	**Strings:** Representation, String operations, Implementing String. h library functions	4
4	**Linked List:** Static and dynamic implementation. Single, double, circular, multiple linked lists	5
5	**Stacks:** Recursion and Stacks. Static and dynamic implementation. Expression evaluation. Infix, postfix expressions, multiple stacks	5
6	**Queues:** Static and dynamic implementation, circular queues, and implementation	4
7	**Hash Tables:** Hash tables implementation. Hashing techniques, single, double	4
8	**Storage Management:** Memory Management techniques, garbage collection	4
9	**Trees:** Binary trees, binary search trees, static and dynamic implementation. Tree operations, insert, delete, and search	6
10	**Heaps:** Brief introduction.	1
11	**Sorting and Searching:** Different sorting techniques. Insertion sort, selection sort, bubble sort, radix sort, quick sort, merge sort, heap sort.	6
12	**Graphs:** Representation of graphs, BFS, DFS sort. Graph Algorithms	4
TOTAL HOURS FOR THE COURSE		**52**

References

1. Data Structures by Rajni Jindal
2. Data Structures by Schaum's Series
3. Data Structures by Knuth
4. Data Structures by Farouzan
5. Data Structures using C and C++ by Langsam, A

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE34	**Digital System Design – I**	2	1	3

Section	Course contents	Hours
1.	Introduction to Digital Electronics, Digital Systems and Digital Logic. Advantages and Disadvantages of Digital Systems. Review of Digital Signals and their attributes. Review of Number systems, Radix conversion, Binary and Hexadecimal Arithmetic.9's, 10's, 1's & 2's complements and their usage, Binary codes (Weighted and non-Weighted), Error detecting and Correcting codes, Applications of various binary digital codes	8
2.	Introduction to Boolean Algebra, Theorems of Boolean algebra, Canonical forms, Representation of logical functions using Boolean Algebra, Truth Tables and Simplification using Boolean functions, Karnaugh map and Tabulation method	8
3.	Basic Logic Gates, Implementation of Boolean functions using various logic gates. Implementation of various Boolean functions using AND-OR-NOT, NAND-NAND, NOR- NOR, OR-AND-NOT and DEDICATED Gate logic	6
4.	**Digital Logic Families:** Introduction to bipolar Logic families: DDL, RTL, DTL, TTL, ECL and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family- Totem pole, Open collector outputs, TTL subfamilies, Comparison of different logic families on the basis of design parameters	10
5.	Multiplexers and De-multiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Multipliers, Parity Checker and Magnitude Comparator. Multiplexer and decoder logic. Implementation of various Boolean functions using multiplexer and decoder logic	10
6.	**Introduction to Sequential logic:** Flip-flops-SR,JK,D and T flip-flops- Level triggering and edge triggering, Counters-Asynchronous and synchronous Counters, Modulo counters.	10
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Anil K. Maini, "Digital Electronics", Wiley.
2. Malvino and Leach, "Digital principles and Applications" Tata Mc Graw Hill.
3. Jain R P, "Modern Digital Electronics", Tata Mc Graw-Hill, Third Edition,(2003)
4. Mano M. Morris, "Digital Design", Pearson Education, Third Edition,(2006)
5. Flecther, "An Engineering Approach to Digital Design", Prentice Hall of India, New Delhi.
6. Tocci Ronald J, "Digital Systems- Principles and Applications" Prentice Hall of India, New Delhi

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE33	**Analog Electronic Circuits - I**	2	1	3

Section	Course contents	Hours
1	***P-N Junction diode***: Brief review of structure and operation, current components in a p-n junction, Circuit models	6
2	Temperature dependence, Diode capacitances and switching times, rectifier circuits, voltage regulation, limiting circuits, level shifters, voltage multipliers	4
3	***BJT***: Brief review of structure and operation, IV characteristics, Equivalent circuit models, Ebers-Moll model, CE, CC and CB configurations, input and output characteristics, Biasing and bias stability, analysis of basic amplifier configurations	8
4	Low frequency h-parameter model, Analysis and design of transistor amplifiers using h-parameters. Millers theorem	4
5	High frequency hybrid-pi model, Analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, transistor as a switch	5
6	***FET***: Brief review of structure, operation and characteristics of JFET and MOSFET, Depletion and enhancement type MOSFETS, FET biasing	4
7	FET Small signal model, Common source, Common drain and Common gate amplifiers and their analysis. Low and High frequency response of FET amplifier	5
8	***Building Blocks of IC Amplifiers***: Current sources, current mirrors and current steering circuits, CE and CS amplifiers with current source loads	4
9	Cascode amplifier, folded cascode, double cascoding, Wilson current mirror, Wildar current source, Darlington pair	4
10	***Feedback Basics***: General feedback structure, impact of positive and negative feedback on circuit parameters, feedback topologies (series-shunt, series-series, shunt-series, shunt-shunt), Analysis of example circuits for each feedback topology, stability in feedback amplifiers	8
TOTAL HOURS FOR THE COURSE		**52**

References

1. Sedra A.S. and Smith K.C., Microelectronic Circuits, *Oxford University Press.*
2. Razavi B., Fundamentals of Microelectronics, *John Wiley & Sons.*
3. Boylestad R. and Nashelsky L., Electronic Devices and Circuits, *Prentice Hall*
4. J. Millman and C. Halkias, Integrated Electronics, *McGraw Hill Publications*
5. Neamen D. A., Microelectronics: Circuit Analysis and Design, *McGraw Hill Publications*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE32	**Network Analysis and Synthesis**	3	1	4

Section	Course contents	Hours
1	Charge and energy, capacitance, inductance and resistance parameters in the light of field and circuit concepts	3
2	Approximate realization of a physical system as a circuit. Reference directions for currents and voltages, conventions for magnetically coupled circuits, Circuit topology	4
3	First order differential equation: Differential equations as applied in solving networks. Application of initial conditions. Evaluating initial conditions in networks	6
4	Laplace Transformations. Wave form analysis and Synthesis; The unit step, ramp and impulse functions and Laplace transforms. Initial and final value theorem, Convolution integral, convolution as summation	6
5	Network theorems and impedance functions: Complex frequency, transformer impedance and transform circuits, series and parallel combination of elements	5
6	Network Functions – Poles and Zones: Ports of terminal pairs. Network functions for one port and two port network. Time domain behavior from poles zero plot	5
7	Two port parameters: Relationship between two-port parameters. Admittance, Impedance, transmission and hybrid parameters	6
8	Relationship between parameter sets. Parallel connection of two port Networks. Characteristic impedance of two port networks	5
9	Filters Filter fundamentals - pass & stop band, filter classification	5
10	Constant-k and m-derived Filters	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Network Analysis by Van Valkenberg
2. Network Analysis & Synthesis by F. Kuo
3. Network Analysis by G.K.Mittal

4th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCMTH41	Engineering Mathematics – IV	2	1	3

Section	Course contents	Hours
1.	Analytical Functions, C-R Equations	4
2.	Complex Integration	3
3.	Cauchy's Fundamental Theorem, Cauchy's Integral Theorem	3
4.	Cauchy's Inequality and Liouville's theorem on Integral Function	2
5.	Taylor's and Laurent's Expansions	3
6.	Zeroes and Poles of Analytic Functions	2
7.	Residues and Contour Integration	3
8.	Solution of Series	2
9.	Legendre's Functions, Rodrigues's Formula	3
10.	Generating Functions for Legendre's Polynomials and Recurrence Formulae	3
11.	Bessel's Functions	3
12.	Recurrence Formulae and Bessel's Functions of Integral Order.	3
13.	Continuous Wavelet Transform, Basic Properties of Wavelet Transform	3
14.	Discrete Wavelet Transform, Orthonormal Wavelets	3
15.	Multi Resolution Analysis	2
16.	Construction of Orthonormal Wavelets	2
17.	Daubchie's Wavelets and Algorithms	3
18.	Band limited wavelets, Balian low theorem	3
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Complex Variables & Applications by R. V. Churchill
2. Theory of Functions of Complex Variables by E. I. Copson

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE42	**Analog Electronic Circuits – II**	3	1	4

Section	Course Contents	Hours
1	***Differential Amplifiers*:** MOS and BJT differential pair, large signal analysis and small signal analysis of differential pairs, common mode rejection, DC offset, differential amplifiers with active loads	8
2	***Operational Amplifiers*:** Ideal Op Amp, differential and common mode signals, inverting and non-inverting configuration, open loop and closed loop gain, input and output resistance, Applications of Op Amp: integrator, differentiator, weighted summer, voltage follower, instrumentation amplifier, effect of bandwidth on circuit performance, large signal operation of Op Amps, ADC and DAC using Op Amps	8
3	***Sinusoidal Oscillators*:** Basic principle of sinusoidal oscillators, oscillation criterion, analysis of oscillator circuits using BJT, FET and Op-Amps (ring, LC, phase shift, Wein Bridge), brief discussion on crystal oscillators. Design of practical Oscillator circuits	8
4	***Waveform Shaping Circuits*:** *Bistable Multivibrators*: Feedback loop, transfer characteristics, triggering, Bistable circuit as a memory element, application as a comparator. *Astable Multivibrators*: Operation, generation of square and triangular waveforms. *Monostable Multivibrators:* Generation of a standardized pulse, 555 IC timer, Implementation of monostable bistable and astable multivibrator using 555 IC	8
5	***Output Stages and Power Amplifiers*:** Classification of output stages, Class A, Class B, Class AB and Class D output stages; circuit operation. Transfer characteristics, power conversion efficiency and power dissipation of each output stage. Power supplies and IC regulators	7
TOTAL HOURS FOR THE COURSE		**39**

References

1. Sedra A.S. and Smith K.C., Microelectronic Circuits, *Oxford University Press.*
2. Razavi B., Fundamentals of Microelectronics, *John Wiley & Sons.*
3. R. Gayakward, Operational Amplifiers, *Pearson Education*
4. Boylestad R. and Nashelsky L., Electronic Devices and Circuits, *Prentice Hall*
5. J. Millman and C. Halkias, Integrated Electronics, *McGraw Hill Publications*
6. Neamen D. A., Microelectronics: Circuit Analysis and Design, *McGraw Hill Publications*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE43	**Digital System Design – II**	2	1	3

Section	Course contents	Hours
1.	**Review to Sequential logic:** Flip flop and Timing circuit : set-reset latches, D-flip-flop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop. Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register.	8
2.	Introduction to state equations and state diagrams, design with state equation state diagram, mealy Sequential circuit design, Moore Sequential circuit design, Equivalent states and reduction of state tables, sequential circuit timing, Tri-state logic and buses.	7
3.	**Data-conversion circuits:** Digital –to-analogue converters, D/A converters specifications, Types of D/A converters, D/A converters application, Integrated circuits D/A, A/D converters, A/D converters specifications, Types of A/D converters, , Integrated circuits A/D converters, A/D converters applications.	6
4.	Memory organization, Classification, and characteristics of memories, Sequential memories, ROMs, R/W memories, Content Addressable memories, CCD memory, PLA, PAL and Gate Array, introduction to CPLD and FPGA.FPGA Architecture.	6
5.	**Introduction to VHDL:** Computer-aided design, Hardware Description Languages, VHDL description of combinational circuits, VHDL modules, VHDL models for multiplexers, Modeling combinational circuits using VHDL Processes, Variables, signals and constants, Arrays and loops in VHDL, VHDL data-types and operators, , VHDL libraries and Packages, IEEE Standard logic, Compilation, Simulation of VHDL Code.	10
6.	**VHDL for Sequential Logic:** Modeling Flip-flops using VHDL Processes, Modeling Registers and counters using VHDL Processes, Modeling a sequential machine, Synthesis of VHDL code, More about Processes and sequential statements.	8
7.	**VHDL for digital system design:** VHDL code for BCD to seven-segment decoder, VHDL code for BCD adder, VHDL code for serial adder, VHDL code for binary multiplier, VHDL code for 4x4 array multiplier, VHDL code for binary divider.	7
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Anil K. Maini, "Digital Electronics", Wiley
2. Charles H. Roth, "Digital System Design using VHDL", Thomson
3. Mano M. Morris, "Digital Design", Pearson Education, Third Edition,(2006)
4. Tocci Ronald J, "Digital Systems- Principles and Applications" Prentice Hall of India, New Delhi
5. Charles H. Roth, "Fundamentals of logic design", CENGAGE Learning

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE44	**Signals and Systems**	2	1	3

Section	Course contents	Hours
1	**Introduction to signals and Systems Representation:** Classification of signals and systems: Introduction to signals and systems, Continuous time and discrete time signals.	3
2	Classification of CT and DT signals -periodic and non-periodic, Even and Odd, Power and Energy, Invertible and Non-invertible, Deterministic and Random.	4
3	Elementary signals - exponential, sine, step, impulse and its properties, ramp, rectangular, sine, triangular, signum, Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration(Accumulator for DT), time scaling, time shifting and folding.	5
4	System viewed as interconnection of of operations, properties of systems, sampling theorem, graphical and analytical proof of band limited signals.	4
5	System: definition, classification – Linear and Non-Linear, Time Variant and Time Invariant, Causal and Non-causal, Stable and Unstable (BIBO stability), Static and Dynamic.	4
6	**Fourier Analysis:** Analysis of continuous time signals: Definition and necessity of CT and DT Fourier series and Fourier transforms.	4
7	Fourier series representation of continuous time and discrete time periodic signals - properties of continuous time and discrete time Fourier series.	4
8	Continuous Time Fourier Transform (CTFT), amplitude and phase spectra of CT signals, Properties of CTFT, convolution and multiplication property of CTFT, systems characterized by Linear Constant Coefficient Differential Equations, Limitations of FT and need of LT and ZT.	4
9	Laplace Transform – ROC, poles and zeros, Properties of Laplace Transform, inverse Laplace transform, relation between Laplace transform and Fourier transform.	3
10	**Analysis of Continuous time LTI Systems:** Laplace Transform: Linear time invariant –continuous time systems: Differential equation and Block diagram representation of LTI systems, Impulse response and properties of LTI systems.	3
11	Convolution integral, properties of convolution, frequency response, State variable equations and matrix representation of systems, Analysis and characterization of LTI systems using Fourier and Laplace transform.	3
12	Computation of impulse response, transfer function, causality and stability using Laplace Transform, Unilateral Laplace transform & its applications to solve differential equations.	5
13	**Analysis of Discrete Time Systems:** Introduction Z-Transform: Analysis of discrete time signals and systems: Sampling of CT signals and aliasing, DTFT and properties, Unilateral Z-Transform & its applications to LTI Systems described by difference equations.	5
	TOTAL HOURS FOR THECOURSE	**50**

References

1. Oppenheim A. V., Wilsky A. S. and Nawab S. H., Signals and Systems, *Pearson Education*
2. Haykin S. and Veen B. V., Signals and Systems, *John Wiley and Sons*
3. Roberts M. J., Signals and Systems: Analysis Using Transform Method and MATLAB, *Tata McGraw Hill*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE45	**Electromagnetic Fields and Waves**	2	1	3

Section	Course contents	Hours
1.	Review of Electric Field Coulombs law, Electric field due to a point charge, surface charge and volume charge, divergence and curl of E, Electric potential	6
2.	Review of Magnetic Field, Lorentz law, Biot-Savarts law, B due to line current, Surface current and volume current densities, Divergence and curl of B, Magnetic Potential	6
3.	Maxwell's Equations, Maxwell's equations in Electrostatics and magneto-statics, in medium, Maxwell's equation	6
4.	Potential functions, Boundary conditions	4
5.	Wave equation and its solution	4
6.	Electromagnetic Waves, Poynting Theorem	4
7.	Phase and group velocity	4
8.	Plane waves in lossless and lossy media,	4
9.	Wave propagation in Ferrites-Faraday Rotation and Bire frigerence.	4
10.	Normal and oblique incidence at plane conducting boundary	4
11.	Normal and oblique incidence at plane dielectric boundary	4
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Jordan E and Balman K: Electromagnetic Waves & Radiating Systems, PHI
2. David K. Cheng: Field and Wave Electromagnetics, Addison Wesley
3. Krauss: Electromagnetics, Mc Graw Hill.
4. Griffiths: Introduction to Electrodynamics, PHI

Course No.	Subject	Teaching Periods		Credits
		L	P	
ESCECE46	OOPS with Java	2	2	3

Section	Course Content	Hours
1.	**Introduction to Java** Definition, History of Java, The Internet and Java's Place of IT, Applications and Applets, Java Virtual Machine, Byte Code- Procedure Oriented vs. Object-Oriented Programming, Compiling and Running a Simple Program, Setting up your Computer for Java Environment, Writing a program, Compiling, Interpreting and Running the Program, Handling Common Errors.	4
2.	**Tokens, Expressions and Control Structures** Primitive Data Types,User Defined Data Types, Declarations, Constants, Identifiers, Literals, Type Conversion and Casting, Variables: Arrays of Primitive Data Types, Comment Syntax, Garbage Collection, Expressions, Using Operators: Using Control Statements	5
3.	**Object Oriented Programming Concepts** Fundamentals of Classes: A Simple Class, Creating Class Instances, Adding methods to a class, Calling Functions/Methods, Abstraction, Encapsulation, Using 'this' Keyword, Constructors, Default constructors, More on methods: Passing by Value,by Reference, Access Control, Methods that Return Values, Polymorphism and Method Overloading, Recursion; Nested and Inner Classes	8
4.	**Inheritance & Packaging** Inheritance: Using 'extends' keyword, Subclasses and Superclasses, 'super' keyword usage. Overriding Methods, Dynamic Method Dispatch; The Object class, Abstract and Final Classes, Package: Access Control; Interfaces: Defining an Interface, Implementing and applying interfaces.	4
5.	**Handling Error / Exceptions** Basic Exceptions, Proper use of exceptions, User defined Exceptions, Catching Exception: try, catch; Throwing and re-throwing: throw, throws; Cleaning up using the finally clause.	2
6.	**. Handling Strings** Creation, Concatenation and Conversion of a String, Changing Case, Character Extraction, String Comparison, Searching Strings, Modifying Strings, String Buffer.	2
7.	**Threads** Create/Instantiate/Start New Threads: Extending java.lang.Thread, Implementing java.lang.Runnable Interface; Understand Thread Execution, Thread Priorities, Synchronization, Inter-Thread Communication, Deadlock.	7
8.	**I/O and Streams**java.io package, Files and directories, Streams and Character Streams; Reading/Writing Console Input/Output, Reading and Writing files, The Serialization Interface, Serialization & Deserialization	2
9.	**Understanding Core Packages** Using java.lang Package: java.lang.Math, Wrapper classes and associated methods (Number, Double, Float; Integer, Byte; Short, Long; Character, Boolean); Using java.util package: Core classes (Vector, Stack, Dictionary, Hashtable, Enumerations, Random Number Generation).	3
10.	**Holding Collection of Data** Arrays And Collection Classes/Interfaces, Map/List/Set Implementations: Map Interface, List Interface, Set Interface, Collection Classes: Array List, Linked List,	3

11.	**Java Applications** About AWT & Swing, About JFrame (a top level window in Swing), Event Handling in Swing Applications, Layout Management using FlowLayout, Border Layout, Grid Layout, Using JPanel, Choice components like JCheck Box, JRadio Button, Borders components, JCombo Box & its events, JList& its events with MVC patterns,	8
12	**Introduction to Java Applets** Definition, Applet lifecycle methods, Build a simple applet, Using Applet Viewer, Adding Controls: Animation Concepts.	1
13	**Database Programming using JDBC** Using Connection, Statement & Result Set Interfaces for Manipulating Data with the Databases.	2

Books

1. The Java Tutorial: A Short Course on the Basics (The Java Series) 6th Edition by Raymond Gallardo , Scott Hommel, Sowmya Kannan, Joni Gordon, Sharon Biocca Zakh
2. Thinking in Java 4th Edition by Bruce Eckel
3. Java the Complete Reference latest edition Herbert Schildt
4. Head First Java by Kathy Sierra O'Reilly publication

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE42L	Analog Electronic Circuits Lab – II	2	1

List of Experiments

1) To assemble current series feedback amplifier and study its performance.
2) To assemble a voltage shunt feedback amplifier and study its performance.
3) To design RC phase shift oscillator using OPAMP/BJT.
4) To assemble a differential amplifier and obtain its CMRR.
5) To study different applications of OP AMPS.
    a. OP-AMP as voltage comparator
    b. OP-Amp as Zero Crossing Detector
    c. OP-AMP as an inverting amplifier.
    d. OP AMP as a non -inverting amplifier
    e. OP AMP as an integrator
    f. OP AMP as a differentiator
6) To measure the following parameters of a typical OP-AMP.
    a. I/P Impedance
    b. O/P Impedance
    c. Slew rate
    d. CMRR
7) Obtain frequency response of an OP-AMP & hence find its bandwidth.
8) Study performance of multivibrator circuits using 555 chip in following modes:
    a. Bistable
    b. Astable
    c. Monostable
    d. Use of 555 Chip as a timer circuit.
9) To assemble a Schmitt trigger Circuit and to obtain its characteristics and to use it as squaring circuit.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE43L	**Digital System Design Lab – II**	2	1

List of Experiments

Experiments on Design using VHDL and Implementation using Xilinx/Spartan Kits:
Combinational Design & Implementation Exercises:

1. Design and implementation of basic Gates: AND, OR, NOT.
2. Design and implementation of universal gates.
3. Design and implementation of 2:1 Mux using other basic gates.
4. Design and implementation of 2 to 4 Decoder.
5. Design and implementation of Half-Adder, Full Adder, Half Subtractor, Full Subtractor.
6. Design and implementation of 3:8 Decoder.
7. Design and implementation of 8:3 Priority Encoder.
8. Design and implementation of 4-Bit Binary to Grey code Converter.
9. Design and implementation of 4-Bit Binary to BCD Converter using sequential statement.
10. Design an 8-Bit parity generator (with for loop and Generic statements).
11. Design and implementation of 2's Complementary for 8-bit Binary number using Generate statements.

Sequential Design & Implementation Exercises:

12. Design and implementation of all type of Flip-Flops using (if-then-else) Sequential Constructs
13. Design and implementation of 8-Bit Shift Register with shift Right, shift Left, Load and Synchronous reset.
14. Design and implementation of Synchronous 8-bit Johnson Counter.
15. Design and implementation of counters (MOD3, MOD5, MOD8, MOD16).
16. Design and implementation of a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
17. Design and implementation of 3-line to 8-line decoder with address latch.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE44L	**Signals and Systems Lab**	2	1

List of Experiments

1. Introduction to:
    a. MATLAB
    b. Basic operations on matrices
    c. Logical operations and loops
    d. Function files etc
2. Generation of various signals and sequences
3. Operation on signals and sequences
4. Generation of even & odd components of a signal
5. Check different properties of given systems
6. Perform convolution of continuous time signals & discrete time sequences
7. Auto correlation and Cross correlation
8. Gibbs phenomenon
9. Fourier analysis of periodic signals using a) trigonometric Fourier series b) using exponential Fourier series
10. Plot magnitude and Phase response of a given system.
11. Inverse Fourier transform
12. Properties of Fourier transform (linearity, scaling, shifting, duality, differentiation etc)
13. Laplace transform and it's Inverse
14. Discrete time Fourier transform and it's Inverse
15. Z-transform and its Inverse

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE46L	EDA Tools Lab – II	2	1

Introduction to MATLAB

1. Introduction to MATLAB and its workspace.
2. Working with matrices: creation of 1d, 2d, 3d and nd matrices, acquisition of matrices, processing and operations on matrices.
3. Various plotting tools. Plotting vector and matrix data, Plot labeling, curve labeling and editing, 2D and 3D plot, surface, mesh and grid plotting.
4. Working with Complex numbers and their operations.
5. MATLAB Programming: Automating commands with scripts, writing programs with logic and flow control, Writing functions, Control statement Programming, Conditional Statement Programming, Examples.
6. M files: Working with script tools, Writing Script file, executing script files, The MATLAB Editor, Saving m files.
7. GUI Design: Introduction Of Graphical User Interface, GUI Function Property, GUI Component Design, GUI Container, Writing the code of GUI Callback, Dialog Box, Menu Designing, Applications.
8. MATLAB SIMULINK: Introduction of SIMULINK, SIMULINK Environment & Interface, Study of Library, Circuit Oriented Design, Equation Oriented Design, Model, Subsystem Design, Connect Call back to subsystem, Application.
9. Image Processing with MATLAB: Importing and Visualizing Images, Importing and displaying images, converting between image types, Exporting images, Interactive Exploration of Images.
10. Symbolic Math in MATLAB: Calculus-Numerical Integration, Linear Algebra, Roots of Polynomials, Algebraic equations, Differential Equations (1st & 2nd order), Transforms (Fourier, Laplace, etc), Ordinary Differential equations, Examples of few ODEs.

Introduction to PCB Design

1. Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA) tools and comparison, PCB Design Process, PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factor for digital and analog circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards. Design for manufacturability Design-specification standards.
2. Introduction to PCB Fabrication & Assembly, Steps involved in fabrication of PCB. PCB Fabrication techniques-single, double sided and multilayer, Etching: chemical principles and mechanisms, Post operations- stripping, black oxide coating and solder masking, PCB component assembly processes.
3. Using any Electronic design automation (EDA) software, Practice following PCB Design steps (Open source EDA Tool KiCad Preferable) Example circuit: Basic RC Circuit ,Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, NETLIST generation, Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB

5th Semester

Course No	Subject	Teaching Periods		Credits
		L	T	
PCCECE51	**Information Theory and Coding**	2	1	3

Section	Course Contents	Hours
1.	**Introduction to probability**, Bayes Theorem- concept of random variable- probability density and distribution functions, function of a random variable.	10
2.	Moments, Independence of a random variable. Introduction to random process and random sequences, concept of stationarity.	10
3.	**Channel Coding:** Mutual information and its properties, information rate, channel capacity, Shannon's Channel Coding Theorem, Discrete channels – Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Differential Entropy, Capacity of AWGN Channel.	10
4.	**Error Control Codes:** Repetition Coding, Linear Block Codes, Cyclic Codes, Syndrome Decoding, Convolutional Codes, Viterbi Decoding.	10
5.	**Recent Trends in Information and Coding Theory:** Codes for 5G/6G: LDPCCodes, Polar Codes; Information theory for machine learning; Quantum Information and computing.	10
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Elements of Information Theory by Thomas, Joy A., and Cover, Thomas M.; Wiley, 2012.
2. Digital Communication Systems by Haykin, Simon; United Kingdom, Wiley.
3. Digital Communications by Proakis, John G., and Salehi, Masoud United States; McGraw-Hill, 2008.
4. Information theory: coding theorems for discrete memoryless systems by Csiszar, Imre, and János Körner; Cambridge University Press, 2011.
5. Error control coding by Lin, Shu, and Daniel J.Costello; Pearson Education India, 2011.
6. Selected papers from IEEE Transactions on Information Theory and other reputed journals/conference papers related to Information Theory and Coding.

Credits

Course No	Subject	Teaching Periods		Credits
		L	T	
ESCECE52	**Digital Signal Processing**	2	1	3

Section	Course Contents	Hours
1.	Introduction to Digital Signal Processing, Limitations of analog signal processing, Advantages of digital signal processing and its applications	2
2.	Introduction to Digital Signal processors, types of Digital Signal Processors, Various practical DSP's, Digital Signal Processor Architecture, comparative study between a General-Purpose Processor and Digital Signal Processor	4
3.	Signal Processing: Review of elementary discrete time sequences and systems, convolution, correlation, LTI system, Concepts of stability, causality	3
4.	Difference Equations and its Solution	3
5	Review of Z transform (unilateral/bilateral) and properties, Application to difference equations	3
6.	Sampling of Continuous Time Signals: Sampling and aliasing problem, Reconstruction of a continuous time signal from its samples	3
7.	Discrete Time Processing of Continuous time signals and vice-versa. Decimation & Interpolation; changing the sampling rate	5
8.	Frequency Domain Representation of Discrete Time Signal and Systems. Review of DTFT Discrete Fourier Transform: DFT and its properties; Linear Periodic and Circular Convolution	7
9.	Linear Filtering using DFT, Filtering of long data sequences	2
10.	Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques; Linear filtering approaches to computation of DFT	5
11.	FIR and IIR systems, Basic Structures of Discrete Time Systems, Block Diagram representation of Linear Constant coefficient Difference equations, Signal flow graph, basic structures of IIR and FIR systems	5
12.	Design of Discrete time IIR filters from continuous time filters, Impulse Invariance, Bilinear Transformation, etc., Butterworth, Chebyshev filters	4
13.	Linear Phase FIR filters, Design of FIR filters by windowing (hamming, hanning, keiser etc.)	4
TOTAL HOURS FOR THE COURSE		**50**

References

1. A textbook of DSP Techniques by Steven W. Smith
2. Digital Signal Processing using John. G. Proakis and Dimitry G. Manolakis.
3. Digital Signal Processors, B. Venkataramani & M. Bhaskar, Tata McGrawHill

Course No.	Subject	Teaching Periods		Cr
		L	T	
PCCECE53	**Communication Systems – I**	3	1	4

Section	Course contents	Hours
1.	Review of basic signal and systems, Introduction to Communication System (Analog and Digital), Basic block diagram of communication system, Channel, modulation, need for modulation, properties of Fourier transform enabling modulation (Duality, frequency shifting)	8
2.	Analog modulation: Amplitude Modulation: AM, DSB/SC, SSB, VSB etc. Generation and detection, waveforms, mathematical expressions for performance parameters, Advantages/Disadvantages and Applications. Frequency division multiplexing, Time division multiplexing.	8
3.	Angle modulation: Phase modulation and Frequency modulation: FM (NBFM, WBFM): Generation (Direct and Indirect Methods) and detection (Phase and frequency Discrimination), waveforms, mathematical expressions for performance parameters, Advantages/Disadvantages and Applications. Carson's rule.	8
4.	AM & FM Receivers (Tuned Radio Frequency and Super Hetero-dyne), Image frequency, Image rejection ratio, selectivity, sensitivity, fidelity.	6
5.	Pre-emphasis and De-emphasis in FM Systems.	1
6.	Introduction to Noise, types of noise, Performance of AM & FM Systems in presence of noise.	3
7.	Sampling, over sampling, critical sampling and under sampling.	3
8.	Introduction to digital communication techniques, advantages disadvantages with respect to analog communication, applications.	2
9.	Pulse analog modulation (introduction and types), Pulse digital modulation, ASK, FSK, PSK, DPSK, QPSK, QAM, M-ary PSK, ASK, FSK: Generation, detection, waveforms, analysis, constellation diagrams.	8
10.	Probability of error, Calculation of error probability of ASK, BPSK, BFSK, QPSK	3
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Principles of Communication Systems by Taub & Schelling.
2. Electronic Communication Systems by G. Kennedy.
3. Communication systems by S. Haykins.
4. Principles of electronic communication systems LE Frenzel – 2007.
5. Advanced Electronic Communications Systems W. Tomasi

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE54	**Microprocessors**	2	1	3

Section	Course contents	Hours
1.	Microcomputer Structure and Operations: Basic Microcomputer Elements	3
2.	Typical Microcomputer Structure	2
3.	CPU, Memory System	3
4.	Input Output	3
5.	Microprocessors and Memory: Typical 8, 16- and 32-bit Microprocessors	5
6.	8085 Microprocessor Specification	2
7.	Memory Technologies	2
8.	Assembly Language Programming I: Programming Model of 8085, Registers, Fetch, Execute Operation of CPU, Instruction Set	6
9.	Assembly Language Programming II: Addressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow Control Using Looping and Branching	6
10.	Assembly Language Programming III: Stack, Subroutines, Interrupts, Resets	6
11.	Bus System: System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding	6
12.	Microprocessors Interfacing: Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access, The Serial Subsystems, Peripheral Interface, Analog Converter Subsystem	6
TOTAL HOURS FOR THE COURSE		**50**

References

1. Microprocessor Architecture, Programming & Applications by Ramesh Goankar
2. Microprocessor & Applications by Leventhal.
3. Microprocessors by Mathur.

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE55	**Control Systems**	2	1	3

Section	Course contents	Hours
1	Introduction to linear Control System: Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems	5
2	System Representations: transfer functions, block diagram representation, signal flow graphs	5
3	Time Domain Analysis of Control Systems: Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response), Steady state error analysis	8
4	Stability of Control Systems: Stability characteristic equation, stability of linear time invariant systems, Rough-Hurwitz Criterion	6
5	Frequency Domain Analysis of Control Systems: Frequency domain characteristics second order systems relative stability, Nyquist criterion, Bode Plot, Root locus plot	10
6	Proportional, Integral, Derivative Control (PID). Lag, lead and lag lead compensation	8
7	Introduction to Modern Control Theory: State Equations, State Transition Matrix, State transition equations, State Diagrams, concept of controllability and observability	8
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Modern Control Engineering by K.Ogatta
2. Automatic Control Systems by Benjamin C.Kuo

Course No.	Subject	Teaching Periods P	Credits
ESCECE52L	Digital Signal Processing Lab.	2	1

List of Experiments

1. Familiarization with DSP processor TMS 320 C 6713.
2. Write a program to generate a sine/triangular/square wave.
3. Write a program to generate a sine/triangular/square wave of variable. Amplitude and frequency.
4. Write a program to generate AM signal.
5. Write a program to generate an echo of an audio signal.
6. Write a program to perform convolution of two signals.
7. Write a program to perform DFT & IDFT of a signal.
8. Write a program to design a low pass audio digital filter.

Course No.	Subject	Teaching Periods P	Credits
PCCECE53L	Communication Systems Lab – I	2	1

List of Experiments

1. Generation and detection of amplitude modulated signals.
2. Generation and detection of frequency modulated signals.
3. To measure sensitivity, selectivity, and fidelity of a radio receiver.
4. To test a pulse code modulator.
5. Study different line Encoding Schemes.
6. Generation and detection of Digital Modulation techniques.
7. Noise Analysis of AM & FM.

Note: Lab kits are to be used for demonstration only, the practical shall be realized using discreet components where ever applicable.

Course No.	Subject	Teaching Periods P	Credits
PCCECE54L	**Microprocessors Lab**	2	1

List of Experiments

1.
i) To develop a program to add two double byte numbers.
ii) To develop a subroutine to add two floating point quantities.
2.
i) To develop program to multiply two single byte unsigned numbers, giving a 16-bit product
ii) To develop subroutine which will multiply two positive floating-point numbers.
3. To write program to evaluate P* Q*+R* & S are 8-bit binary numbers.
4. To write a program to divide a 4-byte number by another 4-byte number.
5. To write a program to divide an 8-bit number by another 8 bit number upto a fractional quotient of 16 bit.
6. Write a program for adding first N natural numbers and store the results in memory location X.
7. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
8. Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
9. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
10. Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a program by which the data stored in a RAM table is displayed.
11. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
12. To design and interface a circuit to convert digital data into analog signal using the 8255A in the memory mapped I/O.
13. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
14. To design a circuit to interface a memory chip with microprocessor with given memory map.

Course No.	Subject	Teaching Periods P	Credits
PCCECE55L	Control Systems Lab	2	1

List of Experiments

1. Study working of PID Trainer Kit/MATLAB for various controller configurations.
2. Use of SIMULINK for response study of inputs like:
   i. Step
   ii. Ramp

for systems of various orders: with and without feedback.

3. Write a MATLAB program to find:
   a. Step response of a first order system.
   b. Impulse response of first order system.
4. Write a MATLAB program to obtain impulse, step& ramp response of a second order system.
5. Write a MATLAB program to find rise-time, peak-time, maximum overshoot &settling time of second order systems.
6. Write a MATLAB program to find unit step response of second & higher order systems.
7. Write a MATLAB program to plot root locus of second & higher order system & hence comment on stability.
8. Write a MATLAB program to demonstrate effect of addition of poles & zeros to a transfer function.
9. Write a MATLAB program to obtain Bode plot of transfer function. Find gain margin & hence comment on stability.
10. Write a MATLAB program to determine Polar plot of a given transfer function.
11. Write a MATLAB program to draw NYQUIST plot of a second& higher order system.

Note: Lab kits may also be used where ever applicable.

Course No.	Subject	Teaching Periods P	Credits
PCCECE56L	EDA Tools Lab – III	2	1

PYTHON for Engineers

Section	Course Contents
1	**UNIT I** Introduction, Computational Modelling, Programming to support computational modelling ,Why Python for scientific computing, Optimisation strategies, Get it right first, then make it fast , Prototyping in Python, Literature Recorded video lectures on Python for Python prompt and Read-Eval-Print Loop (REPL) Integer division How to avoid integer Data Types and Data Structures Integers Long integers Floating Point numbers Complex numbers
2	**UNIT II** Sequence String, List, Tuples Indexing sequences, Slicing, Passing arguments to functions, Call by value Call by reference Argument passing in Python, Performance considerations, Inadvertent modification of data, Equality and Identity, Input and Output: Printing to standard output.
3	**UNIT III** Conditionals: If-then-else For loop While loop Relational operators (comparisons) in if and while Exceptions Raising Exceptions Creating our own exceptions LBYL vs EAFP Functions and modules Introduction Using functions Defining functions, Default values and optional parameters
4	**UNIT IV** SymPy: Numeric types Differentiation and Integration, Ordinary differential equations Series expansions and plotting Linear equations and matrix inversion Nonlinear equations Output: LATEX interface and pretty-printing Automatic generation of C code
5	**UNIT V** Numerical Computation, Numbers and numbers, Limitations of number types Using floating point numbers (carelessly) Using floating point numbers carefully Numerical Python (numpy): arrays Numpy introduction Arrays Convert from array to list or tuple Standard Linear Algebra Operations More numpy examples Numpy for Matlab users
6	**UNIT VI** Visualising Data Matplotlib (Pylab) Matplotlib and Pylab IPython's inline mode Histograms Visualising matrix dataVisual Python Basics, rotating and zooming Setting the frame rate for animations Tracking trajectories Connecting objects (Cylinders, springs)
7	**UNIT VII** Numerical Methods using Python (scipy) Overview SciPy Numerical integration Solving ordinary differential equations

Note: Implement using raspberry pi.

References

1. Python The Complete Reference by Martin C. Brown, Tata McGraw-Hill Education India
2. Python Crash Course by Eric Matthes published by O'Reilly
3. Python Cookbook: Recipes for Mastering Python 3 (3rd Edition) published by O'Reilly

6th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE61	Communication Systems – II	3	1	4

Section	Course contents	Hours
1.	Waveguides and Cavity Resonators, Transverse Electric and Transverse magnetic Waves	3
2.	Wave propagation through rectangular and circular waveguides, Power transmission and attenuation in waveguides	4
3.	Electromagnetic Resonators, Rectangular & Circular cavities	4
4.	Strip Lines: Propagation Constant, Characteristic impedance and attenuation characteristics of strip lines and micro-strips	4
5.	Propagation of Waves: Waves in free space, Attenuation, Absorption and polarization, effects of Environment	5
6.	Ground wave propagation, sky wave propagation, space wave propagation	5
7.	Troposcatter propagation and Extra-terrestrial propagation	3
8.	Radiation: Retarded Potential and Electromagnetic field, Radiation from a short current element	3
9.	Half wave dipole, Radiation Resistance, Effect of ground on radiating elements	3
10.	Antennas: Basic Antenna parameters, Radiation pattern, Directivity and Antenna Gain	3
11.	Bandwidth and beam-width, Polarization	3
12.	Folded dipole and applications. Antenna arrays	3
13.	Parabolic reflector, Properties and feed mechanism	2
14.	Horn Antenna, Loop Antenna	1
15.	Satellite Communication	4
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Liao, S. Y: Microwave Devices & Circuits, PHI
2. David Pozar: Microwave Engineering, John Wiley
3. Jordan, E and Balman, K: Electromagnetic Waves & Radiating Systems, PHI
4. Krauss, J.D: Antennas, Mc Graw Hill

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE62	Microcontrollers and Embedded Systems	2	1	3

Section	Course contents	Hours
1.	Introduction to embedded systems, Embedded System applications, Overview of Microcontrollers, choosing a Microcontroller for an embedded application	4
2.	8051 Microcontroller hardware, internal Architecture, input/output pin and port architecture	4
3.	Instruction Set of 8051, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction	4
4.	Addressing modes, accessing memory using various addressing modes with assembly code examples	2
5.	Single bit instructions and programming, I/O port programming: I/O programming, bit manipulation	3
6.	8051 programming in C, 8051 Hardware Connection and Hex File	4
7.	Timer and counter architecture in 8051, programming 8051 timers, counter programming, Examples of Timers and Counters using Assembly and C programming Language	4
10.	Interfacing LCD with 8051 using C programming Language	4
11.	Interfacing Keyboard using C programming Language	4
12.	Interfacing A/D & D/A converters with programming examples	4
13.	Interfacing 8051 with DC Motor, Relay, Stepper-motor, and Servomotor	8
14.	Intel Programmable peripheral interface (PPI)-8255, 8255 interfacing with 8051	2
TOTAL HOURS FOR THE COURSE		**50**

References

1. The 8051 Microcontrollers and Embedded Systems: Muhammed Ali Mazidi; Pubisher: Pearson Publication
2. The 8051Microcontrollers Architecture, Programming & Applications Kenneth J.AyalaPenram International Publishing
3. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing: Subrata Ghoshal Publisher: Cengage Learning Asia
4. Embedded Systems & Robots : Projects Using the 8051 Microcontroller: Subrata Ghoshal Publisher: Cengage Learning Asia.

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE63	Electrical Machines	2	1	3

Section	Course contents	Hours
1.	Transformers: Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response, polarity test	6
2.	Autotransformers, three- phase transformer connections, impedance matching	4
3.	Isolation & instrument transformers	3
4.	D.C. Machines: Operating principle, generator & motor action, construction, types of excitation, emf & torque equations, power stages & efficiency. Commutation & Armature Reaction	6
5.	Characteristics & application of d.c generators, starting & speed control of d.c motors	4
6.	Characteristics & applications of d.c motors	3
7.	Electric braking	1
8.	Induction Machines: Three-phase induction motors. Principle of operation, construction, types	3
9.	Rotating magnetic field, emf equation of an AC Machine, torque developed in an induction motor, equivalent circuit model, torque-speed characteristics, starting & speed control	6
10.	Single phase induction motors, starting, application	3
11.	Synchronous Machines: Construction, types & operating principle of synchronous generator, A.C armature windings, equivalent circuit, phasor diagrams, voltage regulation, parallel operation, synchronization, Power Angle characteristics, effect of field excitation change	6
12.	Synchronous Motor, principle, starting, hunting, damper windings	3
13.	Special Purpose Motors: Stepper Motor, Universal Motor, Shaded-pole Motor	4
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Electric Machinery by Fitzgerald
2. Electric Machinery by Nagrath

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE64	**Electronic Measurement & Instrumentation**	2	1	3

Section	Cour	Hours
1	Measurement System and Standards: Instrumentation system and its classification, Primary and secondary standards, Standards of various	6
2	Static and Dynamic response	2
3	Measurement Errors, and accuracy of an instrumentation system	3
4	Signal Generators and Analyzers: Function generators, RF Signal Generator, Sweep Generator, Frequency synthesizer, Wave Analyzers for Audio and radio frequency waves. Measurement of harmonic distortion. Spectrum analysis	4
5	**Mechanical and Electromechanical sensor** • Resistive (potentiometric type) • Strain gauge • Inductive sensor • LVDT • Proximity sensor	4
6	**Capacitive sensors:** Piezoelectric element force & stress sensing, ultrasonic sensors	4
7	**Thermal sensors:** Resistance change type (RTD, Thermistor), Thermocouple, Radiation sensors (Pyrometer)	4
8	**Optical sensors:** LDR, Photovoltaic cells, Photodiodes	3
9	Introduction to Smart Sensors	3
10	Definition, advantages and Importance of PLC, Evolution history of PLC, architecture and block diagram	5
11	PLC hardware Types of PLC, CPU unit architecture, Memory classification, Input/output devices and it's interfacing, Digital-Analog modules, Communication modules, Special function modules	12
	TOTAL HOURS FOR THE COURSE	5

References

1. Electronic Measurements by W. Cooper
2. Electrical & Electronic Measurements by A.K. Sawhney

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCECE65	**VLSI Design**	2	1	3

Section	Course contents	Hours
1	Review of MOSFET: Constructional & Operational features of MOSFET	3
2	I-V Equation, Second Order Effects	3
3	MOS Capacitor, C-V Characteristics	2
4	MOSFET Switch, Transmission gate	2
5	CMOS Inverter (Pull-up & Pull-down), Inverter Static Characteristics, Noise Margin	3
6	Switching characteristics of Inverter (Fall Time, Rise Time, Delay Time), Dynamic Characteristics, Power Dissipation	3
7	VLSI Technology: Wafer Processing, Oxidation, Epitaxy, Deposition, Ion- Implantation & Diffusion	4
8	The Silicon gate Process, n-well CMOS Process, p-well Process, Twin-Tub Process, Silicon On Insulator	4
9	CMOS Logic Design (Gates): CMOS Logic Gate Design (NAND & NOR Logic)	3
10	Switching Characteristics (Delay Time, Power, Fan-in, Fan-out), Transistor Sizing, The Compound Gates	4
11	CMOS Logic Structures: CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, C2MOS Logic, BiCMOS Logic, NP Domino Logic	5
12	Layout: Design Rules/Floor planning, Simple Layout Examples	5
13	CMOS Logic Design (Circuits): Multiplexers, MUX Implementation in CMOS & Transmission Gate	4
14	RAM Cell Implementation, Implementation of Flip-Flop, Register/Counters	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. CMOS VLSI Design: A Systems Perspective by N. Weste & K. Eshraghian
2. CMOS VLSI Design: A Circuits & Systems Perspective by N. Weste, D. Harris & A. Bannerjee
3. Digital Integrated Circuits: A Design Perspective by Rabaey

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE61L	**Communication Systems Lab – II**	2	1

List of Experiments

1. To measure and plot radiation pattern of different antennas yagi-uda, parabolic, path, horn, dipole and mono pole antenna.
2. To study and verify the communication using wave-guides.
3. To study and verify VSWR for a traveling wave.
2. To study Satellite Communication using trainer kit.

Course No.	Subject	Teaching Periods P	Credits
PCCECE621	Microcontrollers and Embedded Systems Lab	2	1

List of Experiments

1. Interface 8051 microcontroller with 8 LEDS and write a program to flash these LEDs.
2. Interface 8051 microcontroller with Eight Keys and write a program that will scan these Eight Keys and Display its Binary code on LEDs.
3. Interface 8051 microcontroller with an LCD and write a program to display a message on the first and 2nd line of LCD.
4. Interface 8051 microcontroller with a seven-segment display and display a message "1234" on the seven-segment display.
5. Write a program for energizing the Two DIP relays interfaced to 8051 microcontroller board.
6. Write a program to demonstrate Opto-isolated inputs on 8051 board.
7. Interface 8051 microcontroller with a stepper motor and write a program to move the motor first clockwise by 20 steps and then anticlockwise by 20 steps and test on the board.
8. Interface 8051 microcontroller with ADC chip and the display digital value on an LCD.
9. Write a program to demonstrate DAC by generating a RAMP signal.
10. Write a program to store data in the EEPROM (24C02) provided on the 8051 board for permanent storage of data.
11. Write a program to read data from the EEPROM (24C02) provided on the 8051 board for permanent storage of data.

Note: Programs for above experiments should be implemented both using Assembly and C programs instructions.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE64L	**Electronic Measurement & Instrumentation Lab**	2	1

List of Experiments

1. Obtain Characteristics of LVDT
2. Obtain Characteristics of Strain gauge
3. Obtain Characteristics of thermocouple
4. Obtain Characteristics of thermistor
5. Obtain Characteristics of RTD transducer
6. PLC programs based on the available kits in the Lab

Course No.	Subject	Teaching Periods P	Credits
PCCECE65L	VLSI Design Lab	2	1

List of Experiments

1. To find VI characteristics of a MOSFET.
2. To verify the operation of MOSFET as a Switch.
3. To verify the operation of MOSFET as a linear resistor.
4. To verify the Voltage transfer characteristics of CMOS Inverter.
5. To design and verify the operation of CMOS based basic(NOT,AND,OR) and universal gates(NAND, NOR).
6. To design and verify 2x1 multiplexer/ de-multiplexer using CMOS Logic.
7. To design and verify 2x1 multiplexer/ de-multiplexer using transmission gates.
8. To design and verify RAM Cell using CMOS cross coupled inverters.
9. To design/generate layout of CMOS based NOT, NAND and NOR gates.

Note: Simulators used may include ADS, Cadence, Mentor Graphics based on availability.

Course No.	Subject	Teaching Periods	Credits
		P	
PSIECE66	SEMINAR	2	1

DESCRIPTION:

The Technical Seminar shall be carried out as part of the 6th semester curriculum and is important for the partial fulfillment for the award of the Bachelors Degree in Engineering. The main objectives of conducting the seminar are:

1. To encourage the students to study advanced engineering developments
2. To prepare and present technical reports.
3. To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 15 to 20 minutes in front of the faculty committee for seminars and the students from the 6th semester (preferably from other semesters also). Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

7th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
ESCECE71	**Power Electronics**	2	1	3

Section	Course contents	Hours
1.	Review of power semiconductor switching devices, Diode, Thyristors, MOSFET, IGBT, Characteristics and applications	7
2.	Introduction to Turn-ON/Turn-OFF mechanism of switching devices, Gate-drive circuits, Switching-aid circuits, protection, Heat sink design	7
3.	Single phase rectifiers (uncontrolled, semi-controlled, controlled) with passive loads, Performance analysis, Applications	8
4.	Three-phase rectifiers (uncontrolled, semi-controlled, controlled) with passive loads, Performance analysis, Applications	7
5.	Single-phase inverter: principle of operation, single phase bridge inverter, voltage Control in inverters and harmonic reduction using PWM strategies, Applications	8
6.	Three-phase inverters: 180 degree conduction and 120 degree conduction, voltage Control in inverters and harmonic reduction using PWM strategies	8
7.	Introduction to DC-DC converters; buck ,boost and buck-boost converters, Applications	5
TOTAL HOURS FOR THE COURSE		**50**

References

1. Fundamental of Power Electronics: Robert Erickson, D.Maksimovic
2. Power Electronics, Circuits, Devices and Applications: Muhammad H. Rashid
3. Power Electronic, Devices, Applications, and Passive Components: Barry W. Williams
4. Power Electronics-converters, Applications, and Design: NedMohan, Tore.M.Undel and, William P. Robbins

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE72	**Data Communication**	2	1	3

Section	Course contents	Hours
1	***Introduction*** - Data Communications, The OSI Model, TCP/IP Protocol Suite	3
2	***(PHYSICAL LAYER and MEDIA)_Data and Signals*** - Analog And Digital, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance	5
3	***Digital Transmission*** - Digital-To-Digital Conversion, Analog-To-Digital Conversion, Transmission Modes	6
4	***Analog Transmission*** - Digital-To-Analog Conversion, Analog-To-Analog Conversion	6
5	***Bandwidth Utilization: Multiplexing and Spreading*** – Multiplexing, Spread Spectrum	4
6	***Transmission Media*** - Guided Media, Unguided Media	2
7	***(DATA LINK LAYER)_Error Detection and Correction*** – Introduction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum	5
8	***Data Link Control*** – Framing, Flow And Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point-To-Point Protocol	5
9	***Multiple Access*** – Random Access, Controlled Access, Channelization	5
10	***Wired LANs: Ethernet*** - IEEE Standards , Standard Ethernet , Changes In The Standard, Fast Ethernet, Gigabit Ethernet	2
11	***Wireless LANs*** - IEEE 802.11, Bluetooth	2
12	***Connecting LANs, Backbone Networks, and Virtual LANs*** - Connecting Devices, Backbone Networks, Virtual LANs	3
13	***Wireless WANs: Cellular Telephone and Satellite Networks*** - Cellular Telephony, Satellite Networks	2
TOTAL HOURS FOR THE COURSE		**50**

References

1. Data Communications and Networking by Behrouz A. Forouzan, Tata McGraw Hill
2. Computer Networks by Andrew S. Tanenbaum, Pearson Education
3. Data Communications and Computer Networks by W. Stallings

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCECE73	Microwave Engineering	3	1	4

S. No.	Course contents	Hours
1	Microwave Semiconductor Devices: Classification of Microwave Devices	2
2	Point Contact diode; Tunnel Diode	3
3	Gunn Diode, two valley structures, mode of operation, circuit realization	3
4	IMPATT Diode, circuit realization	2
5	PIN diode, basic principles of operation equivalent circuit, and application as switch, modulator and Phase shifter	4
6	Microwave Components: Microwave Hybrid Circuits: Waveguide tee: E-plane tee, H-plane tee, Magic tee, hybrid rings (rat-race circuits)	5
7	Directional Couplers, S-Matrix of direction Coupler. Circulators and isolators	4
8	Microwave Amplifiers & Oscillators : Microwave tubes: lead inductance and Inter electrode capacitive effects Transient angle effect, Gain bandwidth Limitation	3
9	Klystrons: Multi-cavity Klystron and Reflex Klystron	3
10	Gunn Oscillator, Magnetron oscillator	3
11.	Transmission Lines Transmission Line equations and solutions.	3
12.	Characteristic impedance and propagation constant	3
13.	Reflection and transmission coefficients, SWR	3
14.	Open and short circuit lines- their use as circuit elements at UHF	3
15.	Line impedance and admittance	2
16.	Smith Chart	2
17.	Impedance Matching	2
TOTAL HOURS FOR THE COURSE		**52**

References

1. Liao, S. Y, Microwave Devices & Circuits, PHI
2. David Pozar, Microwave Engineering, John Wiley
3. R E Collin: Foundations for Microwave Engineering, Mc Graw Hill
4. Skolnik: Introduction to Radar Engineering, Mc Graw Hill

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE74	**Computer Organization and Architecture**	2	1	3

Section	Course contents	Hours
1	Computer organization and architecture, Computer Level Hierarchy, Evolution of Computers, Von-Neumann Architecture, Structure and Components of Computers	6
2	Computer Functions, Instruction Execution and Instruction Cycle State Diagrams	4
3	Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings	4
4	Basic CPU equation. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Speedup, Amdahl's and Moore's Laws	4
5	Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes, CPU Register Organization	4
6	Computer arithmetic logic design, fast adders, multiplication, Booth's algorithm, fast multiplication, integer division, ALU– Fixed and Floating point ALU Organization, floating point arithmetic	6
7	Control Unit – Functional Requirements, Structure, Control Signals, hardwire and Micro-programmed Wilkes Control unit, Microinstructions and its formats, Control Memory	6
8	Introduction to Pipelining and Parallel Processing	2
9	Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion	2
10	Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence, Virtual memory– Overlays, Paging, Segmentation and Fragmentation	6
11	Input-Output organization– Peripheral devices, I/O modules, Input-output interface, Modes of transfer - Programmed I/O, Interrupt-driven I/O, Direct Memory access, I/O processor, Data Communication processor	6
TOTAL HOURS FOR THE COURSE		**50**

References

1. William Stalling: Computer organization and architecture, Latest Edition
2. John P. Hayes: Computer Architecture and Organization, Latest Edition
3. Computer Organization by Hamachar
4. Computer Organization & Architecture by M. M. Mao

Course No.	Subject	Teaching Periods	Credits
		P	
ESCECE71L	**Power Electronics Lab**	2	1

List of Experiments

1: To do the following:

(a) To obtain V-I Characteristics of an SCR.

(b) To obtain V-I Characteristics of a TRIAC.

2: To obtain the Static Emitter Characteristic sofa UJT.

3: To study the Line-synchronized UJT Relaxation Oscillator as a triggering agent for a thyristor and plot load voltage v/s firing angle.

4: To study various firing schemes of an SCR and draw the traces for various waveforms:

(a) Resistance Triggering Technique,

(b)R-C Triggering Technique,

(c)Linear Firing Scheme,

(d)Inverse Cosine Firing Scheme.

5: To study a Single-Phase Half-Wave Converter and plot Source voltage, Load voltage and load current for R and R-L loads.

6: To study a Single-Phase Semi-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-L and Motor Loads.

7: To study a Single-Phase Full-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-L and Motor Loads.

8: To study a Three-Phase Semi-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-Land Motor Loads.

9: To study a Three-Phase Full-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-Land Motor Loads.

10: To study a Single-Phase Dual Converter on Motor Load.

11: To study a DC-DC Buck Converter (Step-Down Chopper)for R, R-L and DC Motor Load and plot Load voltage Vs. Duty Ratio.

12: To study a Single-Phase Voltage Source Inverter on Rand R-L Loads.

13: To study a Three-Phase Voltage Source Inverter on R and R-L Loads.

14: To study a Single-Phase PWM Voltage Source Inverter on R and R-L Loads and plot Load voltage Vs. Modulation index.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE72L	**Data Communication Lab**	2	1

List of Experiments

1. Perform pulse coded modulation for analog to digital conversion. Analyze bandwidth requirement, data rate generation, synchronous and asynchronous mode of transmission.
2. Perform bandwidth utilization technique time division multiplexing.
3. Perform various line coding formats and compare transmission characteristic of each formats.
4. Perform digital carrier modulation techniques used in wireless communication.
5. Perform amplitude modulation and demodulation.
6. Perform serial data communication between two data terminal equipment using optical link.
7. Perform digital data transfer through RF transmitter and receiver.
8. Demonstration of different types of cables used in data communication.
9. Perform Installation of LAN and troubleshooting of frequently occurred problems.
10. Create and test wireless sensor networks.
11. To study various aspects of data communication by field visit at data center.
12. Perform data communication using IR.

Course No.	Subject	Teaching Periods	
		P	Credits
PCCECE73L	**Microwave Engineering Lab**	2	1

List of Experiments

1. Study of Microwave components and Instruments.
2. To plot and study the V-I characteristics of a Gunn diode.
3. Tuning of Gunn Oscillator.
4. To study the characteristics of Reflex Klystron.
5. Tuning of Klystron Oscillator.
6. To study the Characteristics of Detector.
7. To measure the Frequency using direct reading frequency meter and compare it with indirect frequency meter.
8. To study the properties of E- and H-plane waveguide tee junctions and to determine isolations, coupling coefficients and input VSWR.
9. Study of transmission lines concepts using trainer Kit.

Credits
1

Course No.	Subject	Teaching Periods	Credits
		P	
PSIECE76	**Project (Phase-I)**	2	1

DESCRIPTION:

The Project work shall be carried out by a group of students. The maximum number of students in a group can be four (4). In the project work, a student shall choose a specific topic/area for the project. The selected areas shall encompass recent and emerging trends in technologies that prove beneficial for society in general and humanity in particular. Supervisor/mentor will be assigned to each student in the beginning of the 7th semester of their course. The Project Phase-1 can encompass any of the following.

1. A full-fledged mini project that needs to be submitted in totality at the end of 7th semester. The deliverables include: The working prototype of the project, Project Report and PPT presentation.
2. A part of the major project (Project-phase-II).The Deliverables include the working modules of the project, the partial project completion Report and the PPT presentation.
3. A Part of the major Research based project (Project-phase-II).The deliverables include partial Project completion report containing (Problem Definition, Literature Survey, Design methodology and Simulations), the working modules (H/W or S/W) and PPT presentation.

METHOD OF EVALUATION:

The Project Phase-I will be Evaluated at the end of the 7th Semester. The students need to present themselves before an examination committee (Internal + External) with the working modules of the project.

In case of the students who have developed a full-fledged mini project. The evaluation will be final.

In case of the students who have developed project as part of the Major project will be evaluated for the 7th semester. In Case the examination committee is not satisfied with the work of the team, they will have full authority to cancel the project for further development in the 8th semester.

The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Internal project guides and Project Faculty Incharge.

8th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE81	**Wireless Communication**	2	1	3

Section	Course contents	Hours
1	**Introduction to Cellular Mobile Systems:** A basic cellular system, performance criteria, Uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, Analog & digital cellular systems.	4
2	**Elements of Cellular Radio Systems Design:** General description of the problem, Concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omnidirectional antenna system, cell splitting, consideration of the components of cellular systems.	7
3	**Cell Coverage for Signal & Traffic:** General introduction, obtaining the mobile point to point mode, Radio propagation characteristics: models for path loss, shadowing and multipath fading Propagation over water or flat open area, foliage loss, propagation nearin distance, long distance propagation, point to point prediction model characteristics, cellsite, antenna heights and signal coverage cells, mobile to mobile propagation.	7
4	**Cell Site Antennas and Mobile Antennas:** Characteristics of antennas, antenna at cell site, mobile antennas, LOS antennas, TDD, FDD.	5
5	**Frequency Management, Channel Assignment and handoff:** Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, handoff, types of hand off and their characteristics, hand off analysis, dropped call rates & their evaluation.	7
6	**Multiple access techniques used in mobile wireless communications:** FDMA/TDMA, CDMA. FDM / TDM Cellular systems, Cellular CDMA, comparison of FDM / TDM systems and Cellular CDMA.	7
7	Capacity, soft capacity, erlang capacity and their usage.	3
8	**Global System for Mobile Communication (GSM) system overview:** GSM Architecture, Mobility management, Network signaling, Frequency allocation and control, Base System and Master System, GSM, DCS1800, Various value added services.	8
9	Introduction to GPRS, EDGE, UMTS, HSPDA, HSUPA, LTE.	4
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Wireless Communication; Principles and Practice; T. S. Rappaport
2. Principles of Mobile Communication, G. L Stuber Kluwer Academic.
3. Wireless and Digital Communications; Dr. Kamil o Feher (PHI)
4. Mobile Communication HandBook; IEEE Press
5. Mobile Communication Engineering– Theory & Applications; TMH

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE82	**Computer Network & Security**	2	1	3

Section	Course Contents	Hours
1	Introduction- Networks, The Internet, Protocols And Standards	4
2	Network Models - Layered Tasks, The OSI Model, Layers In The OSI Model, TCP/IP Protocol Suite, Addressing	4
3	Switching - Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Structure of a Switch	3
4	Using Telephone and Cable Networks for Data Transmission	3
5	NETWORK LAYER, Logical Addressing	5
6	Network Layer: Internet Protocol - Internetworking: Need for Network Layer, Internet as a Datagram Network, Internet as a Connectionless Network, IPv4, Datagram, Fragmentation, Checksum, Options, IPv6, Advantages, Packet Format, Extension Headers , Transition From IPv4 to IPv6:Dual Stack, Tunneling, Header Translation	6
7	Network Layer: Address Mapping, Error Reporting, and Multicasting - Address Mapping: Mapping Logical to Physical Address: ARP, Mapping Physical to Logical Address: RARP, BOOTP, and DHCP, ICMP, IGMP, ICMPv6	6
8	Network Layer: Delivery, Forwarding, and Routing – Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols	6
9	(TRANSPORT LAYER)_Process-to-Process Delivery: UDP, TCP, and SCTP - Process-To-Process Delivery, User Datagram Protocol (UDP): Well-Known Ports for UDP, User Datagram, Checksum, UDP Operation, Use of UDP, TCP: TCP Services, TCP Features, Segment, A TCP Connection, Flow Control, Error Control, Congestion Control, SCTP: SCTP Services, SCTP Features, Packet Format, An SCTP Association, Flow Control, Error Control, Congestion Control	3
10	(APPLICATION LAYER)_Domain Name System - Name Space, Domain Name Space, Distribution Of Name Space, DNS In The Internet, Resolution, DNS Messages, Types of Records, Registrars, Dynamic Domain Name System (DDNS), Encapsulation	2
11	Introduction: Need of security, Security attacks, services and mechanisms, Network security model	4
12	Network Security: Firewalls, IP Security, Virtual Private Networks and Intrusion Detection, Web Security-SSL and TLS	4
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Data Communications and Networking by Behrouz A. Forouzan, Tata McGraw Hill
2. Computer Networks by Andrew S. Tanenbaum, Pearson Education
3. Data Communications and Computer Networks by W. Stallings
4. Cryptography and Network Security by Forouzan, PHI 4.

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCECE83	**Organization of Engineering Systems & HR Management**	2	1	3

Section	Course contents	Hours
1	Introduction to the subject and the course	1
2	**Module A: Basics of organizations and human resources management** Understanding organizations: nature and functions, Concerns of organizing engineering business and systems, Structure and process issues in running organizations, Design issues in running organizations, Operating organizations	12
3	**Module B: Effectiveness and performance** Cybernetics and systems framework, Socio-technical systems, Dealing with efficiency and excellence, Man-machine relationship, Longitudinal Thinking	12
4	**Module C: Human elements of functioning organizations** Concerns of recruitment, selection, skill formation and redeployment, Developing teams and leadership, Understanding motivation, Elements of human resources planning, Indian Industrial Law and managing industrial relations	13
TOTAL HOURS FOR THE COURSE		**38**

References

1. Beer, Stafford(1975) *The Heart of Enterprise*, Preguin Press, London
2. Coulson-Thomas Colin,((1997) *The Future of Organisation: Achieving Excellence through Business Transformation* .Kogen Page
3. Constantin Virgil Negoita (1992). *Cybernetics and Applied Systems*, CRS Press, USA
4. Dimitris N. Chorafas (2011). *Business, Marketing, and Management Principles for IT and Engineering*, Taylor and Francis,USA
5. Gautam Vinayshil(1988) Comparative Manpower Planning Practices-Select Indian Experiences, National Publishing House, New Delhi

Course No.	Subject	Teaching Periods P	Credits
PCCECE81L	Wireless Communication Lab	2	1

List of Experiments

1. Study of Dual SIM Phone.
2. Study of GSM.
3. Study of 3G.
4. Study of CDMA.
5. Study of Bluetooth

Note: Simulators used include following, where ever applicable OPNET, NS2, NS3.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE82L	**Computer Network & Security Lab**	2	1

List of Experiments

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Install and Configure Wired and Wireless NIC and transfer files between systems in LAN and Wireless LAN.
3. Install and configure Network Devices: HUB, Switch and Routers.
4. Connect the computers in Local Area Network.
5. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).
6. Establish Peer to Peer network connection using two systems using Switch and Router in a LAN.
7. Configure Internet connection and use IPCONFIG,PING / Tracer and Net stat utilities to debug the network issues.
8. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
9. Study of basic network command and Network configuration commands.
10. Configure Network topologies using packet tracer software.
11. Demonstrate firewalls and Intrusion Detection System (IDS)

Course No.	Subject	Teaching Periods P	Credits
PSIECE84	**Project (Phase-II)**	8	4

DESCRIPTION:

The Project work shall be carried out by a group of students .The maximum number of students in a group can be four (4). In the project work student shall choose a specific topic/area for the project. The selected areas shall encompass recent and emerging trends in technologies that prove beneficial for society in general and humanity in particular. Supervisor/mentor will be assigned to each student in the beginning of the 8th semester of their course. The Project Phase-II can encompass any of the following.

1. A fresh project to be chosen after the evaluation of 7th semester minor project is over .The deliverables include The working prototype of the project, Project Report and PPT presentation to be submitted at the end of the 8th semester.
2. The Remaining part of the 8th semester project (Project-phase-II), that the students had chosen as full project at the seventh semester level. The students must have completed a part of it, duly evaluated by the examination committee at the 7th semester level. The uptake of the project is subjected to the condition that the evaluation committee gives a nod for further uptake of the project. The deliverables include The working prototype of the project, Project Report and PPT presentation to be submitted at the end of the 8th semester.

3. The Remaining Part of the major Research based project (Project-phase-II) that the students had chosen as full project at the seventh semester level. The students must have completed a part of it, (as described in the project-Phase-I plan), duly evaluated by the examination committee at the 7th semester level. The uptake of the project is subjected to the condition that the evaluation committee gives a nod for further uptake of the project. The deliverables include: The working prototype of the project, Project Report and PPT presentation to be submitted at the end of the 8th semester.

METHOD OF EVALUATION:

The Project Phase-II will be evaluated at the end of the 8th Semester. The students need to present themselves before an examination committee (Internal + External) with the working prototype/Software of the project, The Thesis report and the power point presentation of the project.

The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Internal project guides and Project Faculty in-charge.

Course No.	Subject	Teaching Periods	Credits
		P	
PSIECE85	**Professional Viva**	0	1

DESCRIPTION:

A viva voce is an oral test, which literally translated means 'with the living voice'. It's a focused discussion giving you the opportunity to defend your Professional and Technical Abilities in front of a panel of academic experts. The Technical abilities include the core concepts and the skills gained by the student during the process of the four (4) Years of the Degree. While students need to be sure that this isn't a memory test, it is still important to gain a good understanding of the knowledge about your field of study. The professional abilities include the way a student presents himself in-front of an interview panel.

METHOD OF EVALUATION:

The Professional Viva is conducted at the end of the 8th Semester. The students need to present themselves before an examination committee (Internal + External) with professional/Formal attire.
The evaluation committee evaluates the students on the basis of subjective knowledge and soft skills.
The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Internal project guides and Faculty in-charge.

Course No.	Subject	Teaching Periods P	Credits
PSIECE86	**Industrial Internship**	0	1

DESCRIPTION:

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical/ managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.

The Framework for Internship is as per AICTE Guidelines.

Schedule	Duration	Activities
During Vacation after 3rd Semester	4-6 weeks	Industrial/Govt./NGO/ MSME/ Rural Internship/ Innovation/ Entrepreneurship/ Private Enterprise/ Skill development Inst.
During Vacation after 5th Semester	4-6 weeks	Industrial/Govt./NGO/ MSME/ Rural Internship/ Innovation/ Entrepreneurship/ Private Enterprise/ Skill development Inst.
During Vacation after 7th Semester	4-6 weeks	Industrial/Govt./NGO/ MSME/ Rural Internship/ Innovation/ Entrepreneurship/ Private Enterprise/ Skill development Inst.

EVALUATION:

The student can go for more than one internship/ Skill development course in his/her curriculum. But for the necessary evaluation, the student needs to submit one of his/ her best Internship reports and certificates to the college. The evaluation will be done through Seminar Presentation/ Viva-Voce.

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department on the basis of:

1. Quality of content presented
2. Proper planning for presentation.
3. Effectiveness of presentation.
4. Depth of knowledge and skills.
5. Attendance record, daily diary.

The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Senior Faculty and T&P Faculty Incharge.

Professional Elective Courses -I

PEC1ECE601E

SOLID-STATE DEVICES

UNIT I:

Crystal Structure: Fundamental concepts, Closed packed structures, Crystal systems, Crystallographic planes and directions, Miller indices, Point defects. Free electron Theory, classification of solids into conductors, Semiconductors and insulators, Effective mass.

UNIT II:

Dielectric Properties: Dielectric materials, Polarization mechanisms, Dipole moment, Dielectric strength, Methods for producing polarization, Application of dielectric materials. Magnetic Properties: Basic concepts, Soft and hard magnetic materials, Ferrites Selection techniques for applications, Magnetic recording, Magnetic memories. Optical Properties: Index of refraction, Damping constant, characteristic penetration depth and absorbance, Reflectivity and transmissivity, Atomic theory of the optical properties, Optical storage devices.

UNIT III:

Device Materials: Materials for resistors, capacitors and inductors. Superconductivity: Properties of superconductors, Applications of superconductors. Semiconductor Materials: Intrinsic and extrinsic materials, Electron and hole concentration sate equilibrium, Temperature dependence of carrier concentrations, Conductivity and mobility.

UNIT IV:

Effect of temperature and doping on mobility, Direct and indirect recombination of electron and holes, Diffusion and drift of carriers, Diffusion length, Contact potential. Hall Effect and its Applications. Si, Ge, GaAs and other binary semiconductors.

References

1. HummelRE,"ElectronicPropertiesofMaterials",NarosaPublishingHouse.
2. William D Callister, Jr "Materials Science and Engineering", John Wiley and Sons, Inc.
3. Dekker A J "Solid State Physics", Mac Milan, India Limited, Madras.
4. Pillai S O "Solid State Physics", New Age International Publishers.
5. VanVlack L H "Elements of Material Science and Engineering", Addison Wesley Publishers
6. Streetman BG and Banerjee S "Solid State Electron Devices", Prentice Hall of India.

PEC1ECE602E

ADVANCED EMBEDDED SYSTEMS PROTOTYPING

UNIT I

Introduction to open source embedded systems: Components of embedded system. Advantages and applications of embedded systems. Examples of real time embedded systems and how they are manufactured industry ready. Different Microcontroller Architectures (CISC, RISC, ARISC). Internal Resources & Hardware Chips in Details. History of AVR Microcontrollers and Features. Memory Architectures (RAM/ROM).

UNIT II

Learning Arduino Platform: Introduction to ARDUINO, ARDUINO History and Family. ARDUINO flavours, ARDUINO Architecture, Basic ARDUINO KIT Circuits, Programming in Embedded-C, Concepts of C language. Installing the Integrated Development Environment (IDE)-Setting up the Arduino Board-Using the Integrated Development Environment (IDE) to prepare an Arduino Sketch-Uploading and Running the Blink Sketch.

UNIT III

Serial Communications: Introduction to Serial communications, Synchronous and asynchronous Serial communication, UART and Serial Teletypes and standards. Different types of protocol converter IC's used in serial communication interfaces. Anatomy of PC and microcontroller based Serial communications.

UNIT IV

Digital and Analog Input/Output: Introduction to digital inputs and outputs, Types of Digital Inputs and outputs, Introduction to Digital Sensors ,signal conditioning the outputs of sensors for digital input operation, Voltage and Current Specifications of Digital outputs, Signal conditioning of Digital outputs. Types of Switches and their interfacing with microcontrollers, Introduction to AD and DA converters, inbuilt AD, DA converters in microcontrollers. Introduction to PWM and inertial Loads.

References

1. Arduino Cookbook by Michael Margolis. Orielly Media Publications
2. Exploring Arduino: Tools & Techniques by Jeremy Blum. Wiley Publications

PEC1ECE603E

ADVANCED MICROPROCESSORS

UNIT I

Introduction to 8086 Microprocessor Architecture, features and signals.

UNIT II

80286- A Mircroprocessor with Memory Management & Protection. Salient features of 80286, Internal architecture of 80286, Signal descriptions of 80286, Real addressing mode, Protected virtual address mode, Privilege, Protection, Special operation, 80286 Bus interface, Basic Bus operation, Fetch cycles of 80286, 80286 Minimum system configuration, Interfacing memory and I/O devices with 80286, Priority of bus use by 80286, Bus Hold and HLDA sequence, Interrupt acknowledge sequence, Instruction set features.

UNIT III

80386, 80486 – THE 32 Bit Processor: Salient feature of 80386, Architecture and signal description of 80386, Register organization of 80386, Addressing modes, Coprocessor 80387.

UNIT IV

An Introduction to the Pentium Microprocessor.

UNIT V

Interfacing and Programmable Devices for 8086 Based systems, Interfacing of Co-Processor, Switches, LED's, Analog to Digital Converter, Digital To Analog Convertor, DC and Stepper Motor, Seven segment and LCD display with 8086.

References

1. A. K. Ray & K. M. Bhurchandi- Advanced Microprocessor and Peripherals- Tata Mcgraw Hill.
2. B. P. Singh – Advanced Microprocessor and Microcontrollers- New Age International.
3. Brey, Barry B – Intel Microprocessor.
4. D. V. Hall – Micro process Interfacing.
5. "An Introduction to the Intel Family of Microprocessor," by J. L. Antonacos.

PEC1ECE604E

POWER SYSTEMS

UNIT I

DC and AC Distribution System: Introduction to a power system (an overall view), distribution systems Feeder, distribution, service. Mains classification, connection schemes, various types of DC and AC distributors, voltage drop calculations.

UNIT II

Overhead AC Transmission lines: Line Parameters, Types of conductors. Aluminum Core Steel Reinforced (ACSR) etc. Stranding, bundling of conductors. Resistance calculations, skin effect, proximity effect, Inductance and capacitance and capacitance of single Phase, 3 phase, single circuit and double circuit lines.

UNIT III

Representations and performance of short medium and long lines, ABCD constants, Surge impedance, Feranti effect, Power flow through a transmission lines.

UNIT IV

Insulators for overhead lines: Materials for insulators, types of insulators, potential distribution over a string of suspension insulators, methods for equalizing the potential Interference of power lines with communication circuits.

UNIT V

Electrostatic and electromagnetic effect. Corona: Visual and critical disruptive voltage, conditions effecting corona, former loss due to corona, Practical consideration, Mechanical design of transmission lines. Sag and tension calculations.

References

1. Elements of Power System Analysis by W. D. Stevenson
2. Transmission & Distribution of Electrical Energy by H. Cotton & Barber
3. Power System Engg. by Nagrath & Kothari
4. Electrical Power Systems by C. L. Wadwa

PEC1ECE605E

SYSTEM DESIGN

UNIT I

Introduction: Understanding a system, Components of a system: inputs, internal processes, outputs, feedback, assessment and evaluation, learning, Ways of Thinking: Logical Thinking, Causal Thinking, Reductionist Thinking, Holistic Thinking.

UNIT II

Interconnect: The Wire, Interconnect Parameter: Capacitance, Resistance, and Inductance, Electrical Wire Models, SPICE Wire Models, Signal Integrity and High Speed Behavior Of Interconnects: Ringing, Cross Talk and Ground Bounce.

UNIT III

System Hardware decomposition: Data Path And Control Path, Register Transfer Level Description, Control Flow And Data Flow Pipelines with special reference to digital filters, Communication Between Subsystems, Dead Lock and Live Lock problems.

UNIT IV

Subsystem design: HDL based design flow for system design, Introduction to Verilog: various components of Verilog code, Design of combinational circuits, sequential circuits, barrel shifter register, multi-bit adders, multipliers.

UNIT V

MPSoC as System Design Paradigm: Introduction to MPSoC, Need for MPSoC Architectures, Interconnection requirements of sophisticated systems, Network-on-Chip as a interconnection solution, Problems of traditional interconnection techniques, Arbiter for NoC.

References

1) Rabaey Jan M., Chandrakasan Anantha and Borivoje Nikolic, "Digital Integrated Circuits (Design Perspective)", Prentice Hall of India, 2nd Ed., 2003.
2) Laung-Terng Wang, Cheng-Wen Wu and Xiaoqing Wen,"VLSI Test principles And Architectures Design For Testability", Morgan Kaufmann Publishers, 1st Ed., 2006.

PEC1ECE606E

MATHEMATICS FOR MACHINE LEARNING

UNIT I

Linear Algebra: Vectors, Modulus & inner product, Cosine & Dot product of vectors, Projection, Basis, changing basis, vector space, and linear independence of a set of vectors, Applications of changing basis, Linear dependency of a set of vectors, Matrices, vectors, and solving simultaneous equation problems, Types of matrix transformation, Composition or combination of matrix transformations, Gaussian elimination, Inverse matrix, Determinants and inverse, Identifying special matrices, eigenvalues and eigenvectors, Calculating eigenvectors, Visualising Matrices and Eigen

UNIT II

Multivariate Calculus: Functions, Definition of a derivative, Differentiation examples & special cases, Product rule, Chain rule, Matching functions visually, Matching the graph of a function to the graph of its derivative, Let's differentiate some functions, Practicing the product rule, Practicing the chain rule, Differentiate with respect to anything, The Jacobian, Jacobian applied, The Sandpit, The Hessian, Practicing partial differentiation, Calculating the Jacobian, Bigger Jacobians, Calculating Hessians, Multivariate chain rule, Simple neural networks, Training Neural Networks, Building approximate functions, Power series, Power series derivation, Power series details, Linearisation, Multivariate Taylor

UNIT III

Statistics: Exploring one-variable quantitative data: Displaying and describing, exploring one-variable quantitative data: Summary statistics, exploring one-variable quantitative data: Percentiles, z-scores, and the normal distribution, exploring two-variable quantitative data, collecting data

UNIT IV

Probability: Introduction to Probability, Conditional probability and independent events, Visualization of conditional probabilities and Independence, Bayes's rule, Probability distribution, Binomial distribution, Variance of random variable. Discrete random variables with infinite number of values, Geometric and Poisson distributions, Systems of random variables; properties of expectation and variance, covariance and correlation, Linear transformations of random variables, Probability density function (PDF), Cumulative distribution function (CDF), Properties of CDF, Linking PDF and CDF, Histogram as approximation to a graph of PDF.

References

1. Bayesian Statistics the Fun Way: Understanding Statistics and Probability by Will Kurt published by O'Reilly
2. Think Stats by Allen Downey published by O'Reilly
3. Think Bayes: Bayesian Statistics in Python by Allen Downey published by O'Reilly
4. *Mathematics for Machine Learning* by. Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong. published by Cambridge University Press
5. Linear Algebra and Learning from Data, by Gilbert Strang Wellesley Publishers
6. Highlights of Calculus, by Gilbert Strang Wellesley Publishers2nd Edition

PEC1ECE607E

OPERATIONS RESEARCH

UNIT I
Introduction to OR Modelling Approaches & various Real-life Situations, Linear Programming Problems (LPP), Basic L L P 's Applications, Various Components of LPP formulation, Solving LPP.

UNIT II
Simultaneous Equations and Graphical Methods, Simplex Method, Duality Theory, Big-M Method, Transportation problems & Assignments Problems.

UNIT III
Network Analysis: Shortest Path, Dijkstra Algorithm, Floyd Algorithms, Maximal Flow Problem ((Ford-Fulkerson), PERT- CPM.

UNIT IV
Queuing Theory: Introduction, Basic Definitions & Notations, Axiomatic Derivation of the Arrival & Departure (Poisson Queue), Poisson Queue Models: M/M/1: ∞/FIFO, M/M/1: N/ FIFO.

References

1. H.A. Taha, "Operations Research", Macmillan Publishing Company.
2. Hadley G., "Linear Programming", Narosa Publishers.
3. Mital, "Optimization Methods", New Age International.
4. Rao, "Engineering Optimization", New Age International.

Professional Elective Courses - II

PEC2ECE701E

INTRODUCTION TO MACHINE LEARNING

UNIT I
Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation. Linear Regression, Multiple Variable Linear Regression, Logistic Regression, Naive Bayes Classifiers, k-NN Classification

UNIT II
Neurons and biological motivation. Linear threshold units. Perceptron's: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

UNIT III
Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators. Kernels for learning non-linear functions. Decision Trees, Random Forest, Using committees of multiple hypotheses. Bagging, boosting, and Active learning with ensembles.

UNIT IV
Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies. Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

UNIT V
Learning from unclassified data. Clustering. Hierarchical Clustering. k-means clustering. Dimensionality reduction (PCA), Expectation maximization algorithm (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled.

UNIT VI
Feature engineering Model selection and tuning Model performance measures K fold cross-validation, Regularising Linear models ML pipeline Bootstrap sampling Grid search Cross Validation,

References

1. Introduction to Machine Learning with Python by Andreas C. Muller & Sarah Guido O'Reilly
2. Hands on Machine Learning with Scikit-Learn and Tensor Flow by Aurélien Géron O'Reilly
3. Python Machine Learning for Beginners: Handbook for Machine Learning, Deep Learning and Neural Networks Using Python, Scikit-Learn and TensorFlow by Sanders, Finn

PEC2ECE702E

INTRODUCTION TO MACHINE LEARNING LAB

List of Experiments

1. Basic concepts of object programming in Python A short journey from procedural to object approach Properties Methods Inheritance - one of object programming foundations Exceptions once again Generators and closures Processing files Working with real files

2. Introduction to Python Packages NumPy, Pandas, Matplotlib, Seaborn, ScikitLearn

3. Introduction to traditional Datasets used in Machine Learning

4.Introduction to Classification: Intuitive understanding of the Naïve Bayes Classification, Mathematical Formulation, Implementation of Naïve Bayes Classification using Python-ScikitLearn

5. Introduction to Regression: Intuitive understanding of the Linear Regression, visualizing linear regression, Machine learning applications of linear regression.

PEC2ECE703E

DIGITAL IMAGE PROCESSING

UNIT I
Introduction: imaging and imaging devices. Image sampling and quantization, relationship between pixels and imaging geometry

UNIT II
Image enhancement techniques: Frequency domain, spatial domain, and fuzzy logic based.

UNIT III
Image Segmentation: using edge detection and edge linking techniques, Image threshold and region-oriented segmentation.

UNIT IV
Image representation schemes: Chain codes, polygonal approximation, and signatures.

UNIT V
Shape descriptors: Fourier descriptors. Descriptor using moments. Descriptor using AR and CAR modeling.

UNIT VI
Texture: Introduction to texture, different techniques of texture analysis and their comparison

References

1. Digital Image Processing, R. C. Gonzalez and R. E. Woods
2. Fundamentals of Digital Image Processing by Anil. K. Jain
3. Two-Dimensional Signal and Image Processing by J S Lim

PEC2ECE704E

DIGITAL IMAGE PROCESSING LAB

List of Experiments in MATLAB:

1. Image acquisition, digitization and display
2. Application of edge detection techniques on Images
3. Enhancement of images using histogram equalization, histogram modification, and fuzzy Logic
4. Segmentation of images using thresholding and region growing.

Tools Required: MATLAB Software, Hardware support for DIP toolbox

PEC2ECE705E

OPTICAL COMMUNICATION SYSTEMS

UNIT I

Structures, wave guiding and Fabrication: Nature of Light, Basic optical laws and definitions, Single mode fibers, Graded index fiber structure, Attenuation, Signal Dispersion in fibers. Optical Sources- LEDs, Laser Diodes, Line Coding.

UNIT II

Photo detector Noise, Detector Response Time, Avalanche Multiplication Noise. Optical Receiver Operation- Fundamental receiver operation, Digital receiver performance, Eye diagrams. WDM Concepts and Components- Passive optical Couplers, Isolators and Circulators

UNIT III

Point to point links, power penalties, error control, Coherent detection, Differential Quadrature Phase Shift Keying. Analog Links: Carrier to noise ratio, Multichannel Transmission Techniques, RF over Fiber, Radio over fiber links, Microwave Photonics.

UNIT IV

Network Concepts, Network Topologies, SONET/SDH, High speed lightwave links, Optical add/ Drop Multiplexing, Optical Switching, WDM Network, Passive Optical Networks, IP over DWDM, Optical Ethernet, Mitigation of Transmission Impairments

UNIT V

Measurement standards, Basic Test Equipment, Optical power measurement, Optical fiber characterization, Eye diagram tests, optical time domain reflectometer, optical performance monitoring, optical fiber system performance measurements.

Recommended Books:

1. Gerd Keiser, "Optical Fiber Communications", 5th Edition, McGraw Hill.
2. Rajeev Ramaswamy and Kumar N Sivarajan, "Optical Networks: A Practical Perspective", 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An imprint of Elsevier).

Reference Books:

1. John. M. Senior, "Optical Fiber Communications: Principles and Practice", 2nd Ed, 2000, PE.
2. Harold Kolimbris, "Fiber Optic Communication", 2nd Ed, 2004, PEI

PEC2ECE706E

OPTICAL COMMUNICATION SYSTEMS LAB

List of Experiments:

1. Measurement of Numerical Aperture.
2. Measurement of Attenuation and Bending Loss.
3. Study of Analog Link and Digital Link.
4. Study of BER and Q-factor estimation in the optical system simulation.
5. EDFA design for DWDM link.
6. Study the Characteristics of a Communication channels AWGN BSC.
7. Analog and Digital Modulation Frequency Modulation and Demodulation QPSK Modulation and Demodulation.
8. Design Conventional Encoder and Decoder.
9. Construction of MUX and DEMUX for WDM systems.
10. Design of Fiber Optic WDM link.
11. Calculate and simulate the attenuation and signal degradation due to intermodal and intramodal distortion.
12. Calculate power coupling losses due to connectors, splices, source output pattern and fiber numerical aperture.
13. Understand, compute and simulate the modes in step index fiber and graded index fiber.
14. Design, implement and test WDM communication system using its basic components.

Tools Required: Optiwave systems, OptSim, Optical Loss test set(OLTS), OTDR, VPIphotonics

PEC2ECE707E

RF CIRCUIT DESIGN

UNIT I:

Importance of Radio Frequency Design, Frequency Spectrum, RF Behavior of Passive Components, Chip Components and Circuit Board Considerations, RF Circuit Manufacturing Process, Transmission Line Analysis, Example of Transmission Lines, Equivalent Circuit Representation, Theoretical Foundation, Circuit Parameters for a Parallel-Plate Transmission Line, Summary of Different Transmission Line Configurations, General Transmission Line Equations, Microstrip Transmission Lines, Terminated Lossless Transmission Line, Special Termination Conditions

UNIT II:

The Smith Chart (From Reflection Coefficient to Load Impedance, Impedance Transformation, Admittance Transformation, Parallel Series Connection)

UNIT III:

Single- and Multi-port Networks (Interconnecting networks, Network properties and Applications, Scattering Parameters), Impedance Matching and Tuning

UNIT IV:

Passive RF Components (Coupler Design, Power Combiner and Power Divider: analytical techniques; Multi-band Component Design Techniques), RF Filter Design, Multi-Frequency Design Techniques, Vector Network Analyzer and Simple Calibration Approach, Active RF Components (RF Field Effect Transistors, MOSFETs, HEMTs),

UNIT IV:

Power Amplifier (Biasing and Matching Networks Design Techniques; Stability Considerations, Constant Gain, Constant VSWR Circles, Power Amplifier Topologies, Power Amplifier Operation Modes, Multi-band Matching Techniques for Power Amplifiers)

Recommended Books:

1. RF Circuit Design Theory and Applications, 2nd edition – R. Ludwig and G. Bogdanov, Pearson Economy

Reference Books:

1. Microwave Engineering, 3rd Edition – D. M. Pozar, Wiley
2. Secrets of RF Circuit Design – Joseph Carr, McGraw Hill
3. RF Circuit Design – R. Bowick, Newnes
4. IEEE Xplore, and IEL

PEC2ECE708E

RF CIRCUIT DESIGN LAB

List of Experiments:

Section I: Learning the CAD tool. Introduction to ADS, ADS Design Guides (Smith Chart and its applications)

Section II:

1. Design various transmission line configurations and study their performance and various termination conditions.
2. Design impedance matching networks for different types of load networks
3. Design and Analysis of multi-port networks
4. Design and implementation of a coupler
5. Design and implementation of Power Combiner and Divider
6. ·Design and implementation of different classes of Power Amplifiers.

Tools Required: Advanced Design System

PEC2ECE709E

COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

UNIT I

Review of Basic Computer Organization, Performance Evaluation Methods, Introduction to RISC Instruction Pipeline, Instruction Pipeline and Performance. Pipeline Hazards and Analysis, Branch Prediction, MIPS Pipeline for Multi-Cycle Operations.

UNIT II

Compiler Techniques to Explore Instruction Level Parallelism, Dynamic Scheduling with Tomasulo's Algorithm and Speculative Execution.

UNIT III

Advanced Pipelining and Superscalar Processors, Exploiting Data Level Parallelism: Vector and GPU Architectures, Architectural Simulation using gem5.

UNIT IV

Introduction to Cache Memory, Block Replacement Techniques and Write Strategy, Design Concepts in Cache Memory.

UNIT V

Basic and Advanced Optimization Techniques in Cache Memory, Cache Optimization using gem5, Introduction to DRAM System, DRAM Controllers, and Address Mapping, Secondary Storage Systems, Design Concepts in DRAM and Hard Disk.

UNIT VI

Tiled Chip Multicore Processors (TCMP), Routing Techniques in Network on Chip (NoC), NoC Router Microarchitecture, TCMP, and NoC: Design and Analysis, Future Trends in Computer Architecture Research.

References

1. Computer Architecture - A Quantitative Approach,5th edition, John L. Hennessy, David A. Patterson. 2.
2. Computer Systems Design and Architecture, 2nd Edition, Vincent P. Heuring 3.
3. Computer Organization and Architecture, 6th Edition, William Stallings 4.
4. Advanced Computer Architectures-A Design Space Approach, Dezsosima, Terence Fountain, Peter Kacsuk.

PEC2ECE710E

COMPUTER ARCHITECTURE AND PARALLEL PROCESSING LAB

List of Experiments:

1. Simulating the implementation of the pipeline.
2. Simulating the implementation of instruction level parallelism
3. Simulating the implementation of Vector Architecture
4. Simulating the implementation of GPU architecture
5. Simulating the implementation of super scalar architecture.

Tools Required: GEM5 simulator, MATLAB and GEMS or SIMICS

PEC2ECE711E

NETWORK SECURITY AND CRYPTOGRAPHY

UNIT I

Security: Need, security services, Attacks, OSI Security Architecture, one time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

UNIT II

Number Theory: Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

UNIT III

Private-Key (Symmetric) Cryptography: Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

UNIT IV

Public-Key (Asymmetric) Cryptography: RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

UNIT V

Authentication and System Security: IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer, Secure Electronic Transaction Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Trusted Systems.

Recommended Books:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, Private Communication in a Public World", Prentice Hall, 2 nd Edition.

Reference Books:

1. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Pres,
2. Stephen Northcutt, Leny Zeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, "Inside Network Perimeter Security", Pearson Education, 2nd Edition
3. Richard Bejtlich, "The Practice of Network Security Monitoring: Understanding Incident Detection and Response", William Pollock Publisher, 2013.

PEC2ECE712E

NETWORK SECURITY AND CRYPTOGRAPHY LAB

List of Experiments:

1. Write a program to perform encryption and decryption using substitution and transposition cipher.
2. Write a program to implement DES algorithm logic
3. Write a program for evaluation of AES
4. Write a program for evaluation Triple DES
5. Write a program to implement Blowfish algorithm logic
6. Write a program to implement RSA algorithm logic
7. Implement Diffie-Hellman key exchange mechanism using html
8. Write a program to implement Euclid algorithm
9. Calculate the message digest of a text using SHA-1 algorithm
10. Implement the signature scheme digital signature standard
11. Implement electronic mail security
12. Case study on web security requirement

Note:

1. Perform above experiments using C/C++/JAVA/MATLAB/Python.
2. Minimum 10 experiments must be performed from the List.

PEC2ECE713E

MIXED SIGNAL DESIGN

UNIT I

Simple CMOS Current Mirror, Common-Source Amplifier, Source-Follower, Source Degenerated Current Mirrors, cascode Current Mirrors, MOS Differential Pair and Gain Stage Process and temperature independent compensation

UNIT II

Sampling Circuits Performance of Sample-and-Hold Circuits, Testing Sample and Holds, MOS Sample-and-Hold Basics, Examples of CMOS S/H Circuits, Bipolar and BiCMOS Sample-and-Holds. Sample-and-Hold Architectures- Open-loop & closed-loop architectures, open-loop architecture with miller capacitance, multiplexed-input architectures, recycling architecture, switched capacitor architecture.

UNIT III

D/A Converter Architectures Input/output characteristics of an ideal D/A converter, performance metrics of D/A converter, D/A converter in terms of voltage, current, and charge division or multiplication, switching functions to generate an analog output corresponding to a digital input. Resistor-Ladder architectures, Current steering architectures

UNIT IV

A/D Converter Architectures Input/output characteristics and quantization error of an A/D converter, performance metrics, Performance Limitations, Resolution, Offset and Gain Error, Accuracy and Linearity, Successive approximation architectures, Flash architectures.

UNIT V

Integrator Based Filters Low Pass filters, active RC integrators, MOSFET-C integrators, transconductance-c integrator, discrete time integrators. Filtering topologies - bilinear transfer function and biquadratic transfer unction, phase-locked loop basics; PLL dynamics; frequency synthesis; all-digital PLLs.

References

1.Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.

2.Razavi, "Principles of data conversion system design", Wiley IEEE Press, 1st Edition, 1994.

3.Jacob Baker, "CMOS Mixed-Signal circuit design", IEEE Press, 2009.

4.Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986.

5.Baker, Li, Boyce, "CMOS: Circuit Design, layout and Simulation", PHI, 2000.

6. P.E. Allen, Doug Holberg, "CMOS Analog Circuit Design", Oxford University Press, 2011.

PEC2ECE714E

MIXED SIGNAL DESIGN LAB

List of Experiments:

Section I: ***Learning the CAD tool.***
Introduction to Cadence, Learning Cadence design framework and Virtuoso environment, Design with Virtuoso schematic editor, Layouts etc.

Section II: ***List of Experiments:***

1. Simulation and analysis of a basic Current mirror circuit.
2. Simulation and analysis of a bipolar current mirror circuit.
3. Design of Common Source Amplifier with different Loads
4. Simulation and design Differential Amplifier
5. Design, Simulation and analysis of an open loop track and hold using MOS technology.
6. Design, Simulation and analysis of Sample and Hold circuit with clock feedthrough circuitry.
7. Design and analysis of a voltage comparator circuit.
8. Design and analysis of ADC (e.g Flash)
9. Design, Simulation and analysis of first order RC filter circuit.
10. Design, Simulation and analysis of low Q and high Q bi-quad filters.
11. Design, Simulation and analysis of first order Gm-C filter circuit.

Tools Required: Cadence Virtuoso/ Advanced Design System/ any other industry grade CAD tool.

PEC2ECE715E

ANTENNA DESIGN

UNIT I

Antenna Fundamentals and Types: Radiation mechanism - over view, Electromagnetic Fundamentals, Solution of Maxwell's Equations for Radiation Problems, Ideal Dipole, Antenna Parameters.

Antenna types: Wires, Patches and Broadband, Dipole Antennas, Yagi - Uda Antennas, Micro strip Antenna, Travelling-wave Wire antennas, Helical antennas. Log - Periodic Antennas, spiral antennas, lens antennas etc

UNIT II

Antenna Arrays: Array factor for linear arrays, uniformly excited, equally spaced Linear arrays, pattern multiplication, directivity of linear arrays, non- uniformly excited -equally spaced linear arrays, Mutual coupling, multidimensional arrays, phased arrays, feeding techniques.

UNIT III

Aperture/Reflector Antennas: Radiation from Aperture and Huygen's principle, uniqueness theorem, Application of the equivalence principle to Aperture problems, uniform Rectangular aperture and radiating slit. Techniques for evaluating Gain .Reflector antennas - Parabolic reflector antenna principles, Axi - symmetric parabolic reflector antenna, offset parabolic reflectors, dual reflector antennas, Gain calculations for reflector antennas, feed antennas for reflectors, field representations, matching the feed to the reflector, general feed model.

UNIT IV

Antenna Synthesis: Formulation of the synthesis problem, synthesis principles, line sources shaped beam synthesis, linear array shaped beam synthesis — Fourier series, Woodward — Laws on sampling method, etc

UNIT V

CEM for Antennas: General Introduction. **Method of Moments**: Introduction to method of Moments, Pocklington's integral equation, integral equations and Kirchoff's Networking Equations, Source Modeling Weighted residuals formulations and computational consideration, calculation of Antenna and scatter characteristics. **Finite Difference Time Domain Method**: Maxwell equations for FTDT method, E - Plane analysis of Horn antennas. **High Frequency Methods:** Geometric optics, Wedge diffraction theory, E - Plane analysis of Horn antennas. Cylindrical parabolic antenna, radiation by a slot and monopole on a finite ground plane. Application of UTD to wireless mobile propagation.

UNIT VI

Basic Concepts of Smart Antennas: Concept and benefits of smart antennas, Fixed weight beam forming basics, Adaptive beam forming. **Instructional Activities:** Design, simulation and analysis of different antennas for wireless applications using related simulation tools.

References

1. Stutzman and Thiele, "Antenna Theory and Design", 2nd Ed, John Wiley and Sons Inc.
2. C. A. Balanis: "Antenna Theory and Design", John Wiley, 3rd Edition, 2005
3. Kraus J D and Marhefka R J, "Antennas for All Applications", 3rd Edition, Tata McGraw Hill, 2002.
4. Elliot R S, "Antenna Theory and Design", Revised Edition, John Wiley and Sons, India, 2006.
5. F . B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005.
6. Jordan E C and Balmain K G, "Electromagnetic Waves and Radiating Systems", 2nd Edition, Pearson Education, 2015.

PEC2ECE716E
ANTENNA DESIGN LAB

List of Experiments

A: Using Antenna Training System

1) Study different types of Antennas
2) Measurement of Radiation pattern of monopole, dipole, folded dipole, helix, Loop (rectangular and circular) antennas.
3) Study the structure, operation and radiation pattern of wired, aperture, planar and array antennas.
4) Proof of Inverse square law and Reciprocity theorem
5) Measurement of radiation pattern of reflector antennas
6) Study of variation in the radiation strength at a given distance from the antenna
7) Study of Yagi-UDA 5 Element Simple dipole antenna

B: Simulation using HFSS/CST:

1) Analysis of co-polarization and cross polarization.
2) Measurement of radiation pattern of planar antennas
3) Antennas Arrays and beamforming
4) Design micro strip patch antennas
5) Design reflector antennas
6) Design Horn antennas

Tools Required: HFSS Antenna design Suite, MATLAB, CST, Antenna Training System

Open Elective Courses

OECECE801E
INTERNET OF THINGS

UNIT I

What is IoT, why IoT matters, the power of IoT, Examples and Applications, How an IoT System Actually works, Structure of IoT.

UNIT II

Sensors and Devices: Hardware Capabilities Scaling & Operations, Industrial sensors, First Generation – Description, Advanced Generation, Integrated IoT Sensors, Polytronics Systems, Sensors' Swarm ,Printed Electronics ,IoT Generation Roadmap ,Wireless Sensor Structure– Energy Storage Module–Power Management Module–RF Module–Sensing Module

UNIT III

Connectivity: An introduction to Connectivity, LPWAN, Cellular, Satellite, WiFi, Bluetooth, Data Processing: Introduction to Cloud, Introduction to IoT platforms, Choosing an IoT Platform, API's, Data Analytics vs Machine Learning

UNIT IV

User Interface & User Experience in IoT, Introduction to UIs & UX for IoT2, Key Considerations for UIs, The Future of IoT and Case Study: Smart Cities, Healthcare, Agriculture

References

1. Dr. Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024', Yole Development Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
4. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014

OECECE802E
INTERNET OF THINGS LAB

List of Experiments:

1. Arduino Uno Architecture, Arduino Simulation Environment, Setup the IDE, Introduction Arduino Libraries.

2. Basics of Embedded C programming for Arduino.

3. Interfacing LED, push button and buzzer with Arduino.

4. Interfacing Arduino with LCD.

5. Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino.

6. Interfacing of Relay Switch and Servo Motor with Arduino.

7. Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library.

8. Web server- introduction, installation, configuration.

9. Posting sensor(s) data to web server.

10. Study of IOT Cloud platforms Thing Speak API and MQTT.

11. Interfacing ESP8266 with Web services.

12. Introduction to Contiki-Cooja Platform.

Tools Required:

1. **Hardware:** Arduino, Raspberry Pi, Intel Galileo, BeagleBone, Smart Phones.
2. **Software:** Contiki on Ubuntu machine.

OECECE803E
SENSORS AND ACTUATORS FOR IOT

UNIT I

Sensors / Transducers: Principles – Classification – Parameters – Characteristics - Environmental Parameters (EP) – Characterization Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer – Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors:– Electrostatic Transducer– Force/Stress Sensors Using Quartz Resonators – Ultrasonic Sensors

UNIT II

Thermal Sensors: Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermos sensors – Resistance Change Type Thermometric Sensors –Thermo emf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Introduction – Sensors and the Principles Behind – Magneto-resistive Sensors – Anisotropic Magneto resistive Sensing – Semiconductor Magneto resistors– Hall Effect and Sensors – Inductance and Eddy Current Sensors– Angular/Rotary Movement Transducers – Synchros– Synchro-resolvers - Eddy Current Sensors – Electromagnetic Flowmeter – Switching Magnetic Sensors SQUID Sensors

UNIT III

Radiation Sensors: Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential - Standard Hydrogen Electrode (SHE) – Liquid Junction and Other Potentials – Polarization – Concentration Polarization— Reference Electrodes - Sensor Electrodes – Electro ceramics in Gas Media.

UNIT IV

Smart Sensors: Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation Sensors –Applications: Introduction – On-board Automobile Sensors (Automotive Sensors)– Home Appliance Sensors – Aerospace Sensors — Sensors for Manufacturing – Sensors for environmental Monitoring

UNIT V

Actuators: Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection Electrical Actuation Systems-Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors

Recommended Books:

1. D. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.

2. W. Bolton – "Mechatronics" –Pearson Education Limited.

Reference Books:

1. Sensors and Actuators – D. Patranabis – 2nd Ed., PHI, 2013.

OECECE804E
SENSORS AND ACTUATORS FOR IOT LAB

List of Experiments:

1. Calibration of various electromechanical sensors and Interfacing with PC or Microcontrollers.
2. Calibration of various Thermal sensors and Interfacing with PC or Microcontrollers.
3. Calibration of various Optical sensors and Interfacing with PC or Microcontrollers.
4. Calibration of various automation sensors and Interfacing with PC or Microcontrollers.
5. Study of various off the shelf sensor modules and interfacing with PC or Microcontrollers.
6. Design and implementation of Signal conditioning circuits for basic transduction elements.
7. Interfacing of various actuators with PC or microcontrollers.
8. Design of a full automation system with sensors, actuators and processing elements.

Tools Required: MATLAB, LABVIEW, Proteus, Arduino.

OECECE805E
DEEP LEARNING

UNIT I

Introduction: Course logistics and overview. Linear Algebra Review: Brief review of concepts from Linear Algebra. Optimization: Types of errors, bias-variance trade-off, overfitting-underfitting, brief review of concepts from Vector Calculus and optimization, variants of gradient descent, momentum.

UNIT II

Logistic Regression: Basic concepts of regression and classification problems, linear models addressing regression and classification, maximum likelihood, logistic regression classifiers.

UNIT III

Neural Networks: Basic concepts of artificial neurons, single and multi-layer perceptrons, perceptron learning algorithm, its convergence proof, different activation functions, softmax cross entropy loss function.

UNIT IV

ConvNets: Basic concepts of Convolutional Neural Networks starting from filtering. Convolution and pooling operation and arithmetics. Regularization, Dropout, Batchnorm, etc. Convnet architectures - AlexNet, VGG, GoogLeNet, ResNet, MobileNet-v1, InceptionNet, etc.

UNIT V

Deep Learning Tasks: Detection, segmentation problem definition, challenges, evaluation. Classification, region proposals, RCNN and other architectures and techniques. Applications of deep learning to computer vision, speech recognition, etc.

References

1. "Deep Learning", I Goodfellow, Y Bengio and A Courville, 1st Edition, MIT Press
2. Python Machine Learning for Beginners: Handbook for Machine Learning, Deep Learning and Neural Networks Using Python, Scikit-Learn and TensorFlow by Sanders, Finn
3. Deep Learning with Python, François Chollet

OECECE806E
DEEP LEARNING LAB

List of Experiments:

1. Introduction to Python based Deep Learning-I
2. Introduction to Python based Deep Learning-II
3. Introduction to online Python Coding Platforms: Google COLAB, KAGGLE, etc.
4. Designing, training and evaluating a basic shallow neural net in Python.
5. Designing, training and evaluating a deep neural net in Python.
6. Using Transfer Learning for fine-tuning of a pre-trained CNN
7. Experiment on Computer Vision using Deep Learning.
8. Experiment on Speech Recognition using Deep Learning.
9. Using Tensor Processing Units (TPUs) for Deep Learning.

Tools required:

1. Python Software
2. MATLAB Software
3. Online Computing Platforms: Google Colab, Kaggle.

OECECE807E
INDUSTRIAL IOT

UNIT I

Introduction to Industrial Internet of Things• Embedded systems & computer networks• Machine-to-machine (M2M) communication• Internet of Everything (IoE)• Machine learning & artificial intelligence• Distributed computing• Industrial automation• Interoperability, identification localization, communication, and software-defined assets• Evolution of IIoT – understanding the IT & OT convergence• OT components like Industrial control systems, PLC, SCADA, and DCS• IT components like hardware, software, and people processes• Adoption of IIoT• Market trends and opportunities in IIoT

UNIT II

Industrial automation – PLC & SCADA• History of automation – plants to parts• Knowledge discovery process• The DIKW (Data, Information, Knowledge, and Wisdom) pyramid and its relevance in IoT• PLC vs. Microcontrollers• Industrial networks• Machine-to-machine networks

UNIT III

Sensor data mining and analytics• Transducers: Sensors & actuators• Data acquisition, storage, and analytics• Real-time analytics• Understanding the differences between IoT and Big Data• Improving operational efficiency with IoT• Edge analytics & data aggregation

UNIT IV

Wireless Sensor Area Networks (WSAN)• Sensor nodes• WSN communication technology• Fundamentals and applications of Bluetooth, Zigbee, and WiFi• Fundamentals and applications of Cellular communication and LPWAN technology

UNIT V

Design & development of IIoT systems• IIoT reference architectures• Standardization initiatives• Interoperability issues• Industrial internet reference architecture from Industrial Internet Consortium (IIC)• IIoT design considerations• Centralized vs. distributed architectures• Industrial networks, communication technologies, protocols

UNIT VI

Industry 4.0 – Smart Factories• Integration of products, processes, and people• Smart factories and cyber-physical systems• Design principles• Challenges on the path to be a smart factory

UNIT VII

Industrial cloud platforms• Industrial gateways• Commercial gateways by Intel and Cisco• Cloud-based gateway solutions• IaaS, PaaS, and SaaS models• Cloud components and services• Device management, databases, visualization, and reporting• Notification management• Security management• Cloud resource monitoring and management• AWS IoT• Microsoft Azure IoT• GE Predix• PTC Thingworx

References

1. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0 Paperback – 1 January 2018 by Giacomo Veneri Antonio Capasso
2. Introduction to Industrial Internet of Things and Industry 4.0 1st Edition CRC Press by Sudip Misra
3. IoT Fundamentals | Networking Technologies, Protocols, and Use Cases for the Internet of Things | First Edition Pearson Paperback – 16 August 2017 by Hanes David, Salgueiro Gonzalo, Grossetete Patrick
4. IoT - Internet of Things for Beginners: An Easy-to-Understand Introduction to IoT Paperback – February 21, 2020 by Charles Crowell
5. Getting started with the Internet of Things O'RELLY publications by Cuno Pfister

OECECE808E
INDUSTRIAL IOT LAB

List of Experiments:

1: Study hardware and software used in PLC

2: Implementation of Logic Gates

3: Develop a ladder program for DOL Starter

4: Develop an application using On-Delay Timer

5: Develop an application using Up-Down Counter

6: Implementation of PLC Arithmetic Instructions for a pilot plant

7: Study of PID controller instruction for a pilot plant

8: Study hardware and software platforms for DCS

9: Simulate analog and digital function blocks

10: Study, understand and perform experiments on timers and counters

11: Logic implementation for traffic Control Application

12: Logic implementation for Bottle Filling Application

Tools Required: PLC kits, DCS kits, SCADA software.

OECECE809E
ROBOTICS ENGINEERING

UNIT I

Introduction, History of robots, Classification of robots, Present status and future trends. Basic components of robotic system. Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Mechanisms and transmission, End effectors, Grippers-different methods of gripping, Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, Cam type gripper, Magnetic grippers, Vacuum grippers, Air operated grippers; Specifications of robot.

UNIT II

Drive systems and Sensors Drive system- hydraulic, pneumatic and electric systems Sensors in robot – Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.

UNIT III

Kinematics and Dynamics of Robots 2D, 3D Transformation, Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformation, Simple problems. Matrix representation, Forward and Reverse Kinematics Of Three Degree of Freedom, Homogeneous Transformations, Inverse kinematics of Robot, Robot Arm dynamics, D-H representation of robots, Basics of Trajectory Planning.

UNIT IV

Robot Control, Programming and Applications Robot controls-Point to point control, Continuous path control, Intelligent robot, Control system for robot joint, Control actions, Feedback devices, Encoder, Resolver, LVDT, Motion Interpolations, Adaptive control. Introduction to Robotic Programming, On-line and off-line programming, programming examples. Robot applications-Material handling, Machine loading and unloading, assembly, Inspection, Welding.

Recommended Books:

[T1] Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.

[T2] Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 1999.

Reference Books:

[R1] S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education., 2009.
[R2] Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning., 2009.
[R3] Francis N. Nagy, Andras Siegler, "Engineering foundation of Robotics", Prentice Hall Inc., 1987.
[R4] P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing company Ltd., 1995.
[R5] Carl D. Crane and Joseph Duffy, "Kinematic Analysis of Robot manipulators", Cambridge University press, 2008.
[R6] Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987
[R7] Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc.,1985

OECECE810E

ROBOTICS ENGINEERING LAB

List of Experiments:

1. Basic experiments on introduction to Robot Configuration.
2. Demonstration of Robot with 2 DOF, 3 DOF, 4 DOF, etc.
3. Experiments on programming a robot for applications.
4. Two case studies of Robotics Applications in Industry.
5. Experiments on Robotic Simulation Software.

OECECE811E

MECHATRONICS

UNIT I

Introduction, Examples of Mechatronic systems, Electric circuits and components, Semiconductor Electronics, Transistor Applications

UNIT II

Sensors and transducers: Performance terminology of sensors, Displacement, Position & Proximity Sensors-I, Displacement, Position & Proximity Sensors-II, Force, Fluid pressure, Liquid flow sensors, temperature, light sensor, Acceleration and Vibration measurement, Semiconductor sensor and MEM, SAW

UNIT III

Actuators and mechanisms: Mechanical Actuation System, Hydraulic & Pneumatic Actuation System, Electrical Actuation System-I, Electrical Actuation System-II, Data Presentation system

UNIT IV

Signal conditioning: Introduction to signal processing & Op-Amp, Op-Amp as signal conditioner, Analogue to Digital Converter, Digital to Analogue Converter, Artificial intelligence

UNIT V

Microprocessors and microcontrollers: Digital circuits-I, Digital circuits-II, Microprocessor Micro Controller, Programming of Microcontrollers

UNIT VI

Modeling and system response: Mechanical system model, Electrical system model, Fluid system model, Dynamic response of systems, Transfer function and frequency response.

UNIT VII

Closed loop controllers: P, I, PID Controllers, Digital Controllers, Program Logic Controllers, Input/output & Communication systems, Fault findings

References

1. William Bolton, "Mechatronics electronic control systems in mechanical and electrical engineering", 6th Edition, Pearson Education, 2002.
2. David G. Alciatore, Micheal B. Histand "Introduction to MECHATRONICS and measurement systems", 4th edition, Mc Graw Hill Education-2014
3. M.D. Singh, J.G. Joshi, "Mechatronics", PHI Publications

OECECE812E
MECHATRONICS LAB

List of Experiments:

1. Interfacing of various sensor and actuator modules with microcontrollers.

2. Use of A/D and D/A converters for signal conditioning of sensor signals.

3. Design and Implementation of OP-AMP based signal conditioning circuits for optical and thermal sensors.

4. Mechanical system modeling on PC.

5. Electrical system modeling on PC.

6. Working with PID controllers.

7. Project using Microcontroller-Atmega 328, Myoelectrically Controlled Robotic Arm, Design of a Legged Robot

Tools Required: MATLAB, MATLAB supported EMBEDDED hardware, LABVIEW.

OECECE813E
MICROPROCESSORS IN AUTOMATION

UNIT I

Number Systems, codes, digital electronics: Logic Gates, combinational circuits design, Flip-flops, Sequential logic circuits design: Counters, Shift registers. Introduction to 8085 Functional Block Diagram, Registers, ALU, Bus systems, Timing and control signals.

UNIT II

Machine cycles, instruction cycle and timing states, instruction timing diagrams, Memory interfacing

UNIT III

Assembly Language Programming: Addressing modes, Instruction set, simple programs in 8085; Concept of Interrupt, Need for Interrupts, Interrupt structure, Multiple Interrupt Requests and their handling, Programmable interrupt controller; Interfacing peripherals: Programmable peripheral interface (8255).

UNIT IV

Interfacing Analog to Digital Converter & Digital to Analog converter, Multiplexed seven segments LED display systems, Stepper Motor Control, Data Communication: Serial Data communication (8251), Programmable Timers (8253); 8086/8088 Microprocessor and its advanced features,

UNIT V

Introduction to Digital Control: Sampling theorem, Signal conversion and Processing, Z-Transform, Digital Filters, Implementation of Digital Algorithm.

References

1. Digital Electronics: An Introduction to Theory and Practice by William H. Gothmann, PHI Learning Private Limited
2. Digital Computer Electronics: An Introduction to Microcomputers by Albert Paul Malvino, Tata McGraw-Hill Publishing Company Ltd
3. Microprocessor Architecture, Programming, and Applications with the 8085 by Ramesh Gaonkar, PENRAM International Publishers.
4. Digital Control Systems by Benjamin C. Kuo, Oxford University Press
5. Microcomputer Experimentation with the Intel SDK-85, Lance A. Leventhal Prentice Hall

OECECE814E
MICROPROCESSORS IN AUTOMATION LAB

1. Design and implementation of:
   a. basic Gates: AND, OR, NOT.
   b. Universal gates.
   c. Basic Flip-Flops
2. Using 8085 microprocessor:
   i. develop a program to add two double byte numbers.
   ii. develop a subroutine to add two floating point quantities.
   iii. develop program to multiply two single byte unsigned numbers, giving a 16-bit product
   iv. develop subroutine which will multiply two positive floating-point numbers.
   v. To write program to evaluate P* Q*+R* & S where P, Q, R, S are 8-bit binary numbers.
   vi. To write a program to divide an 8-bit number by another 8-bit number up-to a
   vii. fractional quotient of 16 bit.
   viii. Write a program for adding first N natural numbers and store the results in memory location X.
   ix. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
   x. Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
   xi. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
3. Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a program by which the data stored in a RAM table is displayed.
4. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
5. To design and interface a circuit to convert digital data into analog signal using the 8255A in the memory mapped I/O.
6. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
7. To design a circuit to interface a memory chip with microprocessor with given memory map
8. Write a program to control the operation of stepper motor using 8085 and 8255 PPI

Annexure "AZ"

Syllabus: Audio Visual Mechanic

Marks: 120
Time: 02:00 Hours

ITEM GRID AND SYLLABUS:

	GRID	TOTAL NUMBER OF QUESTIONS
APTITUDE	General English	24
	General knowledge and current affairs (India)	18
	General knowledge with special reference to J&K	6
	Numerical and Reasoning Ability	18
	Basic Concepts of Computers	6
	TOTAL MARKS (APTITUDE)	72
TECHNICAL	TECHNICAL QUESTIONS	48
	TOTAL MARKS	120

DETAILED SYLLABUS INDICATED BELOW FOR *APTITUDE* AND *TECHNICAL*

APTITUDE SYLLABUS

GENERAL ENGLISH

- Articles
- Clauses
- Pronouns
- Homonyms/ homophones
- Tenses
- Clauses
- Punctuation
- Synonyms and antonyms
- Analogies

- Idioms and phrases
- Uses of Prepositions

GENERAL KNOWLEDGE AND CURRENT AFFAIRS (INDIA)

- Important dates in Indian History / Freedom struggle, different dates and events
- First in world (Adventure, Sports,Discoveries). First in India (Adventure, Sports, Discoveries)
- Popular names of Personalities (Religion, Politics, Scientific discoveries, Geographical, Sports, History)
- The Newspaper world – (Current Dailies & Weeklies of India)
- Books & Authors – General
- Languages
- Capitals & Currencies
- United Nations Organizations –
  Veto Powers

  No. of Countries as its Members

  Principal organs and their functions
- SAARC, ASEAN
- Everyday Science
- World famous Awards - (1. in Science)
  (2. in Literature)
  (3. in Sports)
- National Awards - (1. in Science)
  (2. in Literature)
  (3. in Sports)
- The world of Sports
- Climate & Crops in India
- Democratic institutions
- Forms of Government
- Political & Physical divisions of world & India
- Important rivers & Lakes in India
- Current Events of National and International Level
- Role of Mathematics in Economics
- Agriculture in economic development; Industrialization and economic development
- Indian Foreign Trade
- New economic reforms and growth of foreign trade
- Inflation – Concept and types; Causes and consequences

GENERAL KNOWLEDGE WITH SPECIAL REFERENCE TO J&K

- Abbreviations, Important dates, popular names of personalities and their achievements/Contribution (National and International)
- Constitution of J&K – Formation, Fundamental rights, Directive Principles
- Weather, Climate, Crops, Means of Transport
- Important power projects and their impact on State Economy
- Rivers and Lakes
- Important Tourist Destinations
- History of J&K
- Historical places of the State and their importance
- RTI Act
- Indus Water Treaty and its impact on State economy

NUMERICAL AND REASONING ABILITY

The candidates will be tested primarily on the fundamental mathematical concepts and application oriented reasoning. The broad areas will include the following;

Basic Arithmetic:

- Number System
- Percentage
- Average
- Profit & Loss
- Ratio & Proportion
- Speed, Distance and Time
- Mathematical reasoning

Reasoning ability:

- Number series
- Letter series
- Coding decoding
- Direction sense
- Blood relations
- Statements and conclusions
- Logical Reasoning
- Mental Reasoning

BASIC CONCEPTS OF COMPUTERS

The candidates' understanding of the concepts of computers and its application will be tested and it will broadly cover the following:

- Computer terminology
- Hardware and Software
- Storage and Operating systems
- Safety and Security
- E-mail and Internet Usage

TECHNICAL SYLLABUS

- Fundamentals of Electrical Engineering

- Basics of Information Technology
- Engineering Drawing
- Electronic Components and Materials
- Basic Electronics
- General Engineering
- Electronic Devices and Circuits
- Electronic Instruments and Measurements
- Principles of Communication Engineering
- Digital Electronics
- Electronic Drawing, Design and Fabrication Techniques
- Computer Programming and Applications
- Electrical Machines
- Communication Systems
- Network Filters and Transmission Lines
- Microprocessors and Applications
- Fundamentals of Electronic Instrumentation
- Microwave and Radar Engineering
- Troubleshooting of Electronic Equipment
- Power Electronics
- Advanced Microprocessors
- Consumer Electronics
- Micro controllers and Embedded Systems
- Digital and Data Communication

Annexure "BA"

Time: 02 Hours **Total Marks: 120**

Syllabus for Junior Scientific Assistant

Qualification Prescribed: *Bachelor's Degree in Science from a recognized University with the stream of Physics, Chemistry and Biology having at least 60 % marks in aggregate.*

A) Physics:-

- Thermal Physics, Solid State Physics, Mathematical Physics, Quantum Mechanics and application, fundamental concepts such as force, motion, gravity and electricity, work and energy, properties of matter, kinetic theory of gases, key concepts of thermal physics, thynodynamic systems, atmosphere and properties, Fission and Fusion. Oscillators, Amplifiers and operation amplifiers, Electricity and Magnetism, Waves and Optics, Electromagnetic induction.

B) Chemistry:-

- Classification of elements, chemical speciation. Particles, ions and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter. Thermochemical and photochemical reactions in the atmosphere. Chemistry of air pollutants, Photochemical smog.
- Various Methods for detection of pollutants in Air, Water and Soil.
- Chemistry of water: concept of DO, BOD, COD, sedimentation, coagulation, filtration.
- Inorganic and organic components of soil, Nitrogen pathways and NPKin soils.
- Pesticides in water, Biochemical aspects of Arsenic, Cadmium, Lead, Mercury, Carbon Monoxide and Pesticides, Insecticides, MIC, carcinogens in the air.
- Analytical Methods: Kjeldahl, Colourimetry, Spectrophotometry, Chromatography.
- Industrial Chemistry, Polymer chemistry, Pharmaceutical Chemistry.
- Green Crackers and banned chemicals in fire crackers.

C) Biology:-

- Unit of life, cell- tissue, origin and evolution of life, diversity of life.
- Molecular Biology, Animal Biology, Microbiology, Genetics, Biotechnology, Natural Resource Management, Biochemical Techniques.
- Ecology and Environment, bio-geo-chemical cycles, energy flow in an eco-system, food chain.
- Photo-synthesis, respiration, photo respiration.
- Global warming and climate change.
- Ozone depletion.
- Bio fuels, bio fertilizers, tissue culture techniques and biotechnology applications.

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Annexure "BB"

Syllabus for Chemical Assistant

Total Marks 120 **Time 2 Hours**

Part-I: 16 Marks

1. Definition of Museum, Museology and Museography.
2. History and development of Indian Museum.
3. Museum Collection.
    a. Primary source
    b. Secondary source
    c. Documentation system
    d. Catalogue
    e. Exhibition
4. What is documentation system?
5. Museum as an educational-research institution.
6. Communication policy of the Museum.
7. Importance of design of Museum galleries and Museum building.
8. Museum as an agency of non-formal education

Part-II: 8 Marks

Stereochemistry:

Elements of symmetry, Chirality due to chiral centre, molecules with more than one Chiral centre, threo and erythro isomers optical activity in the absence of chiral carbon (biphenyls, allenes and spirans). Chirality due to helical shape. Enantiotropic and diastereotropic atoms, groups and faces. Conformational analysis of cycloalkanes and decalines. Effect of conformation and reactivity in acyclic and cycloalkanes. Conformation of sugars, steric strains due to unavoidable crowding.

Part-III: 8 Marks

Reaction Mechanism/Structure and reactivity

Types of mechanisms. Types of reactions, thermodynamic and kinetic requirements, Methods of determining reaction mechanism, isotope effects. Effect of structure on reactivity: Resonance and field effects, steric effect, quantitative treatment. The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation.

Part-IV: 8 Marks

Aliphatic Electrophilic substitutions

General mechanism of SE1, SE2 and SEireactions, Mechanism of reactions involving migration of double bond. Effect of substrate, leaving group and solvent on reactivity. Strok-enamine reaction.

Part-V: 8 Marks

Aliphatic Nucleophilic substitutions

Mechanisms and stereochemical implications of SN2, SN1, SNiandneighbouring group participation (by double and single-bonds) reactions. Effect of substrate structure attacking nucleophile, leaving group and solvent on the rates of SN1 and SN2 reactions. Mixed SN1 and SN2 reactions. Nucleophilic substitution at allylic, aliphatic trigonal and vinylic carbon.

Part -VI 8 Mark

Elimination reactions:

Discussion of E1, E2, E1cB and E2C mechanisms. Effect of substrate structure base and the leaving group on reactivity. Competition between substitution and elimination reactions, Stereochemistry and orientation of E2 elimination. Mechanism and orientation in pyrolytic eliminations, Shapiro reaction.

Part-VII 8 Marks

Aromatic Nucleophilic substitution

Discussion of different mechanism (SN1:SNAr, Benzyne and srn!) structure reactivity relationships. Effect of leaving group and attacking nucleophile.

Part-VIII: 8 Marks

Free Radical Substitution

Free radical substitution mechanisms. Mechanism at an aromatic substrate, neighboring group assistances, reactivity for aliphatic and aromatic substrates. Reactivity in the attacking radical. Effect of solvent on reactivity. Allylic alogenations (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts.

Part-IX: 24 Marks

I). Preventive conservation in terms of:

1. Light
2. Insects
3. Fungus
4. Atmosphere
5. Pollution

II). Curative Conservation

01. Conservation of coins-copper, silver and gold.
02. Conservation of military/warfare equipment's-swords, guns etc.
03. Basic conservation of textile objects like cleaning, darning, lining etc.

04. Basic Conservation of stuffed birds/animals-natural history collection.

Part-III). 8 Marks

How to make a condition report?

Basic things to keep in mind during conservation

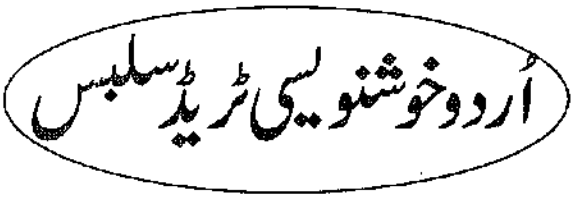
General Knowledge: 16 Marks

1. What is Preventive conservation?
2. What is curative conservations?
3. What is conservation
4. What is archaeology?
5. What is archives? When was achieves established in J&K?
6. What is museum?
7. When was SPS museum Srinagar established? Give history.
8. When was Dogra art museum Jammu established?
9. When was Burzaham archaeological site excavated first?
10. How many periods are traced in Burzaham? Give their details period wise.
11. When is world Heritage Day celebrated?
12. When is world heritage week celebrated?
13. When is International museum day celebrated?
14. Define Indian treasure true act 1978/
15. Define Antiquities and Art Treasure Act 1971 AD.
16. Define Ancient Monument and Archaeological sites and remains Act 1958?
17. Define J&K Ancient monuments and preservation act 1977 (samvath).
18. How many monuments in J&K are declared as State Protected Monuments?
19. How many monuments in J&K are declared as national protected monuments and is presently under the control of ASI?
20. Where are the ancient Buddhist sites located in Jammu and Kashmir?

Annexure "BC"
Syllabus for Kitabat Instructor

Time: 02 Hours

Total Marks: 120



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اُردو خوشنویسی ٹریڈ سلبس

حروفِ آغاز

ہر زبان کا اپنا رسم الخط ہوتا ہے۔ اُس کی تحریر (لکھاوٹ) کے اہم رہنما اصول ہوتے ہیں، جس کی پابندی ہر مُحرّر (کاتب) کے لئے لازمی ہے۔ ساتھ ہی تحریر کا خوشخط اور خوشنما ہونا بھی ضروری ہے۔ جس کے بغیر کوئی بھی عبارت پڑھی اور سمجھی نہیں جاسکتی۔ اُردو زبان کے لئے ''نستعلیق رسم الخط'' کا تعیّن ہے جس میں یہ زبان لکھی پڑھی اور سمجھی جاتی ہے۔ اس کا شُمار دُنیا کے خوبصورت رسم الخطوں میں ہوتا ہے۔ اِس خط کی صحتِ حروف و الفاظ اور خوبصورتی خوشنویسوں کی صدیوں کی محنتِ شاقہ کا نتیجہ ہے۔ اِن ماہرینِ خط اور خوشنویسوں نے تحریرِ خط کے اصول و قواعد کی معیار بندی کردی ہے۔ اُنہیں (اصول و قواعد، اغراض و مقاصد) کو تربیّت دے کر نئے سیکھنے والوں کا کام بہت حد تک آسان کردیا۔ خوشنویسی کے اصول و قواعد کی ترتیب اور معیار بندی کا تعین مُلک کے تقریباً ہر تربیت گاہ میں ہوا ہے۔ سابقہ ریاست جموں و کشمیر اس فن کی ترقی کے لئے کافی حد تک کوشاں رہی ہے، کیونکہ یہاں کی سرکاری زبان اُردو

ہونے کی وجہ سے بھی اس فنِ شریف کو استعفادہ پہونچا ہے۔

فن کتابت یا خطاطی ایک انمول اور بے مثال فن ہے اس کی اپنی روشن تاریخ ہے دُنیا بھر میں اس علم وفن کے پھیلے ہوئے نمونے اس کے عالمگیر ہونے کا احساس دلاتے ہیں، اس فن کے محبّین اور قدر دانوں نے ہر دور میں اس ہُنر (کتابت وخطاطی) کو بلندیاں بخشیں ہیں عالم اسلام کی بڑی بڑی دانشگاہوں اور دارالعلوموں میں اس فن کے بڑے بڑے اور کثیر المقاصد شُعبے قائم ہیں۔ جہاں سے ہزاروں طلبہ وطالبات نہ صرف خطاطی کے فن سے روشناس ہوتے ہیں، بلکہ عملی تربیت بھی حاصل کر کے اور صاحبِ فن بن کر ملک وقوم کی خدمت کرتے ہیں۔ اور اپنی عدیم المثال میراث کو نئی زندگی بخشتے ہیں۔

فنِ خطاطی اِسلامی فنونِ لطیفہ میں بُنیادی اور ریڑھ کی ہڈی کی حیثیت رکھتی ہے جس کا اِرتقاءِ فن اور مقبولیت آوائلِ زمانہ سے ہی شروع ہوگیا تھا۔ تا ایں دم قائم ہے اس کے بے شمار انمول نمونے دُنیا کے مختلف عجائبات میں گنے جاتے ہیں، آیاتِ قرآنی ہوں یا عربی، فارسی اردو، کے قطعات، یا پھر کسی عمارت کے محراب ومنبر پر ثبت آیاتِ قرانیہ، یا پھر نصیحت آموز اشعار وطغرے ہوں، یہ بات مسلّمہ طور پر طے ہے کہ وہ فن خطاطی کے بغیر نامکمل ہیں۔

فنِ خطاطی ایک مکمل اور خوبصورت آرٹ ہے، اِس میں وہ تمام عناصرِ حسن ولطائف، جوفنون ہائے لطیفہ یعنی فائن آرٹس میں پائے جاتے ہیں بدرجہ اُتّم موجود ہیں، اس میں جو جیومیٹری موجود ہے وہ انسانی تاریخ کی سب سے خوبصورت جیومیٹری

ہےاوراس میں اتنی کشش پائی جاتی ہے جوہر صاحب ذوق شخص کواپنی طرف مائل کرتی ہے۔

سابقہ ریاست جموں وکشمیر میں فن خوشنویسی وکتابت کی اپنی تاریخ تھی یہاں پرسرکاری اداروں کی دفتری وعملی ضروریات پوری ہورہی تھیں۔اور کتب خانے، پبلشر، پرنٹنگ پریس والوں کی ضروریات بھی پوری ہورہی تھیں۔

پچھلے چند برسوں سے اس فن کوسرکاری اداروں کے ساتھ مربوط کرنا ضروری ہوگیا تھا۔تاکہ حکومتی شعبہ صنعت وحرفت وٹیکنک کے ساتھ یہ اہم فنِ لطیف مضبوطی سے جڑ جائے اوراس فن کو باقاعدہ سرکاری سرپرستی حاصل ہوجائے اور یہ فن حاصل کرنے والوں کوعملی میدان میں کسی قسم کی مشکل سے دوچار نہ ہونا پڑے۔

ہم جموں وکشمیر ٹیکنیکل بورڈ اور جموں وکشمیر کلچرل اکیڈیمی کے زعماء اورفنونِ لطیفہ کے قدردان حکام کا اس احسن قدم کے لئے شکریہ واجب سمجھتے ہیں کہ اُنہوں نے اس عظیم فن کی بقاء اور حوصلہ افزائی کے لئے اپنی تمام تر کاوشیں صرف کرکے اس کو زندہ جاوید رکھا ہے جس سے کثیر تعداد میں طالبانِ ہُنروفن مستفید ہوسکیں گے۔

تعلیم گاہِ خوشنویسی مرکز میں مُدتِ تعلیم وتربیت تین سالہ ڈپلوما کی تربیت کے دوران اوقاتِ تعلیم روزانہ پانچ گھنٹے تھے۔یعنی گیارہ بجے سے چار بجے تک۔تعلیم گاہِ خوشنویسی اپنی نوعیت کا پہلا اِداہ ہے،جس کی بنیاد 1974ء میں جناب شیخ محمد عبداللہ کے ہاتھوں رکھی گئی تھی۔اور آج تک سینکڑوں طلباء اور طالبات نے اس فن سے اکتسابِ فیض حاصل کیا۔اورسابقہ ریاست جموں وکشمیر کے اہم مرکزی اداروں میں اپنی خدمات انجام دیتے آرہے ہیں۔

خطاطی یا کتابت کا یہ لطیف فن سیکھنے کے لئے امیدوار کا صحیح اُردو زبان جاننا لازمی ہے اور ساتھ ہی اس فن کو سیکھنے کا پورا شوق بھی رکھتا ہو۔ ریاست جموں وکشمیر کے جتنے بھی قدیم اور موقر اخبار، جرائد، رسائل اور اہم نشریاتی ادارے، دانشگاہیں اور مختلف سرکاری محکمے شامل ہیں، اُن میں اپنے فن کے جوہر دکھانے والے اکثر حضرات تعلیم گاہِ خوشنویسی کلچرل اکیڈیمی اور چند دیگر خوشنویسی مراکز کے سند یافتہ ہیں اور یہ سلسلہ ہنوز جاری ہے۔

ہم اُمید کرتے ہیں کہ انشاء اللہ فنون ہائے لطیفہ کو پروان چڑھانے والے اہم مرکزی اداروں کی کوششیں شدومد سے آگے بھی جاری وساری رہیں گی۔

☆

اردو خوشنویسی ٹریڈ سلبس

(سالِ اوّل)

کسی بھی علم و ہُنر کو سیکھنے کے لئے اُس کے بنیادی و لازمی اصول و قواعد ہوتے ہیں، فنِ کتابت اور خوشنویسی کے لئے بھی ان کی اہم ضرورت ہے۔ مندرجہ ذیل قواعد وضوابط اور اغراض ومقاصد اس سلسلے میں تجویز کئے جاتے ہیں۔

پہلی سہ ماہی

1 خوشخطی و کتابت کے لئے لازمی قواعد وضوابط کا صحیح علم سے آشنا کرانا۔ (50 گھنٹے)

2 کتابت سیکھنے کے لئے صحیح طریقے سے بیٹھنے کا ڈھنگ۔ زیرِ مشق بنانا اور استعمال کرنے کا صحیح طریقہ۔ (10 گھنٹے)

3 نُقاط اور اُن کے اقسام کی صحیح جہ نکاری مثلاً نُقطۂ سادہ، نقطۂ چکور، یا چہار گوشہ، نقطۂ مائل بعلو، نقطہ مدور وغیرہ۔ (50 گھنٹے)

4 ابتدائی مشق کرنے کے لئے مارکیٹ میں دستیاب نوٹ کاپی کا انتخاب اور طالب علموں کو کاغذ کے مختلف النوع اقسام کے بارے میں صحیح جانکاری دینا۔

(5 گھنٹے)

5 قلم پکڑنے کا خاص نوعیت کا طریقہ اور کتابت کے لئے مخصوص قسم کے قلموں کے اقسام کی جانکاری۔ (10 گھنٹے)

6 خوشنویسی کرنے کے لئے طالب علموں کو نڑی اور بانس کا قلم قط دار بنانے اور اس میں شگاف ڈالنے کا طریقہ بعد میں مخصوص پتھری پر قلم کو گھسنے کی تربیت دینا تاکہ قلم رواں دواں چلے۔ (15 گھنٹے)

7 جلی کتابت کی مختلف روشنائیوں کو تیار کرنے کا طریقہ۔(5 گھنٹے)

8 بازار میں دستیاب مختلف قسم کی تیار شدہ رنگوں اور روشنائیوں کا انتخاب اور ان میں پائے جانے والے اجزائے ترکیبی کا تعارف وطریقہ استعمال۔

(5 گھنٹے)

9 حرفِ تہجی/ مفردات ''الف، ب سے ''ی'' تک بنیادی اصول و قواعد کو ملحوظِ نظر رکھ کر خوشنویسی سیکھنا، سکھانا، اس پر عملی طور پر پے در پے مشق و ریاضت کرنا۔ (150 گھنٹے)

کُل میزانیہ اوقات..... ..... (300 گھنٹے/75 ہفتے)

☆

دوسری سہ ماہی

1 حروف کے جوڑوں اور حروف کی پیوندکاری کی مسلسل مشق کرانا۔

(50 گھنٹے)

2 مرکبات، حروف، الفاظ پورے فنی اصول وقواعد کے ساتھ سیکھنا، سکھانا۔ (50 گھنٹے)

3 مرکبات تقطعیاں فنِ کتابت کے معیار کے لحاظ سے مکمل کرنا، کیونکہ آگے کے کام کی بنیاد انہی تقطیعوں پر موقوف ومنحصر ہے مثلاً:

بابب، الخ
جاجب، الخ
ساسب، الخ (50 گھنٹے)

صاصب، الخ
طاطب، الخ

عاعب، الخ
قافب ۔ الخ
کاکب، الخ
لالب، الخ
مامب، الخ (100 گھنٹے)

نانب، الخ
ہاہب، الخ
یایب الخ (50 گھنٹے)

اسی طور ساری تختیاں مشق کرانا اور اُن میں مہارت حاصل کرانا فنِ کتابت و خوشنویسی کے لئے ضروری ہے۔

کُل میزانیہ اوقات ..... (300 گھنٹے/75 ہفتے)

☆

تیسری سہ ماہی

1 دو حروف سے زائد جوڑ والے مرکبات حروف کی مشقیں کرائی جائیں۔ مثلاً: قلم، نشتر، بخت، سخت، تخت، رخت، سفر، رحم، مرحم، وقت، تقدر، مقدر، مقصد، شمشاد، عظیم، میخانہ، مہتاب، بیتاب، ہمیشہ، ہمسایہ، شمشیر، تشکیل، تعمیل، تکمیل، تفہیم، یتیم، تسنیم، قبیلہ، جلیلہ، پیلسل، بغیچہ، جیتنا، بکسیلر، تحقیقات، تعینار، ایکسچینج، سینچائی غیرہ زیادہ سے زیادہ حروف والے الفاظ کی صحیح معنی میں روزانہ مشق کرانا۔ (120 گھنٹے)

2 طریقۂ کالم بندی برائے اخبارات، رسائل وجرائد۔ (5 گھنٹے)

3 کتابی صفحات کی مختلف النوع طریقوں سے کتابت کرنا، اُس کی تزئین کرنا، حاشیہ سازی کرنا، شہہ سُرخیاں اور بغلی سُرخیاں حسبِ ضرورت ترتیب دینا یا سجانا۔ (115 گھنٹے)

4 فنونِ خطاطی کے مشہور ومعروف موجّد مولانا محمد حسین ابنِ مقلہ اور خطِ نستعلیق کے مابعد موجّد مُلا میر علی تبریزی کے خطوط اور ان کے حالاتِ زندگی کی جانکاری دینا۔ (10 گھنٹے)

5 صحیح املانویسی، مضمون نگاری وانشاء پردازی کے علاوہ زبانی تقاریر کی مشق۔ (50 گھنٹے)

کُل میزانیہ اوقات..... (300 گھنٹے/75 ہفتے)

☆

چوتھی سہ ماہی

1 جلی مرکبات کے مُشکل الفاظ کی مسلسل مشق کرانا۔ (70 گھنٹے)

2 قطعات اور اشعار کی مسلسل کتابت کی مشقیں کرانا۔ (70 گھنٹے)

3 خط نسخ وثلث کی ابتدائی جانکاری اور اس کی مشق۔ (70 گھنٹے)

4 ڈکٹیشن دینے کے بعد املا کی دُرستگی کرانا۔ (50 گھنٹے)

5 خوشنویسی کے بارہ اصول: ترکیب حُجوئی، ترکیب کُلی، کرسی، نسبت، ضعف، قوت، سطح، دُور و سطح، صعود، نزول، صفا اور شان کی جانکاری۔ (15 گھنٹے)

6 ٹریسنگ پیپر، بٹر پیپر، آرٹ پیپر کے استعمال کا طریقہ کی جانکاری۔ (15 گھنٹے)

سابقہ ریاست جموں وکشمیر کے عدیم المثال خطاطوں اور کاتبوں کی کارکردگی کا کماحقہ علم ہونا، اُن کے سوانحی خاکے کی جانکاری دینا۔ (5 گھنٹے)

7 اسلامی ممالک کے ذریعے فنِ کتابت و خطاطی کے بے مثل کارناموں کا تذکرہ۔ (5 گھنٹے)

کُل میزانیہ اوقات..... (300 گھنٹے/75 ہفتے)

☆

اردو خوشنویسی ٹریڈ سلبس

سالِ دوم

پہلی سہ ماہی

1 سالِ اوّل کے بعد طالب علموں کو سالِ دوم میں جلی قلموں کے علاوہ بازار میں دستیاب ہولڈروں ،فونٹین پین اور مختلف نمبرات کی نبوں کے مناسب استعمال کی جانکاری دینا۔ (5 گھنٹے)

2 نبیں جو مختلف نمبرات میں ہوتے ہیں اُن کو مطلوبہ نمبر میں تیار کرنے کی تربیت دینا۔علاوہ ازیں فونٹین پین کو وقتی کتابت کے لئے استعمال کرنے کا طریقہ سکھانا۔ (5 گھنٹے)

3 لِتھو کتابت کی روشنائی بنانے کا طریقہ۔ (2 گھنٹے)

4 کتاب کے صفحہ کا سائز اور اخباری کالم بنانے کا طریقہ سکھانا۔ (3 گھنٹے)

5 آفیسٹ پیپر، بٹر پیپر، ٹریسنگ پیپر کے علاوہ لتھو کتابت کی ابتدائی مشق۔ (25 گھنٹے)

6 ہولڈر نب سے آفسٹ پیپر پر کتاب (عام سائز) لکھنے کی تربیت اور روزانہ مسلسل مشق کرانا۔ (50 گھنٹے)

7 اخباری کالموں میں 6 نمبر نب سے کتابت کرنے کا طریقہ اور روزانہ مشق کی ترغیب دینا۔ (25 گھنٹے)

8 مختلف سائز کُتب کا طریقہ صفحہ سازی اختیار کرنا۔

20X30	18x22	20X30	23X36
16	8	8	4

(5 گھنٹے)

9 فنِ خطاطی کے اعتبار سے جلی عبارات کی مسلسل مشق کرانا۔

(50 گھنٹے)۔

10 آفیسٹ کِتابت کی تربیت، بصورت نظم نثر، جلی سُرخیاں، وصلیاں وغیرہ۔ (50 گھنٹے)

11 خطوطِ مصنوعہ یا تجریدِ خط، مثلاً خطِ گلزار، خطِ غبار، خطِ ماہی، خطِ طغریٰ، خطِ مُقابل، خطِ توام، خطِ معکوس، خطِ ناخن، خطِ شفیعہ، خطِ شکستہ کی جانکاری۔ (25 گھنٹے)

12 تاریخِ خوشنویسی و خطاطی اور اساتذۂ فن کا مُلکی اور عالمی طور پر

تعارف حاصل کرانا۔اس موضوع پر طلبا و طالبات میں بحث و مباحث کرانا ۔
تحریر(لکھاوٹ) کے ساتھ ساتھ اس فن پر بولنے کی مہارت حاصل کرانا اور زبانی
طور اس موضوع کو سمجھنے اور سمجھانے کی صلاحیت پیدا کرنا۔ (5 گھنٹے)

☆☆

کمپیوٹر کلاس

اُردو/ ہندی پروگرام ایچ (ڈی ٹی پی)

کمپیوٹر استعمال کرنے کا طریقہ، انگلش کی بورڈ کو اُردو رمیں یاد کرانے کی مشق۔
مُسلسل اُردو ٹائپنگ جاری رکھنے کی مشق۔
ٹکسٹ بکس، پکچر بوکس، گرافک بوکس۔
لائن گائڈز، فارمیٹنگ ٹکسٹ۔
اُردو رائٹنگ سکرپٹ کی ڈزائننگ۔
ماسٹر پیج، ربن، پرنٹنگ، منحنی خطوط کی جانکاری۔
غزل لے آوٹ، شارٹ کٹ کیز اور کی بورڈ پرفرنسز وغیرہ۔ (50 گھنٹے)

کُل میزانیہ اوقات..... (300 گھنٹے/75 ہفتے)

☆

دوسری سہ ماہ

1 خطِ نستعلیق میں شہہ سُرخیوں کو لکھنے اور سیٹ کرنے کی مسلسل مشق۔
(100 گھنٹے)

2 مختلف جلی حروف اور الفاظ کی آؤٹ لائن نقش، یعنی تزئین و تذہیب کا صحیح طریقہ۔ (100 گھنٹے)

3 قطعات نویسی، طغریٰ نویسی اور اشتہار سازی کی تربیت۔
(15 گھنٹے)

4 باریک (خفی) خوشنویسی، مختلف النوع نبوں کے مناسب استعمال کے ساتھ اور بین السطور کی صحیح ترتیب کی جانکاری۔ (10 گھنٹے)

5 بسم اللہ الرحیم اور اُس کی مثل مختصر قرآنی آیات و دعاؤں کی مختلف زاویوں سے طغریٰ نویسی مشق۔ (15 گھنٹے)

6 اِملانویسی، مضمون نگاری، مکتوب سازی۔ (10 گھنٹے)

7 خطِ کوفی، خطِ مصری، خطِ ثلث، خط نسخ، خطِ توقیع، ، خطِ رقاع، خطِ محقق، خطِ ریحان، خطِ نستعلیق وغیرہ کا تعارف اور ان خطوط میں نام کمانے والے بیشتر وفات شدہ خطاط اور اساتذہ کرام جن میں مولانا محمد یوسف دہلوی، مولانا محمد

یوسف صدیدی، مولانا خلیق احمد ٹونکی، شفیق الزمان خان مُلتانی، مولانا عبدالحمید لاہوری، محمد حسین زرین قلم کشمیری، مولانا محمد باقر علی کاشمیری، مولانا عاصم امروہوی، قاری فرید احمد دہلوی، مولانا مشتاق احمد دیو بندی، محمد صدیق الماس سیالکوٹی، خورشید عالم گوہر قلم مُلتان، (کشمیر سے) خواجہ ناظم الدین وفائی، قاضی عزیز الدین عاشق کشمیری، خواجہ سیف الدین پنڈت، محمد صدیق نجار شیرین قلم، شبیر احمد رضوی اور محمد عباس شوپیانی وغیرہ جیسے عظیم فنکاروں کا مختصر تعارف اور اُن کی فنی خدمات کا مختصر تذکرہ وغیرہ۔

(10 گھنٹے)

کمپیوٹر کتابت

تعارف کثیر الذرائع اور اس کا استعمال

ملٹی میڈیا۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔؟

۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔۔ (40 گھنٹے)

کُل میزانیہ اوقات..... (300 گھنٹے/75 ہفتے)

☆

تیسری سہ ماہی

1 جلی کتابت کی مسلسل مشق کے علاوہ خطِ نسخ اور خطِ ثلث کی تقطعیوں کی تربیت دینا۔ خطِ نسخ و ثلث میں آیاتِ قرآنی، فارسی اشعار کی طغریٰ سازی و تزئین کاری کرنا۔ (55 گھنٹے)

2 مختلف النوع قسم کے دعوت نامے، نکاح نامے، سہرے، سپاس نامے، رُخصتیاں اور کتبہ سازی، لوحِ مکان، لوحِ قبر لکھنے وغیرہ کی جانکاری حاصل کرنا۔ (25 گھنٹے)

3 جدول نویسی، حاشیہ سازی و تزئین کاری اور تذہیب کاری وغیرہ۔ (15 گھنٹے)۔

4 سرورق لکھنے کی مشق کرنا، کرانا۔ (15 گھنٹے)

5 اخباروں کی شہہ سُرخیاں، درمیانی سُرخیاں، بغلی سُرخیاں وغیرہ ترتیب دینا۔ (50 گھنٹے)

6 متنوع خطوط کی مشق۔ (25 گھنٹے)

7	طغریٰ نویسی کی مشق۔	(25 گھنٹے)
8	قرآنی آیات کی متنوع تحریر کی مشق۔	(25 گھنٹے)
9	خطِ شکستہ کا تعارف اور نظری معلومات و مشق۔	(5 گھنٹے)

کمپیوٹر کتابت

اُردو سافٹ ویر (ایچ)

اُردو ٹائپنگ کے بعد مواد کو فائل کے طور جمع کرنا، ماسٹر پیج اور پیج نمبرات دینے کی ترتیب اور جعلی اور باریک سُرخیوں کی ایڈجسٹمنٹ سکھانا۔

کتابی صورت، اخباری صورت اور دیگر صورتوں میں مودا کو ایڈجسٹ کرنے کا طریقہ بتانا۔

سٹائل شیٹ سے کتاب یا اخبار کو سٹنگ کرنا۔

کمپوزنگ مواد کو درآمد یا برآمد کرنے کا طریقہ۔

مواد کو نقش سازی سے آراستہ کرنے کا طریقہ۔ (60 گھنٹے)

کُل میزانیہ اوقات ..... (300 گھنٹے/75 ہفتے)

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چوتھی سہ ماہی

1 سرورق کُتب، رسائل و جرائد، مختلف اقسام ومختلف النوع سے تیار کرنا۔ (25 گھنٹے)

2 خطاطی کے شہپاروں کی تیاری اور مرمت کی تربیت۔(25 گھنٹے)

3 آوٹ لائنگ کے استعمال سے خطاطی کی تربیت۔ (10 گھنٹے)

4 کمرشل آرٹ کو مدِ نظر رکھ کر طالب علموں کو کتابت قلم کے علاوہ پینٹنگ بُرش کی تربیت دینا تا کہ یہ فن پیپر ماشی، کے ساتھ ساتھ لکڑی، پتھر، تانبے، پردے، میز پوش وغیرہ جیسی چیزوں پر مختلف طغروں اور وصلیوں کے ذریعہ سے نمایاں کیا جاسکے۔ (50 گھنٹے)

5 اُردو رسم الخط یعنی نستعلیق میں (لکھی پڑھی جانے والی زبانوں) پہاڑی، گوجری، فارسی، عربی، پنجابی، اور خاص کر کشمیری زبان کا سکرپٹ لکھنے کی جانکاری۔ علاوہ ازیں ایسے سکرپٹ جو اردو رسم الخط سے مطابقت رکھتے ہوں جو بغیر اعراب وعلامات ہوں کو سمجھنے کی صلاحیت کی تربیت وجانکاری دینا ہو۔

(25 گھنٹے)

6 خطاطی کے ضلعی ،صوبائی، ریاستی، ملکی اور بین الاقوامی سطح کے مقابہ جاتی ایوارڈ کے نظم کے علاوہ خصوصی کتابت لیکچروں اور سہ ماہی ورکشاپ (سال بھر کی چار سہ ماہیوں میں دو یا تین ورکشاپ) کا اہتمام کرانا۔

(25 گھنٹے)

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کمپیوٹر کلاس

کورل ڈرا

کورل ڈرا کی جانکاری، بنیادی ٹول کی پہچان، مختلف رنگوں کا استعمال، بٹ میپ کا استعمال مختلف زاویئوں سے، پرنٹر کا استعمال، کورل ڈرا میں سرورق کی ڈزائنگ وغیرہ۔ (70 گھنٹے)

فوٹوشاپ

فوٹوشاپ کی جانکاری، تذئین کاری اور تصاویر سازی۔

سکینر کا استعمال، فوٹو ایڈیٹ کی جانکاری۔

تصاویر کا جوڑ توڑ سکھانا وغیرہ۔ (70 گھنٹے)

کُل میزانیہ اوقات ..... (300 گھنٹے/75 ہفتے)

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ضروری سامان برائے خوشنویسی وخطاطی

1 دورانِ کتابت ٹیک لگانے کے لئے مضبوط تکیہ یا لکڑی کا تختہ
2 نڑی یا بانس کے مختلف قطوں کے قلم
3 مختلف روشنائی
4 ہولڈر
5 نبیں مختلف نمبرات
6 سکیل
7 گدیا
8 شاپنر
9 قلم تراش
10 قط زن
11 زیرِ مشق
12 پلین پیپر، خطوط اندازی شیٹ، لیتھو مسطر، آفسٹ پیپر، ٹریسنگ پیپر، فوٹو پیپر وغیرہ
13 قلم پوش
14 قلم پاک

15 آب زیر (چھوٹا چمچہ)

16 نبیں بنانے کے لئے پتھری

17 کیلی گرافی پین سٹ (مختلف نمبرات)

18 ربر

19 پینسل

20 برش (مختلف نمبرات)

21 قلمدان (بکس)

22 ڈرائینگ پرکار سیٹ

23 روشنائی دان

24 ہینڈ بیگ برائے کتابت ساز وسامان

25 ہائی ٹیک V.5 اور V.10 پین

26 کپڑا مع فوم (برائے روشنائی دان)

27 مارکر قط دار

28 لِتھو روشنائی بنانے کے لئے سٹیل کٹوری یا اُس کے مثل کوئی دوسرا چھوٹا برتن۔

29 کتابت سامان محفوظ رکھنے کے لئے مناسب بکس کا انتخاب

30 ڈرائنگ شیٹ استعمال کرتے وقت مناسب تختے کا انتخاب

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کتب برائے تربیت خوشنویسی و خطاطی

خوشنویسانِ کشمیر (مولوی محمد ابراہیم)

شیرین قلم (کلچرل اکیڈیمی)

صحیفہ خوشنویساں (مولانا احمد دین شاغل)

اعجاز رقم (منشی اعجاز الدین)

پروین رقم (منشی اعجاز الدین)

تنویر الشمس (منشی اعجاز الدین)

تاریخ فنِ خطاطی

رہنمائے اُردو خوشنویسی (مولانا خلیق ٹونکی)

اُردو خوشنویسی حصہ اوّل (انیس صدیقی و انیس چشتی)

اُردو خوشنویسی حصہ دوّم (مولانا خورشید عالم ٹونکی)

مرقّع لوحِ قلم (خورشید عالم گوہر)

مرقّع فیضِ مجدّد (فیض مجدّد کاتب)

☆

مرتبین

عبدالسلام کوثری (انسٹریکٹر وانچارج کیلی گرافی آفیسر کلچرل اکیڈیمی سرینگر)

محمد انور لولابی (ہیڈ کاتب جموں وکشمیر کلچرل اکیڈیمی سرینگر)

مختار احمد (کیلی گرافی انسٹرکٹر انسٹ ناگ آئی ٹی آئی)

اقبال احمد (کتابت واُردو ان پیج سینٹر بارہمولہ)

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Annexure "BD"

SYLLABUS FOR THE POST OF "TECHNICAL ASSISTANT-EDUSAT"

Time: 2 Hours

Maximum Marks=120

1. Satellite Communication: (20 Marks)

- Communication Satellite: Orbit and Description: A brief History of Satellite Communication, Satellite Frequency bands, Satellite Systems, Applications, Orbital Period and Velocity, Effects of Orbital inclination, Azimuth and Elevation, Coverage and Slant range, Eclipse, Orbital perturbations, Placement of a Satellite in a Geo-Stationary Orbit.
- Introduction, Kepler's First Law, Kepler's Second Law, Kepler's Third Law, Definitions of Terms for Earth-Orbiting Satellites, Orbital Elements, Apogee and Perigee Heights, Effects of a non-spherical earth, Atmospheric drag.
- Radio Wave Propagation: Introduction, Atmospheric Losses, Ionospheric Effects, Rain Attenuation, Other Propagation Impairments.
- Propagation effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain Induced attenuation, rain induced cross polarization interference.
- Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Time Division Multiple Access(TDMA), Frame structure, Burst structure, Satellite Switched TDMA Onboard processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception.

2. Advanced Satellite Communication: (20 Marks)

- Earth Station Technology, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial Interface, Power Test methods, Lower Orbit Considerations.
- Introduction to Earth Segment, Receive-Only Home TV Systems, outdoor unit, The indoor unit for analog (FM) TV, Master Antenna TV System, Community Antenna TV System, Transmit-Receive Earth Stations.
- Introduction to Space Segment, The Power Supply, Attitude Control, spinning satellite stabilization, Momentum wheel stabilization, Station Keeping, Thermal Control, TT&C Subsystem, Transponders, The wideband receiver, The input demultiplexer, The power amplifier, The Antenna Subsystem.
- Introduction to Space Link, Equivalent Isotropic Radiated Power, Link-Power Budget Equation, System Noise, Carrier-to-Noise Ratio, Uplink, Saturation flux density, Input backoff, Downlink, Output back-off, Combined Uplink and Downlink C/N Ratio.
- Satellite Navigation & Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers, GPS C/A code accuracy, Differential GPS.

3. Communication System: (15 Marks)

- Introduction to Communication System, Modulation & Need of Modulation.
- Amplitude Modulation: Equation for AM, Spectrum of Sinusoidal AM Signal, Over Modulation, Power Relations in AM Wave, Multiple tone Modulation, Generation of AM Signal, DSB/FC, DSB/SC, SSB/FC, SSB/SC
- Angle Modulation- Frequency Modulation, Phase Modulation, Relation between FM and PM, Types of FM (NBFM & WBFM), Percentage Modulation, Frequency Multipliers
- Sound Broadcast transmitters & Super Heterodyne Receivers: Block Diagram & numerical
- Pulse Modulation- Pulse Amplitude Modulation, Pulse Time Modulation, Pulse Position Modulation, Pulse Coded Modulation System (PCM), Sampling, Quantization, Multiplexing of Signals, Frequency Division Multiplexing, Time Division Multiplexing, Difference between TDM & FDM Techniques.
- Modern Digital Modulation & Detection Techniques- Binary Phase Shift Keying, Differential Phase Shift Keying, Quadrature Phase Shift Keying.

4. Antenna Theory: (15 Marks)

- Basic concepts of antennas, Antenna functions and applications Antenna parameters (gain, directivity, radiation pattern, impedance, bandwidth, efficiency) Antenna types (wire antennas, aperture antennas, microstrip antennas).
- Dipole antennas (half-wave, full-wave, folded dipole), Loop antennas (circular, square, rectangular),Slot antennas, Antenna arrays (linear, planar, phased arrays).
- Aperture Antennas Horn antennas (rectangular, conical, pyramidal) Reflector antennas (parabolic, Cassegrain, Gregorian) Lens antennas Microstrip antennas (patch antennas, slot antennas).
- Antenna analysis techniques (method of moments, finite element method, physical optics) Antenna design considerations (gain, directivity, bandwidth, size, weight, cost) Antenna matching and impedance transformation, Antenna polarization.
- Antenna pattern measurements (far-field and near-field),Antenna gain measurements, Antenna impedance measurements, Antenna polarization measurements.

5. Basic Electronics: (10 Marks)

- Semiconductor Physics- Conductor, Semiconductor, Insulator, n-type & p-type semiconductor, mass action law, charge neutrality equation, Drift Current & Diffusion Current & Einstein Relation.
- Semiconductor Diode- PN junction diode & the modes of operation, Expression for diode current, Cut in voltage, Diffusion & Transition Capacitance. Different types of diodes- Zener Diode & its operation, Tunnel Diode.
- Basics of BJT & FET: Bipolar Junction Transistor & its operation modes, Field effect Transistor & its modes.
- Diode Circuits: Half Wave Rectifier, Full Wave Rectifier & Bridge Rectifier, Clippers & Clampers, Zener Diode as a Voltage Regulator.

• BJT Characteristics & Biasing: Transistor Current Components, Early Effect, Common Base, Common Emitter & Common Collector Configuration.
• Transistor Biasing & Thermal Stabilization: Operating Point, Fixed Bias, Emitter Bias, Voltage Divider Bias & Collector to Base Bias Circuit & Thermal Runaway.

6. Electronics Devices and Circuits: (10 Marks)

• Single Stage Amplifier, Multistage Amplifiers and their types with frequency responses.
• Feedback Amplifiers: Block Diagram, Series-Shunt, Shunt-Series, Series-Series, Shunt-Shunt Configuration.
• Large Signal Amplifier: Power Amplifier, Class A, Class B Push Pull Amplifier, Class C, Class AB, and Class D Amplifier.
• Oscillators.
• Operational Amplifiers: Characteristics of Ideal Op-amp, Equivalent Circuit of an Opamp, Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower, Differential Amplifier, Instrumentation Amplifier, etc.

7. Digital Electronics: (10 Marks)

• Logic Gates: NOT, AND, OR, NAND, NOR, EXOR & EXNOR.
• Minimization of Boolean Expression using different laws such as DE Morgan Theorem, Commutative Law, Associative Law, etc.
• Implementation of Boolean Expression using NAND and NOR gates.
• Number System Conversion
• Binary Code, Gray Code, EBCDIC Code, ASCII Code, Excess 3 Code, etc.
• Combinational Circuits: Half Adder & Full Adder, Half Subtractor & Full Subtractor, Multiplexer & Demultiplexer, Encoder & Decoder.
• Sequential Circuits: SR Flip Flop, JK Flip Flop, D Flip Flop, T Flip Flop, Registers & its types, Counters, Master Slave JK Flip Flop.

8. Basic Electrical Engineering: (10 Marks)

• Concept of Potential difference. Current and resistance. Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. SI units of work Power and Energy.
- Conversion of energy from one form to another in electrical and thermal systems.
- Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis.
- Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle period, frequency, instantaneous, peak, average, r.m.s. values, peak factor, and form factor, phase difference, lagging, leading and in phase quantities and phasor representation.
- Faradays' Law of Electromagnetic Induction, Fleming Left hand & Right-Hand Rule, Thumb Rule, and Lenz Law.

• Transformers: Introduction, Losses in a Transformer, Hysteresis & Eddy Current Loss, Efficiency etc.

9. Microprocessors & Microcontrollers: (10 Marks)

- 8085 Microprocessor: Architecture, Instruction Sets & Programming.
- 8086 Microprocessor: Architecture, Instruction Set & Programming.
- Introduction to 8051 Microcontroller.

Annexure "BE"

Syllabus for EduSat Assistant

Time: 02 Hours
Total Marks: 120

SEMESTER 1st
MAJOR COURSE

MCM122J: MASS COMMUNICATION AND MULTIMEDIA PRODUCTION (INTRODUCTION TO JOURNALISM)
CREDITS: THEORY – 04; PRACTICALS - 02

COURSE OBJECTIVES:

1. *To introduce students to the basics of journalism.*
2. *To acquaint them with basic process of journalism.*
3. *To develop the basic skills of journalism.*
4. *To introduce students to the technical terms/jargon of Journalism.*

THEORY (4 CREDITS)

UNIT I

- Journalism as a profession: Concept, nature and scope
- Journalism and democracy; Concept of Fourth Estate
- Job of a journalist, Qualities and skills of a journalist

UNIT II

- What is News, Understanding what makes news; News Values
- Types of News
- Features or components of a news story

UNIT III

- Five 'W's and One 'H': the Main Elements of News
- Generating story ideas
- Sources of news

UNIT IV

- Gathering information: Observation, Interviews, Documents, Internet
- Attribution & Verification; Multi-Sourcing
- Changing trends in Journalism
- Basic journalism terminology

PRACTICALS (2 CREDITS)

Practical work based on relevant theory topics

SUGGESTED READINGS

1. *Elements of Journalism. Bill Kovach & Tom Rosenstiel*
2. *Hough, George (1994). News Writing. Houghton Mifflin College.*
3. *Harcup, Tony (2009). Journalism Principles & Practices. London: Sage.*
4. *Smith, John (2007). Essential Reporting. London: Sage.*
5. *Mencher, Melvin (2011). News Reporting and Writing. New York: McGraw-Hill.*

SEMESTER 2nd
MAJOR COURSE

MCM222J: MASS COMMUNICATION AND MULTIMEDIA PRODUCTION (INTRODUCTION TO COMMUNICATION)
CREDITS: THEORY – 04; TUTORIALS - 02

COURSE OBJECTIVES:

1. *To introduce students to the concepts of communication.*
2. *To acquaint them with models of communication.*
3. *To introduce students to the theories of communication.*

THEORY (4 CREDITS)

UNIT I

- Defining Communication
- Need and functions of Communication
- Elements of Communication

UNIT II

- 7 C's of Communication; Barriers to Communication
- Communication Types: Verbal and Non-Verbal; Formal and Informal; Mediated and Non-Mediated
- Forms of Communication: Intrapersonal, Interpersonal, Group, Public, Mass Communication

UNIT III

- Communication as a process
- Linear and Non-linear models
- Basics concepts of models: Aristotle, Lasswell, Berlo, Shannon & Weaver, Schramm, Dance, Osgood, Westley& MacLean, Kincaid

UNIT IV

- Introduction Communication theory
- Theories of Powerful and Limited Effects, Normative theories of Press
- Functions of Mass Communication: Surveillance, Correlation, Entertainment, Cultural Transmission
- Dysfunctions of Mass Communication

TUTORIALS (2 CREDITS)

Tutorial based on relevant theory topics

SUGGESTED READINGS

1. Mass Communication Theory: An Introduction by Denis McQuail (2005)
2. Understanding Media by Marshall McLuhan
3. Mass Communication Theory and Practice by Uma Narula
4. Introduction to communication studies by John Fiske.
5. Theories of mass communication by Defluer and Ball Rockech

Bachelors with Mass Communication and Multimedia Production as Major

3rd SEMESTER

MCM322J: MEDIA ETHICS CREDITS: THEORY – 4, TUTORIAL: 2

THEORY (4 CREDITS: 60 HOURS) MAXIMUM MARKS: 100

MINIMUM MARKS: 36

Course Learning Outcomes:

To focus on ethical dimensions of issues related to media and understand ethical and moral standards of media professionalism. Students will be able to explore various ethical dilemmas that confront media professionals and know code of ethics of the profession.

UNIT – 1 (15 HOURS)

- Ethics in Journalism: An Introduction
- Understanding Truth and Accuracy
- Conflict of Interest, Freebies
- Sensationalism, Privacy

UNIT – 2 (15 HOURS)

- Media bias, Plagiarism
- Sting Operation, Phone tapping
- Misinformation, Disinformation
- Paid News, Fake News

UNIT – 3 (15 HOURS)

- Ethical aspect of live reporting
- Obtaining Consent, Anonymity
- Ethical considerations in covering marginalized groups, children and gender
- Ethical dilemmas while covering violence and disability

UNIT – 4 (15 HOURS)

- Media Trial, Accountability and Transparency
- Social Media Ethics: Ethical Practices while using Social Media
- SPJ Code of conduct for journalists

TUTORIALS (2 CREDITS: 30 HOURS) MAXIMUM MARKS: 50

MINIMUM MARKS: 18

Case Studies based on Media Ethics

Suggested Reading:

Merino, Noel. (2012). Media Ethics, Greenhaven

Bachelors with Mass Communication And Multimedia Production as Major

4th SEMESTER

MCM423J1: VISUAL COMMUNICATION CREDITS: THEORY – 3, TUTORIAL: 1

THEORY (3 CREDITS: 45 HOURS)

Course Learning Outcomes:

Students will be able to effectively convey ideas, emotions and messages through the skilful use of visual elements and principles of design.

UNIT – 1 (15 HOURS)

- Visual communication principles and significance
- Overview of historical development
- Elements: Line, Shape, Colour, Texture, Form
- Design principles: Balance, Contrast, Emphasis, Rhythm, Unity, Proportion

UNIT – 2 (15 HOURS)

- Graphic design essentials and applications
- Layout design for print and digital media
- Creating logos, posters, brochures
- Software tools: Adobe Creative Suite (Photoshop, Illustrator, InDesign)

UNIT – 3 (15 HOURS)

- Introduction to digital media
- Multimedia elements: images, audio, video, animation
- Interactive design for web, apps, social media
- Basics of video editing, animation, motion graphics

TUTORIALS (1 CREDIT: 15 HOURS) **MAXIMUM MARKS: 25**

MINIMUM MARKS: 9

- Discussing narrative techniques in visuals and using visuals to convey emotions, ideas
- Ethical considerations and cultural sensitivity in visuals and successful case studies

Suggested Reading:

- *Lester, P. M. (2014). Visual Communication: Images with Messages. Routledge.*
- *Lupton, E. (2014). Thinking with Type: A Critical Guide for Designers, Writers, Editors, & Students. Princeton Architectural Press.*
- *Krug, S. (2014). Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability. New Riders.*
- *Flaherty, F. (2000). The Elements of Story: Field Notes on Nonfiction Writing. Harper Perennial.*
- *Sherwin, R. (2017). Visual Storytelling: Inspiring a New Visual Language. Focal Press*

Bachelors with Mass Communication And Multimedia Production as Major
4th SEMESTER

MCM423J2: RADIO PRODUCTION
THEORY (4 CREDITS: 60 HOURS)

CREDITS: THEORY – 4, TUTORIAL: 2
MAXIMUM MARKS: 100
MINIMUM MARKS: 36

Course Learning Outcomes:
This course enables the students to describe various formats of radio formats and the production process of radio program

UNIT – 1 (15 HOURS)
- Radio as a medium of broadcasting
- Radio Broadcasting in India (Pre and Post-Independence)
- Different types of radio stations and transmissions
- Organizational structure and functionaries of a radio station

UNIT – 2 (15 HOURS)
- Programme formats (Interviews, Discussion and Drama)
- Radio News
- Radio Features

UNIT – 3 (15 HOURS)
- Writing for Radio
- Principles of scripting
- Writing links and announcements

UNIT – 4 (15 HOURS)
- Voice modulation, Pronunciation
- Presentation Styles
- Types of Microphones

TUTORIALS (2 CREDITS: 30 HOURS) **MAXIMUM MARKS: 50**

Group Assignment: Write, Record and Edit any radio programme.

Suggested Readings:

- *Mc Leish, R & Link, J. (2016). Radio production. Focal Press.*
- *Fleming, C. (2009) The radio handbook. Routledge.*

- *Ford, M. (2013). Radio production. digital broadcast art. Create Space.*
- *Gilmurray, B. (2010). The media student's guide to radio production. Mightier Pen Pub.*
- *Hausman, C. et al. (2012). Modern radio production: production, programming and performance. Wadsworth.*
- *Keith, C. M. (2010). The radio station: broadcast satellite and internet. Focal Press.*
- *Alten, S.R. (2008). Audio in media (8th ed.). Belmont, CA: Thompson Wadsworth.*
- *McCoy, Q. (1999). No static: A guide to creative radio programming. San Francisco: Backbeat Books.*

Bachelors with Mass Communication And Multimedia Production as Major

4th SEMESTER

MCM423J3: DEVELOPMENT COMMUNICATION CREDITS: THEORY-4
TUTORIAL: 2
THEORY (4 CREDITS: 60 HOURS) **MAXIMUM MARKS: 100**
MINIMUM MARKS: 36

Course Learning Outcomes:
During the course of the study the student will be given an understanding of the process of development and the role of communication in it.

UNIT – 1 (15 HOURS)
- Development: Definition, Meaning and Process
- Human development
- Role of UN and its allied agencies.
- MDG's SDG's.

UNIT – 2 (15 HOURS)
- Theories and Models of development: Dominant paradigm, Dependency model, Alternative paradigm
- Basic needs models
- Nehruvian model
- Gandhian model

UNIT – 3 (15 HOURS)
- Development communication: Definition, Concept, Purpose
- Dev comm. approaches – Diffusion of Innovation, Empathy and Magic Multiplier
- Alternative Dev comm. approaches: Participatory Approach
- Designing messages for Development Communication.

UNIT – 4 (15 HOURS)
- Cyber Media and Development –e-governance, e-chaupal
- ICT for development
- Development Support Communication (DSC),
- Development support communication in India in the areas of: Agriculture, Health & Family Welfare, Women Empowerment.

TUTORIALS (2 CREDITS: 30 HOURS)

MAXIMUM MARKS: 50
MINIMUM MARKS: 18

Practical: Critical analysis of mainstream media's reportage of development issues in India. Analysis of mainstream TV news media reportage on rural problems and issues in India.

Suggested Reading:

- *Hamelink, J. &Mehra, A. (eds.) Communication Development and Human Rights in Asia.Singapore: AMIC.*
- *McPhail, T. L. Development Communication: Reframing the Role of the Media.Sussex: Wiley-Blackwell.*
- *Melkote, S. &Steeves, H. L. Communication for Development in the Third world. Theory and Practice for Empowerment. Thousand Oaks, CA : Sage.*
- *Mies, M. & Shiva, V. Ecofeminism.London: Zed Books.*
- *Mody, B., Designing Messages for Development Communication: An Audience Participation-Based Approach. London: Sage*
- *Neuzil, M. Mass Media and Environmental Conflict: America's Green Crusades.Thousand Oaks, CA: Sage.*

MARKS: 50
RKS: 18

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I)
5th SEMESTER

MCM522J1 MCMP _ NEW MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to critically analyse and navigate the evolving landscape of New Media, demonstrating an understanding of its impact on society, communication, and culture.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- New Media: Meaning Characteristics, Principles
- New Media Interface
- New Media Economy
- Impact of New Media on Journalism

UNIT – 2 (15 HOURS)

- New Media Ecology, Installations
- Elements of Transmedia Narratives across multiple media
- Online Story Construction, Blog, Trends in web/online Journalism
- Artificial Intelligence, Augmented Reality

UNIT – 3 (15 HOURS)

- Tools and Techniques for Online Journalism
- New Media Ethics: Copyright and Legal issues in cyber space,
- Editing online content
- Dark Side of New Media

TUTORIALS (1 CREDIT: 15 HOURS)

- Producing a digital story.
- Constituents of new media- Web 2.0-3.0, Blogs, Micro Blogs, Wikis, social media.
- Using Facebook, Twitter, WordPress, Blogger, YouTube, Docs, Drive, Hangouts

SUGGESTED READINGS:

- Humphreys, Ashlee. Social Media. New York: Oxford University Press
- Levinson, Paul. New Media (2nd Edition). Boston: Pearson.
- Manovich, L. (2001). The language of new media. MIT press.
- Jenkins, H. (2006). Convergence culture: Where old and new media collide. NYU press.
- Flew, T. (2007). New media: An introduction. Oxford: Oxford University Press.
- Gerbaudo, P. (2018). Tweets and the streets: social media and contemporary activism. Pluto Press.
- Castells, M. (2004). The network society A cross-cultural perspective. Edward Elgar Lev Manovich.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – BACHELORS WITH MASS COM

5th SEMESTER

MCM522J2 MCMP _ MEDIA HISTORY

CREDITS: THEORY – 4, TUTORIAL – 2 CM522N MCMP – NEW MEDIA

COURSE LEARNING OUTCOMES:

To trace historical growth and development of media in India and abroad and develop awareness about major landmark events that have helped in shaping the media scenario around

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Traditional Media: Introduction
- History and Origin of Printing
- Evolution of press in India: pre- and post-independence era
- Language Press in India

UNIT – 2 (15 HOURS)

- History of broadcasting at global level
- Growth of Radio in India
- Television in India
- Growth of Digital Media

UNIT – 3 (15 HOURS)

- Origin and development of Folk Media
- Evolution of Cinema in India
- Parallel and Commercial Cinema
- Role of Media in Development

UNIT – 4 (15 HOURS)

- Press in Jammu and Kashmir: Early period
- Growth and Development of Press in Jammu and Kashmir
- Radio and Television in Jammu and Kashmir
- Challenges faced by media professionals

INTERNSHIP

OR

TUTORIALS (2 CREDITS: 30 HOURS)

Group Assignments and class presentations about various aspects of Media History.

SUGGESTED READINGS:

- Ahuja, B.N. (2015). History of Indian Press: Growth of Newspapers in India
- Khanna, Amit. (2019). Words. Sounds. Images: A History of Media and Entertainment in India. HarperCollins India
- Melkote, Srinivas. R. (1998). In International satellite broadcasting in South Asia: Political, economic, and cultural implications. Peter Shields, Binod C. Agrawal (Eds). University Press of America
- Natarajan, J. History of Indian Journalism. Creative Media Partners
- Parthasarathy, Rangaswami. (2017). Journalism in India: From the Earliest Times to the Present Day. New Delhi: Sterling Publishers
- Saraf, Mulk Raj. (1967). Fifty Years as a Journalist. Raj Mahal Publishers

(CT – II)

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT – I)

5th SEMESTER

MCM522N MCMP _ NEW MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to critically analyse and navigate the evolving landscape of New Media, demonstrating an understanding of its impact on society, communication, and culture.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- New Media: Meaning Characteristics, Principles
- New Media Interface
- New Media Economy
- Impact of New Media on Journalism

UNIT – 2 (15 HOURS)

- New Media Ecology, Installations
- Elements of Transmedia Narratives across multiple media
- Online Story Construction, Blog, Trends in web/online Journalism
- Artificial Intelligence, Augmented Reality

UNIT – 3 (15 HOURS)

- Tools and Techniques for Online Journalism
- New Media Ethics: Copyright and Legal issues in cyber space,
- Editing online content
- Dark Side of New Media

TUTORIALS (1 CREDIT: 15 HOURS)

- Producing a digital story.
- Constituents of new media- Web 2.0-3.0, Blogs, Micro Blogs, Wikis, social media.
- Using Facebook, Twitter, WordPress, Blogger, YouTube, Docs, Drive, Hangouts

SUGGESTED READINGS:

- Humphreys, Ashlee. Social Media. New York: Oxford University Press
- Levinson, Paul. New Media (2nd Edition). Boston: Pearson.
- Manovich, L. (2001). The language of new media. MIT press.
- Jenkins, H. (2006). Convergence culture: Where old and new media collide. NYU press.
- Flew, T. (2007). New media: An introduction. Oxford: Oxford University Press.
- Gerbaudo, P. (2018). Tweets and the streets: social media and contemporary activism. Pluto Press.
- Castells, M. (2004). The network society A cross-cultural perspective. Edward Elgar Lev Manovich.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – III)
5th SEMESTER

MCM522J3 MCMP _ ADVERTISING **CREDITS: THEORY – 4, TUTORIAL: 2**

COURSE LEARNING OUTCOMES:
To introduce students to the concept and process of advertising and to outline the importance of advertisements for the success of brands.

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Advertising: Definition and Concept
- History and Evolution of Advertising in India
- Functions and Types of Advertising

UNIT – 2 (15 HOURS)

- Importance of Advertising as a Marketing Strategy
- Understanding Brand, Brand Image and Brand Equity
- Role of Advertising in building Brand Image and Brand Equity

UNIT – 3 (15 HOURS)

- Target Audience: Importance and Scope
- Various Media for Advertising
- Print, Electronic and Digital advertising

UNIT – 4 (15 HOURS)

- Advertising Agency: Definition and Types
- Structure and Function of an Advertising Agency
- Creativity: Concept and Importance in Advertising
- Creative Brief

TUTORIALS (2 CREDITS: 30 HOURS)

- ***Group Assignments and class presentations, especially designing of ads.***

SUGGESTED READING:

- Contemporary Advertising, 2017, 15th Edition, William Arens, Michael Weigold and Christian Arens, Hill Higher Education
- Brand Equity & Advertising- Advertising's role in building strong brands, 2013- David A. Aker, Alexander L. Biel, Psychology Press

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I)
6th SEMESTER

MCM622J1 MCMP _ FOLK MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to appreciate the cultural significance and artistic expressions of Folk Media, understanding its role in preserving traditions, promoting community identity, and fostering social cohesion.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Introduction to traditional folk media
- Different forms of popular traditional media
- Characteristics of folk media
- Various popular forms of folk media in India (Folk Theatre, Folk Songs, Puppet Shows)

UNIT – 2 (15 HOURS)

- Folk Media vs Electronic Media
- Limitations of mass media and advantages of folk media
- Role of traditional folk media in communicating modern themes
- Folk Media and community engagement: Understanding the nature and style of folk media

UNIT – 3 (15 HOURS)

- Integrated use of Folk Media and Mass Media
- Song and Drama Division and Field Publicity Units
- Field Publicity Units
- Use of Folk media for developmental messages

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Practical work based on Kashmiri Folk Traditions (Bandpather, PadshaDaleel, Ladi Shah)***

SUGGESTED READINGS:

- Parmer, Shyam. Traditional Folk Media in India. New Delhi: Geka Books.
- Sitaram, K.S. Culture and Communication, Associate Printers, Mysore.
- Ranganath, H.K. Folk Media and Communication, Chintam Prakashana, Mysore.
- Vijaya, N. The Role of Traditional Folk Media in Rural Areas, Gian Publishing, House, Delhi.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – BACHELORS WI

6th SEMESTER

MCM622J2 MCMP _ CINEMA STUDIES

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will understand evolution and significance of cinema and various technicalities in film making

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Concept and Significance of Cinema
- Evolution of Cinema
- Indian New Wave Cinema or Parallel Cinema
- Culture and Cinema: Characteristics and portrayal

UNIT – 2 (15 HOURS)

- Stages of Production – Pre-production, production and post-production
- Technicalities in Cinema: Semiotics, Narratives, Intertextuality, Mise-en-scene
- Shots and scene, camera movements and angles
- Light, Sound and Composition

UNIT – 3 (15 HOURS)

- Film Genre: Action, Thriller, Comedy, Tragedy, Horror, Scientific Fiction
- Film Narrative: Structural Analysis (Exposition, Rising action, Falling action)
- Film Budgeting
- Pioneers in film making

UNIT – 4 (15 HOURS)

- Film Reviews
- Film Festivals
- Theories of Film making
- Screening of any two national/international award-winning films

PRACTICALS (2 CREDITS: 30 HOURS)

Short Films to be produced by students in groups as part of Practical

SUGGESTED READINGS:

- Ascher, Steven and Pincus, Edward. (2013). The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age (Fifth Edition). Penguin
- Belavadi, Vasuki. (2007). Video Production. Oxford University Press
- Hayward, Susan. (2022). Cinema Studies: The Key Concepts (6th Edition). Routledge
- Hunt, Robert Edgar , Marland, John , Rawle, Steven. (2018). The Language of Film. Bloomsbury. London
- Monaco, James. (2000). How to Read a Film: The World of Movies, Media and Multimedia (Language, History, Theory). Oxford University Press

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT – I)

6th SEMESTER

MCM622N MCMP _ FOLK MEDIA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *Students will be able to appreciate the cultural significance and artistic expressions of Folk Media, understanding its role in preserving traditions, promoting community identity, and fostering social cohesion.*

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Introduction to traditional folk media
- Different forms of popular traditional media
- Characteristics of folk media
- Various popular forms of folk media in India (Folk Theatre, Folk Songs, Puppet Shows)

UNIT – 2 (15 HOURS)

- Folk Media vs Electronic Media
- Limitations of mass media and advantages of folk media
- Role of traditional folk media in communicating modern themes
- Folk Media and community engagement: Understanding the nature and style of folk media

UNIT – 3 (15 HOURS)

- Integrated use of Folk Media and Mass Media
- Song and Drama Division and Field Publicity Units
- Field Publicity Units
- Use of Folk media for developmental messages

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Practical work based on Kashmiri Folk Traditions (Bandpather, PadshaDaleel, Ladi Shah)***

SUGGESTED READINGS:

- Parmer, Shyam. Traditional Folk Media in India. New Delhi: Geka Books.
- Sitaram, KS. Culture and Communication, Associate Printers, Mysore.
- Ranganath, H.K. Folk Media and Communication, Chintam Prakashana, Mysore.
- Vijaya, N. The Role of Traditional Folk Media in Rural Areas, Gian Publishing, House, Delhi.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – III)
6th SEMESTER

MCM62233 MCMP _ PUBLIC RELATIONS

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will be able to strategically manage and enhance the reputation and communication of organizations in diverse media environments

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Public Relations: Definitions, Meaning, Scope
- Concept of Publics in PR
- Ethics in PR

UNIT – 2 (15 HOURS)

- Origin and Growth of PR as a Profession
- Public Relations in India: A Brief Historical Perspective
- Top PR Firms in India

UNIT – 3 (15 HOURS)

- Public Opinion: Meaning and Definitions
- Propaganda: Concept
- Public Relation Tools

UNIT – 4 (15 HOURS)

- Public Relation Campaign
- Public Relations and Advertising
- New Media in Public Relations

TUTORIALS (2 CREDITS: 30 HOURS)

Group Assignments and class presentations based on PR Campaigns.

SUGGESTED READINGS:

- Smith, R. (2013). Public Relations: The Basics. United Kingdom: Taylor & Francis.
- Bernays, E. L. (2013). Public Relations. (n.p.): University of Oklahoma Press.
- Vilanilam, J. V. (2011). Public Relations in India: New Tasks and Responsibilities. India: SAGE.

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I)
7th SEMESTER

MCM722J1 MCMP_ EXPLORING HINDI CINEMA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

To provide comprehensive understanding about growth and development of Hindi Cinema and to gain expertise in film-making.

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Historical Overview and Development of Hindi Cinema
- Early period and Silent Era in Indian Cinema
- Emergence of Film Studios: New Theatres, Bombay Talkies, Imperial theatre, R.K. Studio
- The Golden Age

UNIT – 2 (15 HOURS)

- Contemporary Hindi cinema
- Themes, Representation, Gender and Identity in Hindi Cinema
- Stalwarts of Indian cinema: Satyajit Ray, Mehboob, Shyam Benegal, Guru Dutt, Raj Kapoor, Dilip Kumar
- Reference films: Raja Harishchandra, Alam Ara

UNIT – 3 (15 HOURS)

- Screenplay: Concept and Purpose
- Elements and Structure of Screenplay
- Films and Digital platforms
- Challenges and Opportunities for Hindi Cinema

TUTORIALS (1 CREDIT: 15 HOURS)

Short Films to be produced by students in groups as part of practical exercise

SUGGESTED READINGS:

- Ascher, Steven and Pincus, Edward. (2007). The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age, Plume
- Ganti, Tejaswini. (2013). Bollywood: A Guidebook to Popular Hindi Cinema (Second Edition). Routledge
- Gehlawat, Ajay and Dudrah, Rajinder. (2019). The Evolution of Song and Dance in Hindi Cinema. Routledge
- Rabinger, Michael and Hurbis-Cherrier, Mick. (2020). Directing: Film Techniques and Aesthetics (6th Edition), Routledge
- Rajadhyaksha, Ashish. (2016). Indian Cinema: A Very Short Introduction. OUP Oxford

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – I

7th SEMESTER

MCM722J2 MCMP _ INTERNATIONAL COMMUNICATION

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will develop a comprehensive understanding of the key concepts, theories and challenges in International Communication, enabling them to critically analyse and effectively navigate the complexities of global media landscapes

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- International communication: Significance
- Brief history of international communication
- Communication and Global interactions
- Understanding Different Cultures in communication

UNIT – 2 (15 HOURS)

- Key communication theories for cross-cultural situations
- Different Cultures: Communication Interface
- Media and technology for global connections
- Ethics in cross-cultural communication

UNIT – 3 (15 HOURS)

- Media outreach across globe
- Impact of global media on cultures and societies
- Social media's role in connecting people internationally
- Challenges in media accessibility

UNIT – 4 (15 HOURS)

- International diplomacy and role of communication.
- Using communication for building positive relationships
- Real examples in global communication

TUTORIALS (2 CREDITS: 30 HOURS)

Group assignments and presentations about various aspects of International Communication.

SUGGESTED READINGS:

- Thussu, D. K. (2018). International communication: Continuity and change. Bloomsbury Publishing.
- DeFleur, M. L., & Dennis, E. E. (2018). Understanding mass communication: A liberal arts perspective. Routledge.
- Samovar, L. A., & Porter, R. E. (2010). Communication between cultures. Cengage Learning.
- Castells, M. (2010). The rise of the network society: The information age: Economy, society, and culture (Vol. 1). John Wiley & Sons.
- Seib, P. (2016). Real-time diplomacy: Politics and power in the social media era. Springer.

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BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – III)
7th SEMESTER

MCM722J3 MCMP _ GRAPHIC DESIGNING

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will develop understanding about graphic designing and its functions and applications, besides knowing about different softwares and techniques used to create an engaging content

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Graphic Designing: Concept and Purpose
- Evolution and Scope of Graphic Designing
- Significance of graphic design in contemporary media scenario
- Role of a Graphic Designer

UNIT – 2 (15 HOURS)

- Elements of Design: Line, Shape, Form, Space, Colours etc
- Principles of Design: Unity, Harmony, Balance, Rhythm, Perspective, Emphasis, Proportion, Repetition
- Composition and Layout
- Qualities of a Graphic Designer

UNIT – 3 (15 HOURS)

- Importance of Visual Communication
- Skills and Techniques in Graphic Design
- Digital and interactive media design
- Visualization and Animation: An Overview

UNIT – 4 (15 HOURS)

- Adobe Photoshop
- Illustrator
- InDesign
- Prepare a business plan for an enterprise in graphic design

PRACTICAL (2 CREDITS: 30 HOURS)

Group Assignments and class presentations based on theory inputs

SUGGESTED READINGS:

- *Albers, Josef. (2013). Interaction of Colour. Yale University Press*
- *Franchi, Francesco. (2013). Designing News: Changing the World of Editorial Design and Information Graphics. Gestalten*
- *Hara, Kenya. (2014). Designing Design. Lars Muller Publishers*
- *Roberts, Lucienne & Wright, Rebecca. (2010). Design Diaries: Creative Process in Graphic Design. Laurence King Publishing*
- *Wheeler, Alina. (2012). Designing brand identity: As essential guide for the whole branding team (Fourth edition)*

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT_ BACHELORS WITH M

7th SEMESTER

MCM722N MCMP _ EXPLORING HINDI CINEMA

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

To provide comprehensive understanding about growth and development of Hindi Cinema and to gain expertise in film-making.

THEORY (3 CREDITS: 45 HOURS)

UNIT – 1 (15 HOURS)

- Historical Overview and Development of Hindi Cinema
- Early period and Silent Era in Indian Cinema
- Emergence of Film Studios: New Theatres, Bombay Talkies, Imperial theatre, R.K. Studio
- The Golden Age

UNIT – 2 (15 HOURS)

- Contemporary Hindi cinema
- Themes, Representation, Gender and Identity in Hindi Cinema
- Stalwarts of Indian cinema: Satyajit Ray, Mehboob, Shyam Benegal, Guru Dutt, Raj Kapoor, Dilip Kumar
- Reference films: Raja Harishchandra, Alam Ara

UNIT – 3 (15 HOURS)

- Screenplay: Concept and Purpose
- Elements and Structure of Screenplay
- Films and Digital platforms
- Challenges and Opportunities for Hindi Cinema

TUTORIALS (1 CREDIT: 15 HOURS)

Short Films to be produced by students in groups as part of practical exercise

SUGGESTED READINGS:

- Ascher, Steven and Pincus, Edward. (2007). The Filmmaker's Handbook: A Comprehensive Guide for the Digital Age, Plume
- Ganti, Tejaswini. (2013). Bollywood: A Guidebook to Popular Hindi Cinema (Second Edition). Routledge
- Gehlawat, Ajay and Dudrah, Rajinder. (2019). The Evolution of Song and Dance in Hindi Cinema. Routledge
- Rabinger, Michael and Hurbis-Cherrier, Mick. (2020). Directing: Film Techniques and Aesthetics (6th Edition), Routledge
- Rajadhyaksha, Ashish. (2016). Indian Cinema: A Very Short Introduction. OUP Oxford.

NOR (CT – 1)

IAL: 1

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – 1)
8th SEMESTER

MCM822J1 MCMP _ COMMUNICATION RESEARCH

COURSE LEARNING OUTCOMES:

CREDITS: THEORY – 3, TUTORIAL: 1

- *The course aims to equip students with the skills necessary to critically evaluate communication research and to plan and execute their own research projects.*

UNIT – 1 (15 HOURS)

- Role of research in communication studies
- Exploring research process from conceptualization to dissemination
- Qualitative and quantitative research approaches
- Ethical considerations in communication research

UNIT – 2 (15 HOURS)

- Types of research designs: Exploratory, Descriptive, Experimental, And Correlational
- Sampling techniques and considerations
- Constructing research questions and hypotheses
- Data collection methods: surveys, interviews, content analysis, focus groups, etc.

UNIT – 3 (15 HOURS)

- Literature review: sourcing, reviewing, and synthesizing existing research
- Developing a research proposal
- Data analysis and interpretation
- Writing research papers and presenting results.

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Group work to prepare a research paper.***

SUGGESTED READINGS:

- Deacon, D., Golding, P., Green, L., & Sweeney, M. (2021). Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis. Bloomsbury Academic USA; 3rd edition. ISBN: 9781501316968
- Plooy, G. (2007). Communication Research: Techniques, Methods, and Applications. Juta Academic ISBN: 0702156418

NOR (CT – 1)

AL: 1

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR (CT – 1)
8th SEMESTER

MCM822J1 MCMP _ COMMUNICATION RESEARCH

CREDITS: THEORY – 3, TUTORIAL: 1

COURSE LEARNING OUTCOMES:

- *The course aims to equip students with the skills necessary to critically evaluate communication research and to plan and execute their own research projects.*

UNIT – 1 (15 HOURS)

- Role of research in communication studies
- Exploring research process from conceptualization to dissemination
- Qualitative and quantitative research approaches
- Ethical considerations in communication research

UNIT – 2 (15 HOURS)

- Types of research designs: Exploratory, Descriptive, Experimental, And Correlational
- Sampling techniques and considerations
- Constructing research questions and hypotheses
- Data collection methods: surveys, interviews, content analysis, focus groups, etc.

UNIT – 3 (15 HOURS)

- Literature review: sourcing, reviewing, and synthesizing existing research
- Developing a research proposal
- Data analysis and interpretation
- Writing research papers and presenting results.

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Group work to prepare a research paper.***

SUGGESTED READINGS:

- Deacon, D., Golding, P., Green, L., & Sweeney, M. (2021). Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis. Bloomsbury Academic USA; 3rd edition. ISBN: 9781501316968
- Plooy, G. (2007). Communication Research: Techniques, Methods, and Applications. Juta Academic ISBN 0702156418

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR
8th SEMESTER

MCM822J2 MCMP _ VIDEO PRODUCTION

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

To blend theoretical dialogues by hands-on activities and imaginative endeavors, students will acquire a comprehensive understanding of video production, spanning from meticulous pre-production strategizing to skillful post-production editing.

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Understanding significance of video as a communication medium
- Basics of visual storytelling and narrative structures.
- Introduction to video equipment, cameras, tripods, and accessories.
- Composition and Framing Techniques.

UNIT – 2 (15 HOURS)

- Importance of lighting
- Controls for exposure, focus, and white balance.
- Three-point lighting setup and its variations.
- Types of lights. Indoor and outdoor lighting.

UNIT – 3 (15 HOURS)

- Script writing, story boarding, and short lists.
- Understanding the elements of a compelling story.
- Planning for different video genres: documentaries, interviews, narratives
- Editing techniques.

UNIT – 4 (15 HOURS)

- Role and responsibilities of production team.
- Video editing software and process.
- Copyright and fair use in video production.
- Ethical considerations in video journalism and documentary film-making

TUTORIALS (2 CREDITS: 30 HOURS)

Group Assignments related to Video Production

SUGGESTED READINGS:

- *Compesi, R., Gomez, J. (2017) Introduction to Video Production :Studio, Field, and Beyond. Taylor & Francis.ISBN:9781351784177.*
- *Diefenbach, D., Slatton, A (2019). Video Production Techniques: Theory and Practice from Concept to Screen. Taylor & Francis.ISBN:9781351051682.*
- *Donald, R. (2000). Fundamentals of Television Production. John Wiley & Sons. ISBN:0813827396*

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR
8th SEMESTER

MCM822J3 MCMP _ MEDIA APPRECIATION

CREDITS: THEORY – 4, TUTORIAL: 2

COURSE LEARNING OUTCOMES:

Students will be able to produce engaging videos that demonstrate a thorough understanding of key concepts and techniques in video production

THEORY (4 CREDITS: 60 HOURS)

UNIT – 1 (15 HOURS)

- Importance of Media in society
- Different media types: print, digital, visual, audio
- Basics of media literacy and critical thinking

UNIT – 2 (15 HOURS)

- Techniques to analyse visuals (photography, film)
- Elements of visual composition: framing, lighting, colour

UNIT – 3 (15 HOURS)

- Analysing audio media (music, podcasts)
- Recognizing narrative in visual and audio media

UNIT – 4 (15 HOURS)

- Media's impact on culture, identity, trends
- Discussing media's role in social and political issues
- Ethical considerations in media consumption

TUTORIALS (2 CREDITS: 30 HOURS)

- Critiquing print media: newspapers, magazines, ads
- Assessing digital media: websites, social platforms

SUGGESTED READINGS:

- *Baran, S. J., & Davis, D. K. (2015). Mass communication theory: Foundations, ferment, and future. Cengage Learning.*
- *Messaris, P. (2014). Visual persuasion: The role of images in advertising. SAGE Publications.*

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MINOR (CT – 1)
8th SEMESTER

MCM822N MCMP _ COMMUNICATION RESEARCH

CREDITS: THEORY – 3, TUTORIAL : 1

COURSE LEARNING OUTCOMES:

- *The course aims to equip students with the skills necessary to critically evaluate communication research and to plan and execute their own research projects.*

UNIT – 1 (15 HOURS)

- Role of research in communication studies
- Exploring research process from conceptualization to dissemination
- Qualitative and quantitative research approaches
- Ethical considerations in communication research

UNIT – 2 (15 HOURS)

- Types of research designs: Exploratory, Descriptive, Experimental, And Correlational
- Sampling techniques and considerations
- Constructing research questions and hypotheses
- Data collection methods: surveys, interviews, content analysis, focus groups, etc.

UNIT – 3 (15 HOURS)

- Literature review: sourcing, reviewing, and synthesizing existing research
- Developing a research proposal
- Data analysis and interpretation
- Writing research papers and presenting results.

TUTORIALS (1 CREDIT: 15 HOURS)

- ***Group work to prepare a research paper.***

SUGGESTED READINGS:

- Deacon, D., Golding, P., Green, L., & Sweeney, M. (2021). Researching Communications: A Practical Guide to Methods in Media and Cultural Analysis. Bloomsbury Academic USA; 3rd edition. ISBN: 9781501316968

Plooy, G. (2007). Communication Research: Techniques, Methods, and Applications. Juta Academic ISBN: 0702156418

BACHELORS WITH MASS COMMUNICATION AND MULTIMEDIA PRODUCTION AS MAJOR
8th SEMESTER

MCM822J2 MCMP _ VIDEO PRODUCTION

CREDITS: THEORY – 4, TUTORIAL : 2

COURSE LEARNING OUTCOMES:

To blend theoretical dialogues by hands-on activities and imaginative endeavors, students will acquire a comprehensive understanding of video production, spanning from meticulous pre-production strategizing to skillful post production editing.

THEORY (4 CREDITS: 60 HOURS)

B Tech - Electronics

3rd Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCMTH31	**Engineering Mathematics - III**	2	1	3

Section	Course contents	Hours
1.	Laplace transform, shifting theorem	4
2.	Laplace transform of differential functions	4
3.	Heaviside's unit step function	2
4.	Dirac-delta function and its Laplace transform	2
5.	Heaviside's expansion theorem	2
6.	Inverse Laplace transform	4
7.	Initial and final value theorem	3
8.	Convolution theorem	1
9.	Applications of Laplace transform in the solution of linear differential equations	4
10.	Fourier series, Harmonic Analysis	4
11.	Definition of Fourier transform, Fourier sine and Cosine Transform	3
12.	Fourier integral formula	4
13.	Applications to solutions of BVP	4
14.	Data modeling , types, tools and techniques	4
15.	Data interpretation , types methods and tools	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Laplace Transforms by Murray R. Speigal
2. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
3. Higher Engg. Mathematics: B.S. Grewal - Khanna publishers.
4. Advanced Engineering Mathematics: Michael D Greenberg-PHI.
5. Higher engineering mathematics: H. K. Dass, Rajnish Verma-S. Chand

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE36L	**EDA Tools Lab – I**	2	1

Introduction to ARDUINO

Section	Course Contents
1	**Basic IDE:** Creating and Saving a Sketch-Structuring an Arduino Program-Using Simple Primitive Types- Using Floating-Point Numbers Working with Groups of Values Using Arduino -Structuring Your Code into Functional Blocks Returning More Than One Value from a Function-Taking Actions Based on Conditions-Repeating a Sequence of Statements-Repeating Statements with a Counter-Breaking Out of Loops-Taking a Variety of Actions Based on a Single Variable-Comparing Character and Numeric Values-Comparing Strings -Performing Logical Comparisons Performing Bitwise Operations-Combining Operations and Assignment.
2	**Using Mathematical Operators:** Finding the Remainder After Dividing Two Values-Determining the Absolute Value Constraining a Number to a Range of Values Finding the Minimum or Maximum of Some Values Raising a Number to a Power Taking the Square Root Rounding Floating-Point Numbers Up and Down Using Trigonometric Functions Generating Random Numbers Setting and Reading Bits Shifting Bits Extracting High and Low Bytes in an int or long Forming an int or long from High and Low Bytes.
3	**Serial Communications:** Sending Debug Information from Arduino to Your Computer Sending Formatted Text and Numeric Data from arduino , Receiving Serial Data in Arduino Sending Multiple Text Fields from Arduino in a Single Message, Receiving Multiple Text Fields in a Single Message in Arduino Sending Binary Data from Arduino Receiving Binary Data from Arduino on a Computer Sending Binary Values from Processing to Arduino Sending the Value of Multiple Arduino Pins Logging Arduino Data to a File on Your Computer.
4	**Digital and Analog input/Output**: Using a Switch Using a Switch Without External Resistors Reliably, Detecting the Closing of a Switch Determining How Long a Switch Is Pressed Detecting Movement Detecting Light Detecting Motion (Integrating Passive Infrared Detectors) Measuring Distance Measuring Distance Accurately Detecting Vibration Detecting Sound Measuring Temperature Connecting and Using LEDs Adjusting the Brightness of an LED Driving High-Power LEDs Adjusting the Color of an LED Sequencing Multiple LEDs: Creating a Bar Graph Sequencing Multiple LEDs: Driving a 7-Segment LED Display Driving Multidigit, Increasing the Number of Analog Outputs Using PWM Extender Chips (TLC5940) Controlling Servos from the Serial Port.

Tools Required: Matlab, Labview, Arduino IDE and Supported Hardware

Course No.	Subject	Teaching Periods	Credits
		P	
ESCECE35L	**Data Structures Lab**	2	1

List of Experiments

1. Basic concepts of data, linear lists, strings, arrays and orthogonal lists, representation of trees & graphs, storage systems, Arrays, Recursion, Stacks, Queues, Linked lists, Binary trees, General Trees, Tree Traversal, Symbol Table and Searching Techniques, Sorting Techniques, graphs.
2. Implement singly and doubly linked lists.
3. Represent a polynomial as a linked list and write functions for polynomial addition.
4. Implement stack and use it to convert infix to postfix expression.
5. Implement array-based circular queue and use it to simulate a producer consumer problem.
6. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
7. Implement binary search tree.
8. Implement priority queue using heaps.
9. Implement hashing techniques.
10. Implement various sorting techniques as taught in class.
11. Implement Dijkstra's algorithm using priority queues.
12. Implement Prim's and Kruskal's algorithms.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE34L	Digital System Design Lab – I	2	1

List of Experiments

1. To do the following:
   A. To verify the truth table of following logic gates:
      a. AND OR and NOT
      b. NAND, NOR, XOR and XNOR
   B. Design of Basic NOT, OR, AND, NAND, NOR Gates using DDL, RTL, DTL, TTL, and CMOS integrated circuits. Study of Open Collector, Open Drain and Totem-Pole Logic Family Configurations.
2. To implement XOR and XNOR using universal logic gates.
   A. To verify De-Morgan's law using logic gates.
   B. To implement certain Boolean expressions and check their equality.
3. To design and realize:-
   A. Half adder and verify its truth table.
   B. Full adder and verify its truth table.
   C. Half Subtractor and verify its truth table
   D. Full Subtractor and verify its truth table.
4. To design a multiplexer/demultiplexer using two input NAND gates
5. To design a 4 bit binary to decimal converter.
6. Design and realize the following flip flops using logic gates.
   A. RS flip flop
   B. JK flip flop
   C. D flip flop
   D. T flip flop

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE33L	**Analog Electronic Circuits Lab – I**	2	1

List of Experiments

1) Introduction about basic equipments in Analog electronics lab.
2) Study of CRO & DSO - Measurement of Voltage, frequency and Phase of a given waveform.
3) Study of Function Generator and working with various signals and their attributes.
4) To study VI characteristics of a silicon rectifier Diode, Shottky barrier Diode, LED and Zener Diode using Multisim and Hardware Test bench.
5) Halfwave, Full-wave rectifier circuits and to study their performance using Multisim and Hardware Test bench.
6) To study clipping and clamping circuits on Multisim and Hardware Test bench.
7) To study voltage regulation using Zener diode.
8) Study V-I characteristics of transistor (PNP and NPN) and calculate the performance parameters of a transistor in CB and CE Configurations.
9) To assemble a CB amplifier with various biasing configurations and observe its performance.
10) To assemble a CE amplifier with various biasing configurations and observe its performance.
11) To design a practical amplifier using transistors with given specifications and parameters.
12) To Study V-I characteristics of JFET and MOSFET and determine their performance parameters.
13) To Study various FET and MOSFET configurations and their practical application circuits.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE32L	Network Analysis and Synthesis Lab	2	1

List of Experiments

1) Lissajous Patterns- Measurement of Voltage frequency and Phase of a different waveform.
2) To assemble LCR circuits and find time constant of each. Observe their performance in low pass and high pass mode.
3) For a given two port network measure:
   a. z parameters.
   b. y parameters.
   c. ABCD parameters.
   d. h parameters.
4) To experimentally determine the characteristic impedance and to plot the attenuation characteristics of the following circuits.
   a. Constant-k Low Pass Filter.
   b. Constant-k High Pass Filter.
   c. m-derived Low Pass Filter.
   d. m-derived High Pass Filter.

Course No.	Subject	Teaching Periods		Credits
		L	T	
ESCECE35	**Data Structures**	2	1	3

Section	Course contents	Hours
1	**Introduction:** Basic concept of data, structures and pointers	5
2	**Arrays:** Representation, implementation, polynomial representation. Limitations	4
3	**Strings:** Representation, String operations, Implementing String. h library functions	4
4	**Linked List:** Static and dynamic implementation. Single, double, circular, multiple linked lists	5
5	**Stacks:** Recursion and Stacks. Static and dynamic implementation. Expression evaluation. Infix, postfix expressions, multiple stacks	5
6	**Queues:** Static and dynamic implementation, circular queues, and implementation	4
7	**Hash Tables:** Hash tables implementation. Hashing techniques, single, double	4
8	**Storage Management:** Memory Management techniques, garbage collection	4
9	**Trees:** Binary trees, binary search trees, static and dynamic implementation. Tree operations, insert, delete, and search	6
10	**Heaps:** Brief introduction.	1
11	**Sorting and Searching:** Different sorting techniques. Insertion sort, selection sort, bubble sort, radix sort, quick sort, merge sort, heap sort.	6
12	**Graphs:** Representation of graphs, BFS, DFS sort. Graph Algorithms	4
TOTAL HOURS FOR THE COURSE		**52**

References

1. Data Structures by Rajni Jindal
2. Data Structures by Schaum's Series
3. Data Structures by Knuth
4. Data Structures by Farouzan
5. Data Structures using C and C++ by Langsam, A

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE34	**Digital System Design – I**	2	1	3

Section	Course contents	Hours
1.	Introduction to Digital Electronics, Digital Systems and Digital Logic. Advantages and Disadvantages of Digital Systems. Review of Digital Signals and their attributes. Review of Number systems, Radix conversion, Binary and Hexadecimal Arithmetic.9's, 10's, 1's & 2's complements and their usage, Binary codes (Weighted and non-Weighted), Error detecting and Correcting codes, Applications of various binary digital codes	8
2.	Introduction to Boolean Algebra, Theorems of Boolean algebra, Canonical forms, Representation of logical functions using Boolean Algebra, Truth Tables and Simplification using Boolean functions, Karnaugh map and Tabulation method	8
3.	Basic Logic Gates, Implementation of Boolean functions using various logic gates. Implementation of various Boolean functions using AND-OR-NOT, NAND-NAND, NOR- NOR, OR-AND-NOT and DEDICATED Gate logic	6
4.	**Digital Logic Families:** Introduction to bipolar Logic families: DDL, RTL, DTL, TTL, ECL and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family- Totem pole, Open collector outputs, TTL subfamilies, Comparison of different logic families on the basis of design parameters	10
5.	Multiplexers and De-multiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Multipliers, Parity Checker and Magnitude Comparator. Multiplexer and decoder logic. Implementation of various Boolean functions using multiplexer and decoder logic	10
6.	**Introduction to Sequential logic:** Flip-flops-SR,JK,D and T flip-flops- Level triggering and edge triggering, Counters-Asynchronous and synchronous Counters, Modulo counters.	10
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Anil K. Maini, "Digital Electronics", Wiley.
2. Malvino and Leach, "Digital principles and Applications" Tata Mc Graw Hill.
3. Jain R P, "Modern Digital Electronics", Tata Mc Graw-Hill, Third Edition,(2003)
4. Mano M. Morris, "Digital Design", Pearson Education, Third Edition,(2006)
5. Flecther, "An Engineering Approach to Digital Design", Prentice Hall of India, New Delhi.
6. Tocci Ronald J, "Digital Systems- Principles and Applications" Prentice Hall of India, New Delhi

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE33	**Analog Electronic Circuits - I**	2	1	3

Section	Course contents	Hours
1	***P-N Junction diode***: Brief review of structure and operation, current components in a p-n junction, Circuit models	6
2	Temperature dependence, Diode capacitances and switching times, rectifier circuits, voltage regulation, limiting circuits, level shifters, voltage multipliers	4
3	***BJT***: Brief review of structure and operation, IV characteristics, Equivalent circuit models, Ebers-Moll model, CE, CC and CB configurations, input and output characteristics, Biasing and bias stability, analysis of basic amplifier configurations	8
4	Low frequency h-parameter model, Analysis and design of transistor amplifiers using h-parameters. Millers theorem	4
5	High frequency hybrid-pi model, Analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, transistor as a switch	5
6	***FET***: Brief review of structure, operation and characteristics of JFET and MOSFET, Depletion and enhancement type MOSFETS, FET biasing	4
7	FET Small signal model, Common source, Common drain and Common gate amplifiers and their analysis. Low and High frequency response of FET amplifier	5
8	***Building Blocks of IC Amplifiers***: Current sources, current mirrors and current steering circuits, CE and CS amplifiers with current source loads	4
9	Cascode amplifier, folded cascode, double cascoding, Wilson current mirror, Wildar current source, Darlington pair	4
10	***Feedback Basics***: General feedback structure, impact of positive and negative feedback on circuit parameters, feedback topologies (series-shunt, series-series, shunt-series, shunt-shunt), Analysis of example circuits for each feedback topology, stability in feedback amplifiers	8
TOTAL HOURS FOR THE COURSE		**52**

References

1. Sedra A.S. and Smith K.C., Microelectronic Circuits, *Oxford University Press.*
2. Razavi B., Fundamentals of Microelectronics, *John Wiley & Sons.*
3. Boylestad R. and Nashelsky L., Electronic Devices and Circuits, *Prentice Hall*
4. J. Millman and C. Halkias, Integrated Electronics, *McGraw Hill Publications*
5. Neamen D. A., Microelectronics: Circuit Analysis and Design, *McGraw Hill Publications*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE32	**Network Analysis and Synthesis**	3	1	4

Section	Course contents	Hours
1	Charge and energy, capacitance, inductance and resistance parameters in the light of field and circuit concepts	3
2	Approximate realization of a physical system as a circuit. Reference directions for currents and voltages, conventions for magnetically coupled circuits, Circuit topology	4
3	First order differential equation: Differential equations as applied in solving networks. Application of initial conditions. Evaluating initial conditions in networks	6
4	Laplace Transformations. Wave form analysis and Synthesis; The unit step, ramp and impulse functions and Laplace transforms. Initial and final value theorem, Convolution integral, convolution as summation	6
5	Network theorems and impedance functions: Complex frequency, transformer impedance and transform circuits, series and parallel combination of elements	5
6	Network Functions – Poles and Zones: Ports of terminal pairs. Network functions for one port and two port network. Time domain behavior from poles zero plot	5
7	Two port parameters: Relationship between two-port parameters. Admittance, Impedance, transmission and hybrid parameters	6
8	Relationship between parameter sets. Parallel connection of two port Networks. Characteristic impedance of two port networks	5
9	Filters Filter fundamentals - pass & stop band, filter classification	5
10	Constant-k and m-derived Filters	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Network Analysis by Van Valkenberg
2. Network Analysis & Synthesis by F. Kuo
3. Network Analysis by G.K.Mittal

4th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCMTH41	Engineering Mathematics – IV	2	1	3

Section	Course contents	Hours
1.	Analytical Functions, C-R Equations	4
2.	Complex Integration	3
3.	Cauchy's Fundamental Theorem, Cauchy's Integral Theorem	3
4.	Cauchy's Inequality and Liouville's theorem on Integral Function	2
5.	Taylor's and Laurent's Expansions	3
6.	Zeroes and Poles of Analytic Functions	2
7.	Residues and Contour Integration	3
8.	Solution of Series	2
9.	Legendre's Functions, Rodrigues's Formula	3
10.	Generating Functions for Legendre's Polynomials and Recurrence Formulae	3
11.	Bessel's Functions	3
12.	Recurrence Formulae and Bessel's Functions of Integral Order.	3
13.	Continuous Wavelet Transform, Basic Properties of Wavelet Transform	3
14.	Discrete Wavelet Transform, Orthonormal Wavelets	3
15.	Multi Resolution Analysis	2
16.	Construction of Orthonormal Wavelets	2
17.	Daubchie's Wavelets and Algorithms	3
18.	Band limited wavelets, Balian low theorem	3
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Complex Variables & Applications by R. V. Churchill
2. Theory of Functions of Complex Variables by E. I. Copson

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE42	**Analog Electronic Circuits – II**	3	1	4

Section	Course Contents	Hours
1	***Differential Amplifiers*:** MOS and BJT differential pair, large signal analysis and small signal analysis of differential pairs, common mode rejection, DC offset, differential amplifiers with active loads	8
2	***Operational Amplifiers*:** Ideal Op Amp, differential and common mode signals, inverting and non-inverting configuration, open loop and closed loop gain, input and output resistance, Applications of Op Amp: integrator, differentiator, weighted summer, voltage follower, instrumentation amplifier, effect of bandwidth on circuit performance, large signal operation of Op Amps, ADC and DAC using Op Amps	8
3	***Sinusoidal Oscillators*:** Basic principle of sinusoidal oscillators, oscillation criterion, analysis of oscillator circuits using BJT, FET and Op-Amps (ring, LC, phase shift, Wein Bridge), brief discussion on crystal oscillators. Design of practical Oscillator circuits	8
4	***Waveform Shaping Circuits*:** *Bistable Multivibrators*: Feedback loop, transfer characteristics, triggering, Bistable circuit as a memory element, application as a comparator. *Astable Multivibrators*: Operation, generation of square and triangular waveforms. *Monostable Multivibrators:* Generation of a standardized pulse, 555 IC timer, Implementation of monostable bistable and astable multivibrator using 555 IC	8
5	***Output Stages and Power Amplifiers*:** Classification of output stages, Class A, Class B, Class AB and Class D output stages; circuit operation. Transfer characteristics, power conversion efficiency and power dissipation of each output stage. Power supplies and IC regulators	7
TOTAL HOURS FOR THE COURSE		**39**

References

1. Sedra A.S. and Smith K.C., Microelectronic Circuits, *Oxford University Press.*
2. Razavi B., Fundamentals of Microelectronics, *John Wiley & Sons.*
3. R. Gayakward, Operational Amplifiers, *Pearson Education*
4. Boylestad R. and Nashelsky L., Electronic Devices and Circuits, *Prentice Hall*
5. J. Millman and C. Halkias, Integrated Electronics, *McGraw Hill Publications*
6. Neamen D. A., Microelectronics: Circuit Analysis and Design, *McGraw Hill Publications*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE43	**Digital System Design – II**	2	1	3

Section	Course contents	Hours
1.	**Review to Sequential logic:** Flip flop and Timing circuit : set-reset latches, D-flip-flop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop. Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register.	8
2.	Introduction to state equations and state diagrams, design with state equation state diagram, mealy Sequential circuit design, Moore Sequential circuit design, Equivalent states and reduction of state tables, sequential circuit timing, Tri-state logic and buses.	7
3.	**Data-conversion circuits:** Digital –to-analogue converters, D/A converters specifications, Types of D/A converters, D/A converters application, Integrated circuits D/A, A/D converters, A/D converters specifications, Types of A/D converters, , Integrated circuits A/D converters, A/D converters applications.	6
4.	Memory organization, Classification, and characteristics of memories, Sequential memories, ROMs, R/W memories, Content Addressable memories, CCD memory, PLA, PAL and Gate Array, introduction to CPLD and FPGA.FPGA Architecture.	6
5.	**Introduction to VHDL:** Computer-aided design, Hardware Description Languages, VHDL description of combinational circuits, VHDL modules, VHDL models for multiplexers, Modeling combinational circuits using VHDL Processes, Variables, signals and constants, Arrays and loops in VHDL, VHDL data-types and operators, , VHDL libraries and Packages, IEEE Standard logic, Compilation, Simulation of VHDL Code.	10
6.	**VHDL for Sequential Logic:** Modeling Flip-flops using VHDL Processes, Modeling Registers and counters using VHDL Processes, Modeling a sequential machine, Synthesis of VHDL code, More about Processes and sequential statements.	8
7.	**VHDL for digital system design:** VHDL code for BCD to seven-segment decoder, VHDL code for BCD adder, VHDL code for serial adder, VHDL code for binary multiplier, VHDL code for 4x4 array multiplier, VHDL code for binary divider.	7
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Anil K. Maini, "Digital Electronics", Wiley
2. Charles H. Roth, "Digital System Design using VHDL", Thomson
3. Mano M. Morris, "Digital Design", Pearson Education, Third Edition,(2006)
4. Tocci Ronald J, "Digital Systems- Principles and Applications" Prentice Hall of India, New Delhi
5. Charles H. Roth, "Fundamentals of logic design", CENGAGE Learning

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE44	**Signals and Systems**	2	1	3

Section	Course contents	Hours
1	**Introduction to signals and Systems Representation:** Classification of signals and systems: Introduction to signals and systems, Continuous time and discrete time signals.	3
2	Classification of CT and DT signals -periodic and non-periodic, Even and Odd, Power and Energy, Invertible and Non-invertible, Deterministic and Random.	4
3	Elementary signals - exponential, sine, step, impulse and its properties, ramp, rectangular, sine, triangular, signum, Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration(Accumulator for DT), time scaling, time shifting and folding.	5
4	System viewed as interconnection of of operations, properties of systems, sampling theorem, graphical and analytical proof of band limited signals.	4
5	System: definition, classification – Linear and Non-Linear, Time Variant and Time Invariant, Causal and Non-causal, Stable and Unstable (BIBO stability), Static and Dynamic.	4
6	**Fourier Analysis:** Analysis of continuous time signals: Definition and necessity of CT and DT Fourier series and Fourier transforms.	4
7	Fourier series representation of continuous time and discrete time periodic signals - properties of continuous time and discrete time Fourier series.	4
8	Continuous Time Fourier Transform (CTFT), amplitude and phase spectra of CT signals, Properties of CTFT, convolution and multiplication property of CTFT, systems characterized by Linear Constant Coefficient Differential Equations, Limitations of FT and need of LT and ZT.	4
9	Laplace Transform – ROC, poles and zeros, Properties of Laplace Transform, inverse Laplace transform, relation between Laplace transform and Fourier transform.	3
10	**Analysis of Continuous time LTI Systems:** Laplace Transform: Linear time invariant –continuous time systems: Differential equation and Block diagram representation of LTI systems, Impulse response and properties of LTI systems.	3
11	Convolution integral, properties of convolution, frequency response, State variable equations and matrix representation of systems, Analysis and characterization of LTI systems using Fourier and Laplace transform.	3
12	Computation of impulse response, transfer function, causality and stability using Laplace Transform, Unilateral Laplace transform & its applications to solve differential equations.	5
13	**Analysis of Discrete Time Systems:** Introduction Z-Transform: Analysis of discrete time signals and systems: Sampling of CT signals and aliasing, DTFT and properties, Unilateral Z-Transform & its applications to LTI Systems described by difference equations.	5
	TOTAL HOURS FOR THECOURSE	**50**

References

1. Oppenheim A. V., Wilsky A. S. and Nawab S. H., Signals and Systems, *Pearson Education*
2. Haykin S. and Veen B. V., Signals and Systems, *John Wiley and Sons*
3. Roberts M. J., Signals and Systems: Analysis Using Transform Method and MATLAB, *Tata McGraw Hill*

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE45	**Electromagnetic Fields and Waves**	2	1	3

Section	Course contents	Hours
1.	Review of Electric Field Coulombs law, Electric field due to a point charge, surface charge and volume charge, divergence and curl of E, Electric potential	6
2.	Review of Magnetic Field, Lorentz law, Biot-Savarts law, B due to line current, Surface current and volume current densities, Divergence and curl of B, Magnetic Potential	6
3.	Maxwell's Equations, Maxwell's equations in Electrostatics and magneto-statics, in medium, Maxwell's equation	6
4.	Potential functions, Boundary conditions	4
5.	Wave equation and its solution	4
6.	Electromagnetic Waves, Poynting Theorem	4
7.	Phase and group velocity	4
8.	Plane waves in lossless and lossy media,	4
9.	Wave propagation in Ferrites-Faraday Rotation and Bire frigerence.	4
10.	Normal and oblique incidence at plane conducting boundary	4
11.	Normal and oblique incidence at plane dielectric boundary	4
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Jordan E and Balman K: Electromagnetic Waves & Radiating Systems, PHI
2. David K. Cheng: Field and Wave Electromagnetics, Addison Wesley
3. Krauss: Electromagnetics, Mc Graw Hill.
4. Griffiths: Introduction to Electrodynamics, PHI

Course No.	Subject	Teaching Periods		Credits
		L	P	
ESCECE46	OOPS with Java	2	2	3

Section	Course Content	Hours
1.	**Introduction to Java** Definition, History of Java, The Internet and Java's Place of IT, Applications and Applets, Java Virtual Machine, Byte Code- Procedure Oriented vs. Object-Oriented Programming, Compiling and Running a Simple Program, Setting up your Computer for Java Environment, Writing a program, Compiling, Interpreting and Running the Program, Handling Common Errors.	4
2.	**Tokens, Expressions and Control Structures** Primitive Data Types,User Defined Data Types, Declarations, Constants, Identifiers, Literals, Type Conversion and Casting, Variables: Arrays of Primitive Data Types, Comment Syntax, Garbage Collection, Expressions, Using Operators: Using Control Statements	5
3.	**Object Oriented Programming Concepts** Fundamentals of Classes: A Simple Class, Creating Class Instances, Adding methods to a class, Calling Functions/Methods, Abstraction, Encapsulation, Using 'this' Keyword, Constructors, Default constructors, More on methods: Passing by Value,by Reference, Access Control, Methods that Return Values, Polymorphism and Method Overloading, Recursion; Nested and Inner Classes	8
4.	**Inheritance & Packaging** Inheritance: Using 'extends' keyword, Subclasses and Superclasses, 'super' keyword usage. Overriding Methods, Dynamic Method Dispatch; The Object class, Abstract and Final Classes, Package: Access Control; Interfaces: Defining an Interface, Implementing and applying interfaces.	4
5.	**Handling Error / Exceptions** Basic Exceptions, Proper use of exceptions, User defined Exceptions, Catching Exception: try, catch; Throwing and re-throwing: throw, throws; Cleaning up using the finally clause.	2
6.	**. Handling Strings** Creation, Concatenation and Conversion of a String, Changing Case, Character Extraction, String Comparison, Searching Strings, Modifying Strings, String Buffer.	2
7.	**Threads** Create/Instantiate/Start New Threads: Extending java.lang.Thread, Implementing java.lang.Runnable Interface; Understand Thread Execution, Thread Priorities, Synchronization, Inter-Thread Communication, Deadlock.	7
8.	**I/O and Streams**java.io package, Files and directories, Streams and Character Streams; Reading/Writing Console Input/Output, Reading and Writing files, The Serialization Interface, Serialization & Deserialization	2
9.	**Understanding Core Packages** Using java.lang Package: java.lang.Math, Wrapper classes and associated methods (Number, Double, Float; Integer, Byte; Short, Long; Character, Boolean); Using java.util package: Core classes (Vector, Stack, Dictionary, Hashtable, Enumerations, Random Number Generation).	3
10.	**Holding Collection of Data** Arrays And Collection Classes/Interfaces, Map/List/Set Implementations: Map Interface, List Interface, Set Interface, Collection Classes: Array List, Linked List,	3

11.	**Java Applications** About AWT & Swing, About JFrame (a top level window in Swing), Event Handling in Swing Applications, Layout Management using FlowLayout, Border Layout, Grid Layout, Using JPanel, Choice components like JCheck Box, JRadio Button, Borders components, JCombo Box & its events, JList& its events with MVC patterns,	8
12	**Introduction to Java Applets** Definition, Applet lifecycle methods, Build a simple applet, Using Applet Viewer, Adding Controls: Animation Concepts.	1
13	**Database Programming using JDBC** Using Connection, Statement & Result Set Interfaces for Manipulating Data with the Databases.	2

Books

1. The Java Tutorial: A Short Course on the Basics (The Java Series) 6th Edition by Raymond Gallardo , Scott Hommel, Sowmya Kannan, Joni Gordon, Sharon Biocca Zakh
2. Thinking in Java 4th Edition by Bruce Eckel
3. Java the Complete Reference latest edition Herbert Schildt
4. Head First Java by Kathy Sierra O'Reilly publication

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE42L	Analog Electronic Circuits Lab – II	2	1

List of Experiments

1) To assemble current series feedback amplifier and study its performance.
2) To assemble a voltage shunt feedback amplifier and study its performance.
3) To design RC phase shift oscillator using OPAMP/BJT.
4) To assemble a differential amplifier and obtain its CMRR.
5) To study different applications of OP AMPS.
    a. OP-AMP as voltage comparator
    b. OP-Amp as Zero Crossing Detector
    c. OP-AMP as an inverting amplifier.
    d. OP AMP as a non -inverting amplifier
    e. OP AMP as an integrator
    f. OP AMP as a differentiator
6) To measure the following parameters of a typical OP-AMP.
    a. I/P Impedance
    b. O/P Impedance
    c. Slew rate
    d. CMRR
7) Obtain frequency response of an OP-AMP & hence find its bandwidth.
8) Study performance of multivibrator circuits using 555 chip in following modes:
    a. Bistable
    b. Astable
    c. Monostable
    d. Use of 555 Chip as a timer circuit.
9) To assemble a Schmitt trigger Circuit and to obtain its characteristics and to use it as squaring circuit.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE43L	**Digital System Design Lab – II**	2	1

List of Experiments

Experiments on Design using VHDL and Implementation using Xilinx/Spartan Kits:
Combinational Design & Implementation Exercises:

1. Design and implementation of basic Gates: AND, OR, NOT.
2. Design and implementation of universal gates.
3. Design and implementation of 2:1 Mux using other basic gates.
4. Design and implementation of 2 to 4 Decoder.
5. Design and implementation of Half-Adder, Full Adder, Half Subtractor, Full Subtractor.
6. Design and implementation of 3:8 Decoder.
7. Design and implementation of 8:3 Priority Encoder.
8. Design and implementation of 4-Bit Binary to Grey code Converter.
9. Design and implementation of 4-Bit Binary to BCD Converter using sequential statement.
10. Design an 8-Bit parity generator (with for loop and Generic statements).
11. Design and implementation of 2's Complementary for 8-bit Binary number using Generate statements.

Sequential Design & Implementation Exercises:

12. Design and implementation of all type of Flip-Flops using (if-then-else) Sequential Constructs
13. Design and implementation of 8-Bit Shift Register with shift Right, shift Left, Load and Synchronous reset.
14. Design and implementation of Synchronous 8-bit Johnson Counter.
15. Design and implementation of counters (MOD3, MOD5, MOD8, MOD16).
16. Design and implementation of a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
17. Design and implementation of 3-line to 8-line decoder with address latch.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE44L	**Signals and Systems Lab**	2	1

List of Experiments

1. Introduction to:
    a. MATLAB
    b. Basic operations on matrices
    c. Logical operations and loops
    d. Function files etc
2. Generation of various signals and sequences
3. Operation on signals and sequences
4. Generation of even & odd components of a signal
5. Check different properties of given systems
6. Perform convolution of continuous time signals & discrete time sequences
7. Auto correlation and Cross correlation
8. Gibbs phenomenon
9. Fourier analysis of periodic signals using a) trigonometric Fourier series b) using exponential Fourier series
10. Plot magnitude and Phase response of a given system.
11. Inverse Fourier transform
12. Properties of Fourier transform (linearity, scaling, shifting, duality, differentiation etc)
13. Laplace transform and it's Inverse
14. Discrete time Fourier transform and it's Inverse
15. Z-transform and its Inverse

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE46L	EDA Tools Lab – II	2	1

Introduction to MATLAB

1. Introduction to MATLAB and its workspace.
2. Working with matrices: creation of 1d, 2d, 3d and nd matrices, acquisition of matrices, processing and operations on matrices.
3. Various plotting tools. Plotting vector and matrix data, Plot labeling, curve labeling and editing, 2D and 3D plot, surface, mesh and grid plotting.
4. Working with Complex numbers and their operations.
5. MATLAB Programming: Automating commands with scripts, writing programs with logic and flow control, Writing functions, Control statement Programming, Conditional Statement Programming, Examples.
6. M files: Working with script tools, Writing Script file, executing script files, The MATLAB Editor, Saving m files.
7. GUI Design: Introduction Of Graphical User Interface, GUI Function Property, GUI Component Design, GUI Container, Writing the code of GUI Callback, Dialog Box, Menu Designing, Applications.
8. MATLAB SIMULINK: Introduction of SIMULINK, SIMULINK Environment & Interface, Study of Library, Circuit Oriented Design, Equation Oriented Design, Model, Subsystem Design, Connect Call back to subsystem, Application.
9. Image Processing with MATLAB: Importing and Visualizing Images, Importing and displaying images, converting between image types, Exporting images, Interactive Exploration of Images.
10. Symbolic Math in MATLAB: Calculus-Numerical Integration, Linear Algebra, Roots of Polynomials, Algebraic equations, Differential Equations (1st & 2nd order), Transforms (Fourier, Laplace, etc), Ordinary Differential equations, Examples of few ODEs.

Introduction to PCB Design

1. Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA) tools and comparison, PCB Design Process, PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factor for digital and analog circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards. Design for manufacturability Design-specification standards.
2. Introduction to PCB Fabrication & Assembly, Steps involved in fabrication of PCB. PCB Fabrication techniques-single, double sided and multilayer, Etching: chemical principles and mechanisms, Post operations- stripping, black oxide coating and solder masking, PCB component assembly processes.
3. Using any Electronic design automation (EDA) software, Practice following PCB Design steps (Open source EDA Tool KiCad Preferable) Example circuit: Basic RC Circuit ,Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, NETLIST generation, Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB

5th Semester

Course No	Subject	Teaching Periods		Credits
		L	T	
PCCECE51	**Information Theory and Coding**	2	1	3

Section	Course Contents	Hours
1.	**Introduction to probability**, Bayes Theorem- concept of random variable- probability density and distribution functions, function of a random variable.	10
2.	Moments, Independence of a random variable. Introduction to random process and random sequences, concept of stationarity.	10
3.	**Channel Coding:** Mutual information and its properties, information rate, channel capacity, Shannon's Channel Coding Theorem, Discrete channels – Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Differential Entropy, Capacity of AWGN Channel.	10
4.	**Error Control Codes:** Repetition Coding, Linear Block Codes, Cyclic Codes, Syndrome Decoding, Convolutional Codes, Viterbi Decoding.	10
5.	**Recent Trends in Information and Coding Theory:** Codes for 5G/6G: LDPCCodes, Polar Codes; Information theory for machine learning; Quantum Information and computing.	10
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Elements of Information Theory by Thomas, Joy A., and Cover, Thomas M.; Wiley, 2012.
2. Digital Communication Systems by Haykin, Simon; United Kingdom, Wiley.
3. Digital Communications by Proakis, John G., and Salehi, Masoud United States; McGraw-Hill, 2008.
4. Information theory: coding theorems for discrete memoryless systems by Csiszar, Imre, and János Körner; Cambridge University Press, 2011.
5. Error control coding by Lin, Shu, and Daniel J.Costello; Pearson Education India, 2011.
6. Selected papers from IEEE Transactions on Information Theory and other reputed journals/conference papers related to Information Theory and Coding.

Credits

Course No	Subject	Teaching Periods		Credits
		L	T	
ESCECE52	**Digital Signal Processing**	2	1	3

Section	Course Contents	Hours
1.	Introduction to Digital Signal Processing, Limitations of analog signal processing, Advantages of digital signal processing and its applications	2
2.	Introduction to Digital Signal processors, types of Digital Signal Processors, Various practical DSP's, Digital Signal Processor Architecture, comparative study between a General-Purpose Processor and Digital Signal Processor	4
3.	Signal Processing: Review of elementary discrete time sequences and systems, convolution, correlation, LTI system, Concepts of stability, causality	3
4.	Difference Equations and its Solution	3
5	Review of Z transform (unilateral/bilateral) and properties, Application to difference equations	3
6.	Sampling of Continuous Time Signals: Sampling and aliasing problem, Reconstruction of a continuous time signal from its samples	3
7.	Discrete Time Processing of Continuous time signals and vice-versa. Decimation & Interpolation; changing the sampling rate	5
8.	Frequency Domain Representation of Discrete Time Signal and Systems. Review of DTFT Discrete Fourier Transform: DFT and its properties; Linear Periodic and Circular Convolution	7
9.	Linear Filtering using DFT, Filtering of long data sequences	2
10.	Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques; Linear filtering approaches to computation of DFT	5
11.	FIR and IIR systems, Basic Structures of Discrete Time Systems, Block Diagram representation of Linear Constant coefficient Difference equations, Signal flow graph, basic structures of IIR and FIR systems	5
12.	Design of Discrete time IIR filters from continuous time filters, Impulse Invariance, Bilinear Transformation, etc., Butterworth, Chebyshev filters	4
13.	Linear Phase FIR filters, Design of FIR filters by windowing (hamming, hanning, keiser etc.)	4
TOTAL HOURS FOR THE COURSE		**50**

References

1. A textbook of DSP Techniques by Steven W. Smith
2. Digital Signal Processing using John. G. Proakis and Dimitry G. Manolakis.
3. Digital Signal Processors, B. Venkataramani & M. Bhaskar, Tata McGrawHill

Course No.	Subject	Teaching Periods		Cr
		L	T	
PCCECE53	**Communication Systems – I**	3	1	4

Section	Course contents	Hours
1.	Review of basic signal and systems, Introduction to Communication System (Analog and Digital), Basic block diagram of communication system, Channel, modulation, need for modulation, properties of Fourier transform enabling modulation (Duality, frequency shifting)	8
2.	Analog modulation: Amplitude Modulation: AM, DSB/SC, SSB, VSB etc. Generation and detection, waveforms, mathematical expressions for performance parameters, Advantages/Disadvantages and Applications. Frequency division multiplexing, Time division multiplexing.	8
3.	Angle modulation: Phase modulation and Frequency modulation: FM (NBFM, WBFM): Generation (Direct and Indirect Methods) and detection (Phase and frequency Discrimination), waveforms, mathematical expressions for performance parameters, Advantages/Disadvantages and Applications. Carson's rule.	8
4.	AM & FM Receivers (Tuned Radio Frequency and Super Hetero-dyne), Image frequency, Image rejection ratio, selectivity, sensitivity, fidelity.	6
5.	Pre-emphasis and De-emphasis in FM Systems.	1
6.	Introduction to Noise, types of noise, Performance of AM & FM Systems in presence of noise.	3
7.	Sampling, over sampling, critical sampling and under sampling.	3
8.	Introduction to digital communication techniques, advantages disadvantages with respect to analog communication, applications.	2
9.	Pulse analog modulation (introduction and types), Pulse digital modulation, ASK, FSK, PSK, DPSK, QPSK, QAM, M-ary PSK, ASK, FSK: Generation, detection, waveforms, analysis, constellation diagrams.	8
10.	Probability of error, Calculation of error probability of ASK, BPSK, BFSK, QPSK	3
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Principles of Communication Systems by Taub & Schelling.
2. Electronic Communication Systems by G. Kennedy.
3. Communication systems by S. Haykins.
4. Principles of electronic communication systems LE Frenzel – 2007.
5. Advanced Electronic Communications Systems W. Tomasi

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE54	**Microprocessors**	2	1	3

Section	Course contents	Hours
1.	Microcomputer Structure and Operations: Basic Microcomputer Elements	3
2.	Typical Microcomputer Structure	2
3.	CPU, Memory System	3
4.	Input Output	3
5.	Microprocessors and Memory: Typical 8, 16- and 32-bit Microprocessors	5
6.	8085 Microprocessor Specification	2
7.	Memory Technologies	2
8.	Assembly Language Programming I: Programming Model of 8085, Registers, Fetch, Execute Operation of CPU, Instruction Set	6
9.	Assembly Language Programming II: Addressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow Control Using Looping and Branching	6
10.	Assembly Language Programming III: Stack, Subroutines, Interrupts, Resets	6
11.	Bus System: System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding	6
12.	Microprocessors Interfacing: Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access, The Serial Subsystems, Peripheral Interface, Analog Converter Subsystem	6
TOTAL HOURS FOR THE COURSE		**50**

References

1. Microprocessor Architecture, Programming & Applications by Ramesh Goankar
2. Microprocessor & Applications by Leventhal.
3. Microprocessors by Mathur.

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE55	**Control Systems**	2	1	3

Section	Course contents	Hours
1	Introduction to linear Control System: Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems	5
2	System Representations: transfer functions, block diagram representation, signal flow graphs	5
3	Time Domain Analysis of Control Systems: Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response), Steady state error analysis	8
4	Stability of Control Systems: Stability characteristic equation, stability of linear time invariant systems, Rough-Hurwitz Criterion	6
5	Frequency Domain Analysis of Control Systems: Frequency domain characteristics second order systems relative stability, Nyquist criterion, Bode Plot, Root locus plot	10
6	Proportional, Integral, Derivative Control (PID). Lag, lead and lag lead compensation	8
7	Introduction to Modern Control Theory: State Equations, State Transition Matrix, State transition equations, State Diagrams, concept of controllability and observability	8
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Modern Control Engineering by K.Ogatta
2. Automatic Control Systems by Benjamin C.Kuo

Course No.	Subject	Teaching Periods P	Credits
ESCECE52L	Digital Signal Processing Lab.	2	1

List of Experiments

1. Familiarization with DSP processor TMS 320 C 6713.
2. Write a program to generate a sine/triangular/square wave.
3. Write a program to generate a sine/triangular/square wave of variable. Amplitude and frequency.
4. Write a program to generate AM signal.
5. Write a program to generate an echo of an audio signal.
6. Write a program to perform convolution of two signals.
7. Write a program to perform DFT & IDFT of a signal.
8. Write a program to design a low pass audio digital filter.

Course No.	Subject	Teaching Periods P	Credits
PCCECE53L	Communication Systems Lab – I	2	1

List of Experiments

1. Generation and detection of amplitude modulated signals.
2. Generation and detection of frequency modulated signals.
3. To measure sensitivity, selectivity, and fidelity of a radio receiver.
4. To test a pulse code modulator.
5. Study different line Encoding Schemes.
6. Generation and detection of Digital Modulation techniques.
7. Noise Analysis of AM & FM.

Note: Lab kits are to be used for demonstration only, the practical shall be realized using discreet components where ever applicable.

Course No.	Subject	Teaching Periods P	Credits
PCCECE54L	**Microprocessors Lab**	2	1

List of Experiments

1.
i) To develop a program to add two double byte numbers.
ii) To develop a subroutine to add two floating point quantities.
2.
i) To develop program to multiply two single byte unsigned numbers, giving a 16-bit product
ii) To develop subroutine which will multiply two positive floating-point numbers.
3. To write program to evaluate P* Q*+R* & S are 8-bit binary numbers.
4. To write a program to divide a 4-byte number by another 4-byte number.
5. To write a program to divide an 8-bit number by another 8 bit number upto a fractional quotient of 16 bit.
6. Write a program for adding first N natural numbers and store the results in memory location X.
7. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
8. Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
9. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
10. Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a program by which the data stored in a RAM table is displayed.
11. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
12. To design and interface a circuit to convert digital data into analog signal using the 8255A in the memory mapped I/O.
13. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
14. To design a circuit to interface a memory chip with microprocessor with given memory map.

Course No.	Subject	Teaching Periods P	Credits
PCCECE55L	Control Systems Lab	2	1

List of Experiments

1. Study working of PID Trainer Kit/MATLAB for various controller configurations.
2. Use of SIMULINK for response study of inputs like:
   i. Step
   ii. Ramp

for systems of various orders: with and without feedback.

3. Write a MATLAB program to find:
   a. Step response of a first order system.
   b. Impulse response of first order system.
4. Write a MATLAB program to obtain impulse, step& ramp response of a second order system.
5. Write a MATLAB program to find rise-time, peak-time, maximum overshoot &settling time of second order systems.
6. Write a MATLAB program to find unit step response of second & higher order systems.
7. Write a MATLAB program to plot root locus of second & higher order system & hence comment on stability.
8. Write a MATLAB program to demonstrate effect of addition of poles & zeros to a transfer function.
9. Write a MATLAB program to obtain Bode plot of transfer function. Find gain margin & hence comment on stability.
10. Write a MATLAB program to determine Polar plot of a given transfer function.
11. Write a MATLAB program to draw NYQUIST plot of a second& higher order system.

Note: Lab kits may also be used where ever applicable.

Course No.	Subject	Teaching Periods P	Credits
PCCECE56L	EDA Tools Lab – III	2	1

PYTHON for Engineers

Section	Course Contents
1	**UNIT I** Introduction, Computational Modelling, Programming to support computational modelling ,Why Python for scientific computing, Optimisation strategies, Get it right first, then make it fast , Prototyping in Python, Literature Recorded video lectures on Python for Python prompt and Read-Eval-Print Loop (REPL) Integer division How to avoid integer Data Types and Data Structures Integers Long integers Floating Point numbers Complex numbers
2	**UNIT II** Sequence String, List, Tuples Indexing sequences, Slicing, Passing arguments to functions, Call by value Call by reference Argument passing in Python, Performance considerations, Inadvertent modification of data, Equality and Identity, Input and Output: Printing to standard output.
3	**UNIT III** Conditionals: If-then-else For loop While loop Relational operators (comparisons) in if and while Exceptions Raising Exceptions Creating our own exceptions LBYL vs EAFP Functions and modules Introduction Using functions Defining functions, Default values and optional parameters
4	**UNIT IV** SymPy: Numeric types Differentiation and Integration, Ordinary differential equations Series expansions and plotting Linear equations and matrix inversion Nonlinear equations Output: LATEX interface and pretty-printing Automatic generation of C code
5	**UNIT V** Numerical Computation, Numbers and numbers, Limitations of number types Using floating point numbers (carelessly) Using floating point numbers carefully Numerical Python (numpy): arrays Numpy introduction Arrays Convert from array to list or tuple Standard Linear Algebra Operations More numpy examples Numpy for Matlab users
6	**UNIT VI** Visualising Data Matplotlib (Pylab) Matplotlib and Pylab IPython's inline mode Histograms Visualising matrix dataVisual Python Basics, rotating and zooming Setting the frame rate for animations Tracking trajectories Connecting objects (Cylinders, springs)
7	**UNIT VII** Numerical Methods using Python (scipy) Overview SciPy Numerical integration Solving ordinary differential equations

Note: Implement using raspberry pi.

References

1. Python The Complete Reference by Martin C. Brown, Tata McGraw-Hill Education India
2. Python Crash Course by Eric Matthes published by O'Reilly
3. Python Cookbook: Recipes for Mastering Python 3 (3rd Edition) published by O'Reilly

6th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE61	Communication Systems – II	3	1	4

Section	Course contents	Hours
1.	Waveguides and Cavity Resonators, Transverse Electric and Transverse magnetic Waves	3
2.	Wave propagation through rectangular and circular waveguides, Power transmission and attenuation in waveguides	4
3.	Electromagnetic Resonators, Rectangular & Circular cavities	4
4.	Strip Lines: Propagation Constant, Characteristic impedance and attenuation characteristics of strip lines and micro-strips	4
5.	Propagation of Waves: Waves in free space, Attenuation, Absorption and polarization, effects of Environment	5
6.	Ground wave propagation, sky wave propagation, space wave propagation	5
7.	Troposcatter propagation and Extra-terrestrial propagation	3
8.	Radiation: Retarded Potential and Electromagnetic field, Radiation from a short current element	3
9.	Half wave dipole, Radiation Resistance, Effect of ground on radiating elements	3
10.	Antennas: Basic Antenna parameters, Radiation pattern, Directivity and Antenna Gain	3
11.	Bandwidth and beam-width, Polarization	3
12.	Folded dipole and applications. Antenna arrays	3
13.	Parabolic reflector, Properties and feed mechanism	2
14.	Horn Antenna, Loop Antenna	1
15.	Satellite Communication	4
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Liao, S. Y: Microwave Devices & Circuits, PHI
2. David Pozar: Microwave Engineering, John Wiley
3. Jordan, E and Balman, K: Electromagnetic Waves & Radiating Systems, PHI
4. Krauss, J.D: Antennas, Mc Graw Hill

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE62	Microcontrollers and Embedded Systems	2	1	3

Section	Course contents	Hours
1.	Introduction to embedded systems, Embedded System applications, Overview of Microcontrollers, choosing a Microcontroller for an embedded application	4
2.	8051 Microcontroller hardware, internal Architecture, input/output pin and port architecture	4
3.	Instruction Set of 8051, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction	4
4.	Addressing modes, accessing memory using various addressing modes with assembly code examples	2
5.	Single bit instructions and programming, I/O port programming: I/O programming, bit manipulation	3
6.	8051 programming in C, 8051 Hardware Connection and Hex File	4
7.	Timer and counter architecture in 8051, programming 8051 timers, counter programming, Examples of Timers and Counters using Assembly and C programming Language	4
10.	Interfacing LCD with 8051 using C programming Language	4
11.	Interfacing Keyboard using C programming Language	4
12.	Interfacing A/D & D/A converters with programming examples	4
13.	Interfacing 8051 with DC Motor, Relay, Stepper-motor, and Servomotor	8
14.	Intel Programmable peripheral interface (PPI)-8255, 8255 interfacing with 8051	2
TOTAL HOURS FOR THE COURSE		**50**

References

1. The 8051 Microcontrollers and Embedded Systems: Muhammed Ali Mazidi; Pubisher: Pearson Publication
2. The 8051Microcontrollers Architecture, Programming & Applications Kenneth J.AyalaPenram International Publishing
3. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing: Subrata Ghoshal Publisher: Cengage Learning Asia
4. Embedded Systems & Robots : Projects Using the 8051 Microcontroller: Subrata Ghoshal Publisher: Cengage Learning Asia.

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE63	Electrical Machines	2	1	3

Section	Course contents	Hours
1.	Transformers: Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response, polarity test	6
2.	Autotransformers, three- phase transformer connections, impedance matching	4
3.	Isolation & instrument transformers	3
4.	D.C. Machines: Operating principle, generator & motor action, construction, types of excitation, emf & torque equations, power stages & efficiency. Commutation & Armature Reaction	6
5.	Characteristics & application of d.c generators, starting & speed control of d.c motors	4
6.	Characteristics & applications of d.c motors	3
7.	Electric braking	1
8.	Induction Machines: Three-phase induction motors. Principle of operation, construction, types	3
9.	Rotating magnetic field, emf equation of an AC Machine, torque developed in an induction motor, equivalent circuit model, torque-speed characteristics, starting & speed control	6
10.	Single phase induction motors, starting, application	3
11.	Synchronous Machines: Construction, types & operating principle of synchronous generator, A.C armature windings, equivalent circuit, phasor diagrams, voltage regulation, parallel operation, synchronization, Power Angle characteristics, effect of field excitation change	6
12.	Synchronous Motor, principle, starting, hunting, damper windings	3
13.	Special Purpose Motors: Stepper Motor, Universal Motor, Shaded-pole Motor	4
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Electric Machinery by Fitzgerald
2. Electric Machinery by Nagrath

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE64	**Electronic Measurement & Instrumentation**	2	1	3

Section	Cour	Hours
1	Measurement System and Standards: Instrumentation system and its classification, Primary and secondary standards, Standards of various	6
2	Static and Dynamic response	2
3	Measurement Errors, and accuracy of an instrumentation system	3
4	Signal Generators and Analyzers: Function generators, RF Signal Generator, Sweep Generator, Frequency synthesizer, Wave Analyzers for Audio and radio frequency waves. Measurement of harmonic distortion. Spectrum analysis	4
5	**Mechanical and Electromechanical sensor** • Resistive (potentiometric type) • Strain gauge • Inductive sensor • LVDT • Proximity sensor	4
6	**Capacitive sensors:** Piezoelectric element force & stress sensing, ultrasonic sensors	4
7	**Thermal sensors:** Resistance change type (RTD, Thermistor), Thermocouple, Radiation sensors (Pyrometer)	4
8	**Optical sensors:** LDR, Photovoltaic cells, Photodiodes	3
9	Introduction to Smart Sensors	3
10	Definition, advantages and Importance of PLC, Evolution history of PLC, architecture and block diagram	5
11	PLC hardware Types of PLC, CPU unit architecture, Memory classification, Input/output devices and it's interfacing, Digital-Analog modules, Communication modules, Special function modules	12
	TOTAL HOURS FOR THE COURSE	5

References

1. Electronic Measurements by W. Cooper
2. Electrical & Electronic Measurements by A.K. Sawhney

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCECE65	**VLSI Design**	2	1	3

Section	Course contents	Hours
1	Review of MOSFET: Constructional & Operational features of MOSFET	3
2	I-V Equation, Second Order Effects	3
3	MOS Capacitor, C-V Characteristics	2
4	MOSFET Switch, Transmission gate	2
5	CMOS Inverter (Pull-up & Pull-down), Inverter Static Characteristics, Noise Margin	3
6	Switching characteristics of Inverter (Fall Time, Rise Time, Delay Time), Dynamic Characteristics, Power Dissipation	3
7	VLSI Technology: Wafer Processing, Oxidation, Epitaxy, Deposition, Ion- Implantation & Diffusion	4
8	The Silicon gate Process, n-well CMOS Process, p-well Process, Twin-Tub Process, Silicon On Insulator	4
9	CMOS Logic Design (Gates): CMOS Logic Gate Design (NAND & NOR Logic)	3
10	Switching Characteristics (Delay Time, Power, Fan-in, Fan-out), Transistor Sizing, The Compound Gates	4
11	CMOS Logic Structures: CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, C2MOS Logic, BiCMOS Logic, NP Domino Logic	5
12	Layout: Design Rules/Floor planning, Simple Layout Examples	5
13	CMOS Logic Design (Circuits): Multiplexers, MUX Implementation in CMOS & Transmission Gate	4
14	RAM Cell Implementation, Implementation of Flip-Flop, Register/Counters	5
	TOTAL HOURS FOR THE COURSE	**50**

References

1. CMOS VLSI Design: A Systems Perspective by N. Weste & K. Eshraghian
2. CMOS VLSI Design: A Circuits & Systems Perspective by N. Weste, D. Harris & A. Bannerjee
3. Digital Integrated Circuits: A Design Perspective by Rabaey

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE61L	**Communication Systems Lab – II**	2	1

List of Experiments

1. To measure and plot radiation pattern of different antennas yagi-uda, parabolic, path, horn, dipole and mono pole antenna.
2. To study and verify the communication using wave-guides.
3. To study and verify VSWR for a traveling wave.
2. To study Satellite Communication using trainer kit.

Course No.	Subject	Teaching Periods P	Credits
PCCECE621	Microcontrollers and Embedded Systems Lab	2	1

List of Experiments

1. Interface 8051 microcontroller with 8 LEDS and write a program to flash these LEDs.
2. Interface 8051 microcontroller with Eight Keys and write a program that will scan these Eight Keys and Display its Binary code on LEDs.
3. Interface 8051 microcontroller with an LCD and write a program to display a message on the first and 2nd line of LCD.
4. Interface 8051 microcontroller with a seven-segment display and display a message "1234" on the seven-segment display.
5. Write a program for energizing the Two DIP relays interfaced to 8051 microcontroller board.
6. Write a program to demonstrate Opto-isolated inputs on 8051 board.
7. Interface 8051 microcontroller with a stepper motor and write a program to move the motor first clockwise by 20 steps and then anticlockwise by 20 steps and test on the board.
8. Interface 8051 microcontroller with ADC chip and the display digital value on an LCD.
9. Write a program to demonstrate DAC by generating a RAMP signal.
10. Write a program to store data in the EEPROM (24C02) provided on the 8051 board for permanent storage of data.
11. Write a program to read data from the EEPROM (24C02) provided on the 8051 board for permanent storage of data.

Note: Programs for above experiments should be implemented both using Assembly and C programs instructions.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE64L	**Electronic Measurement & Instrumentation Lab**	2	1

List of Experiments

1. Obtain Characteristics of LVDT
2. Obtain Characteristics of Strain gauge
3. Obtain Characteristics of thermocouple
4. Obtain Characteristics of thermistor
5. Obtain Characteristics of RTD transducer
6. PLC programs based on the available kits in the Lab

Course No.	Subject	Teaching Periods P	Credits
PCCECE65L	VLSI Design Lab	2	1

List of Experiments

1. To find VI characteristics of a MOSFET.
2. To verify the operation of MOSFET as a Switch.
3. To verify the operation of MOSFET as a linear resistor.
4. To verify the Voltage transfer characteristics of CMOS Inverter.
5. To design and verify the operation of CMOS based basic(NOT,AND,OR) and universal gates(NAND, NOR).
6. To design and verify 2x1 multiplexer/ de-multiplexer using CMOS Logic.
7. To design and verify 2x1 multiplexer/ de-multiplexer using transmission gates.
8. To design and verify RAM Cell using CMOS cross coupled inverters.
9. To design/generate layout of CMOS based NOT, NAND and NOR gates.

Note: Simulators used may include ADS, Cadence, Mentor Graphics based on availability.

Course No.	Subject	Teaching Periods	Credits
		P	
PSIECE66	SEMINAR	2	1

DESCRIPTION:

The Technical Seminar shall be carried out as part of the 6th semester curriculum and is important for the partial fulfillment for the award of the Bachelors Degree in Engineering. The main objectives of conducting the seminar are:

1. To encourage the students to study advanced engineering developments
2. To prepare and present technical reports.
3. To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

METHOD OF EVALUATION:

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 15 to 20 minutes in front of the faculty committee for seminars and the students from the 6th semester (preferably from other semesters also). Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

7th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
ESCECE71	**Power Electronics**	2	1	3

Section	Course contents	Hours
1.	Review of power semiconductor switching devices, Diode, Thyristors, MOSFET, IGBT, Characteristics and applications	7
2.	Introduction to Turn-ON/Turn-OFF mechanism of switching devices, Gate-drive circuits, Switching-aid circuits, protection, Heat sink design	7
3.	Single phase rectifiers (uncontrolled, semi-controlled, controlled) with passive loads, Performance analysis, Applications	8
4.	Three-phase rectifiers (uncontrolled, semi-controlled, controlled) with passive loads, Performance analysis, Applications	7
5.	Single-phase inverter: principle of operation, single phase bridge inverter, voltage Control in inverters and harmonic reduction using PWM strategies, Applications	8
6.	Three-phase inverters: 180 degree conduction and 120 degree conduction, voltage Control in inverters and harmonic reduction using PWM strategies	8
7.	Introduction to DC-DC converters; buck ,boost and buck-boost converters, Applications	5
TOTAL HOURS FOR THE COURSE		**50**

References

1. Fundamental of Power Electronics: Robert Erickson, D.Maksimovic
2. Power Electronics, Circuits, Devices and Applications: Muhammad H. Rashid
3. Power Electronic, Devices, Applications, and Passive Components: Barry W. Williams
4. Power Electronics-converters, Applications, and Design: NedMohan, Tore.M.Undel and, William P. Robbins

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE72	**Data Communication**	2	1	3

Section	Course contents	Hours
1	***Introduction*** - Data Communications, The OSI Model, TCP/IP Protocol Suite	3
2	***(PHYSICAL LAYER and MEDIA)_Data and Signals*** - Analog And Digital, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance	5
3	***Digital Transmission*** - Digital-To-Digital Conversion, Analog-To-Digital Conversion, Transmission Modes	6
4	***Analog Transmission*** - Digital-To-Analog Conversion, Analog-To-Analog Conversion	6
5	***Bandwidth Utilization: Multiplexing and Spreading*** – Multiplexing, Spread Spectrum	4
6	***Transmission Media*** - Guided Media, Unguided Media	2
7	***(DATA LINK LAYER)_Error Detection and Correction*** – Introduction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum	5
8	***Data Link Control*** – Framing, Flow And Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point-To-Point Protocol	5
9	***Multiple Access*** – Random Access, Controlled Access, Channelization	5
10	***Wired LANs: Ethernet*** - IEEE Standards , Standard Ethernet , Changes In The Standard, Fast Ethernet, Gigabit Ethernet	2
11	***Wireless LANs*** - IEEE 802.11, Bluetooth	2
12	***Connecting LANs, Backbone Networks, and Virtual LANs*** - Connecting Devices, Backbone Networks, Virtual LANs	3
13	***Wireless WANs: Cellular Telephone and Satellite Networks*** - Cellular Telephony, Satellite Networks	2
TOTAL HOURS FOR THE COURSE		**50**

References

1. Data Communications and Networking by Behrouz A. Forouzan, Tata McGraw Hill
2. Computer Networks by Andrew S. Tanenbaum, Pearson Education
3. Data Communications and Computer Networks by W. Stallings

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCECE73	Microwave Engineering	3	1	4

S. No.	Course contents	Hours
1	Microwave Semiconductor Devices: Classification of Microwave Devices	2
2	Point Contact diode; Tunnel Diode	3
3	Gunn Diode, two valley structures, mode of operation, circuit realization	3
4	IMPATT Diode, circuit realization	2
5	PIN diode, basic principles of operation equivalent circuit, and application as switch, modulator and Phase shifter	4
6	Microwave Components: Microwave Hybrid Circuits: Waveguide tee: E-plane tee, H-plane tee, Magic tee, hybrid rings (rat-race circuits)	5
7	Directional Couplers, S-Matrix of direction Coupler. Circulators and isolators	4
8	Microwave Amplifiers & Oscillators : Microwave tubes: lead inductance and Inter electrode capacitive effects Transient angle effect, Gain bandwidth Limitation	3
9	Klystrons: Multi-cavity Klystron and Reflex Klystron	3
10	Gunn Oscillator, Magnetron oscillator	3
11.	Transmission Lines Transmission Line equations and solutions.	3
12.	Characteristic impedance and propagation constant	3
13.	Reflection and transmission coefficients, SWR	3
14.	Open and short circuit lines- their use as circuit elements at UHF	3
15.	Line impedance and admittance	2
16.	Smith Chart	2
17.	Impedance Matching	2
TOTAL HOURS FOR THE COURSE		**52**

References

1. Liao, S. Y, Microwave Devices & Circuits, PHI
2. David Pozar, Microwave Engineering, John Wiley
3. R E Collin: Foundations for Microwave Engineering, Mc Graw Hill
4. Skolnik: Introduction to Radar Engineering, Mc Graw Hill

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE74	**Computer Organization and Architecture**	2	1	3

Section	Course contents	Hours
1	Computer organization and architecture, Computer Level Hierarchy, Evolution of Computers, Von-Neumann Architecture, Structure and Components of Computers	6
2	Computer Functions, Instruction Execution and Instruction Cycle State Diagrams	4
3	Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings	4
4	Basic CPU equation. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Speedup, Amdahl's and Moore's Laws	4
5	Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes, CPU Register Organization	4
6	Computer arithmetic logic design, fast adders, multiplication, Booth's algorithm, fast multiplication, integer division, ALU– Fixed and Floating point ALU Organization, floating point arithmetic	6
7	Control Unit – Functional Requirements, Structure, Control Signals, hardwire and Micro-programmed Wilkes Control unit, Microinstructions and its formats, Control Memory	6
8	Introduction to Pipelining and Parallel Processing	2
9	Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion	2
10	Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence, Virtual memory– Overlays, Paging, Segmentation and Fragmentation	6
11	Input-Output organization– Peripheral devices, I/O modules, Input-output interface, Modes of transfer - Programmed I/O, Interrupt-driven I/O, Direct Memory access, I/O processor, Data Communication processor	6
TOTAL HOURS FOR THE COURSE		**50**

References

1. William Stalling: Computer organization and architecture, Latest Edition
2. John P. Hayes: Computer Architecture and Organization, Latest Edition
3. Computer Organization by Hamachar
4. Computer Organization & Architecture by M. M. Mao

Course No.	Subject	Teaching Periods	Credits
		P	
ESCECE71L	**Power Electronics Lab**	2	1

List of Experiments

1: To do the following:

(a) To obtain V-I Characteristics of an SCR.

(b) To obtain V-I Characteristics of a TRIAC.

2: To obtain the Static Emitter Characteristic sofa UJT.

3: To study the Line-synchronized UJT Relaxation Oscillator as a triggering agent for a thyristor and plot load voltage v/s firing angle.

4: To study various firing schemes of an SCR and draw the traces for various waveforms:

(a) Resistance Triggering Technique,

(b)R-C Triggering Technique,

(c)Linear Firing Scheme,

(d)Inverse Cosine Firing Scheme.

5: To study a Single-Phase Half-Wave Converter and plot Source voltage, Load voltage and load current for R and R-L loads.

6: To study a Single-Phase Semi-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-L and Motor Loads.

7: To study a Single-Phase Full-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-L and Motor Loads.

8: To study a Three-Phase Semi-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-Land Motor Loads.

9: To study a Three-Phase Full-Converter and plot Source voltage, Source current, Load voltage and load current for R, R-Land Motor Loads.

10: To study a Single-Phase Dual Converter on Motor Load.

11: To study a DC-DC Buck Converter (Step-Down Chopper)for R, R-L and DC Motor Load and plot Load voltage Vs. Duty Ratio.

12: To study a Single-Phase Voltage Source Inverter on Rand R-L Loads.

13: To study a Three-Phase Voltage Source Inverter on R and R-L Loads.

14: To study a Single-Phase PWM Voltage Source Inverter on R and R-L Loads and plot Load voltage Vs. Modulation index.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE72L	**Data Communication Lab**	2	1

List of Experiments

1. Perform pulse coded modulation for analog to digital conversion. Analyze bandwidth requirement, data rate generation, synchronous and asynchronous mode of transmission.
2. Perform bandwidth utilization technique time division multiplexing.
3. Perform various line coding formats and compare transmission characteristic of each formats.
4. Perform digital carrier modulation techniques used in wireless communication.
5. Perform amplitude modulation and demodulation.
6. Perform serial data communication between two data terminal equipment using optical link.
7. Perform digital data transfer through RF transmitter and receiver.
8. Demonstration of different types of cables used in data communication.
9. Perform Installation of LAN and troubleshooting of frequently occurred problems.
10. Create and test wireless sensor networks.
11. To study various aspects of data communication by field visit at data center.
12. Perform data communication using IR.

Course No.	Subject	Teaching Periods	
		P	Credits
PCCECE73L	**Microwave Engineering Lab**	2	1

List of Experiments

1. Study of Microwave components and Instruments.
2. To plot and study the V-I characteristics of a Gunn diode.
3. Tuning of Gunn Oscillator.
4. To study the characteristics of Reflex Klystron.
5. Tuning of Klystron Oscillator.
6. To study the Characteristics of Detector.
7. To measure the Frequency using direct reading frequency meter and compare it with indirect frequency meter.
8. To study the properties of E- and H-plane waveguide tee junctions and to determine isolations, coupling coefficients and input VSWR.
9. Study of transmission lines concepts using trainer Kit.

Credits
1

Course No.	Subject	Teaching Periods	Credits
		P	
PSIECE76	**Project (Phase-I)**	2	1

DESCRIPTION:

The Project work shall be carried out by a group of students. The maximum number of students in a group can be four (4). In the project work, a student shall choose a specific topic/area for the project. The selected areas shall encompass recent and emerging trends in technologies that prove beneficial for society in general and humanity in particular. Supervisor/mentor will be assigned to each student in the beginning of the 7th semester of their course. The Project Phase-1 can encompass any of the following.

1. A full-fledged mini project that needs to be submitted in totality at the end of 7th semester. The deliverables include: The working prototype of the project, Project Report and PPT presentation.
2. A part of the major project (Project-phase-II).The Deliverables include the working modules of the project, the partial project completion Report and the PPT presentation.
3. A Part of the major Research based project (Project-phase-II).The deliverables include partial Project completion report containing (Problem Definition, Literature Survey, Design methodology and Simulations), the working modules (H/W or S/W) and PPT presentation.

METHOD OF EVALUATION:

The Project Phase-I will be Evaluated at the end of the 7th Semester. The students need to present themselves before an examination committee (Internal + External) with the working modules of the project.

In case of the students who have developed a full-fledged mini project. The evaluation will be final.

In case of the students who have developed project as part of the Major project will be evaluated for the 7th semester. In Case the examination committee is not satisfied with the work of the team, they will have full authority to cancel the project for further development in the 8th semester.

The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Internal project guides and Project Faculty Incharge.

8th Semester

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE81	**Wireless Communication**	2	1	3

Section	Course contents	Hours
1	**Introduction to Cellular Mobile Systems:** A basic cellular system, performance criteria, Uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, Analog & digital cellular systems.	4
2	**Elements of Cellular Radio Systems Design:** General description of the problem, Concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omnidirectional antenna system, cell splitting, consideration of the components of cellular systems.	7
3	**Cell Coverage for Signal & Traffic:** General introduction, obtaining the mobile point to point mode, Radio propagation characteristics: models for path loss, shadowing and multipath fading Propagation over water or flat open area, foliage loss, propagation nearin distance, long distance propagation, point to point prediction model characteristics, cellsite, antenna heights and signal coverage cells, mobile to mobile propagation.	7
4	**Cell Site Antennas and Mobile Antennas:** Characteristics of antennas, antenna at cell site, mobile antennas, LOS antennas, TDD, FDD.	5
5	**Frequency Management, Channel Assignment and handoff:** Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, handoff, types of hand off and their characteristics, hand off analysis, dropped call rates & their evaluation.	7
6	**Multiple access techniques used in mobile wireless communications:** FDMA/TDMA, CDMA. FDM / TDM Cellular systems, Cellular CDMA, comparison of FDM / TDM systems and Cellular CDMA.	7
7	Capacity, soft capacity, erlang capacity and their usage.	3
8	**Global System for Mobile Communication (GSM) system overview:** GSM Architecture, Mobility management, Network signaling, Frequency allocation and control, Base System and Master System, GSM, DCS1800, Various value added services.	8
9	Introduction to GPRS, EDGE, UMTS, HSPDA, HSUPA, LTE.	4
	TOTAL HOURS FOR THE COURSE	**52**

References

1. Wireless Communication; Principles and Practice; T. S. Rappaport
2. Principles of Mobile Communication, G. L Stuber Kluwer Academic.
3. Wireless and Digital Communications; Dr. Kamil o Feher (PHI)
4. Mobile Communication HandBook; IEEE Press
5. Mobile Communication Engineering– Theory & Applications; TMH

Course No.	Subject	Teaching Periods		Credits
		L	T	
PCCECE82	**Computer Network & Security**	2	1	3

Section	Course Contents	Hours
1	Introduction- Networks, The Internet, Protocols And Standards	4
2	Network Models - Layered Tasks, The OSI Model, Layers In The OSI Model, TCP/IP Protocol Suite, Addressing	4
3	Switching - Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Structure of a Switch	3
4	Using Telephone and Cable Networks for Data Transmission	3
5	NETWORK LAYER, Logical Addressing	5
6	Network Layer: Internet Protocol - Internetworking: Need for Network Layer, Internet as a Datagram Network, Internet as a Connectionless Network, IPv4, Datagram, Fragmentation, Checksum, Options, IPv6, Advantages, Packet Format, Extension Headers , Transition From IPv4 to IPv6:Dual Stack, Tunneling, Header Translation	6
7	Network Layer: Address Mapping, Error Reporting, and Multicasting - Address Mapping: Mapping Logical to Physical Address: ARP, Mapping Physical to Logical Address: RARP, BOOTP, and DHCP, ICMP, IGMP, ICMPv6	6
8	Network Layer: Delivery, Forwarding, and Routing – Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols	6
9	(TRANSPORT LAYER)_Process-to-Process Delivery: UDP, TCP, and SCTP - Process-To-Process Delivery, User Datagram Protocol (UDP): Well-Known Ports for UDP, User Datagram, Checksum, UDP Operation, Use of UDP, TCP: TCP Services, TCP Features, Segment, A TCP Connection, Flow Control, Error Control, Congestion Control, SCTP: SCTP Services, SCTP Features, Packet Format, An SCTP Association, Flow Control, Error Control, Congestion Control	3
10	(APPLICATION LAYER)_Domain Name System - Name Space, Domain Name Space, Distribution Of Name Space, DNS In The Internet, Resolution, DNS Messages, Types of Records, Registrars, Dynamic Domain Name System (DDNS), Encapsulation	2
11	Introduction: Need of security, Security attacks, services and mechanisms, Network security model	4
12	Network Security: Firewalls, IP Security, Virtual Private Networks and Intrusion Detection, Web Security-SSL and TLS	4
	TOTAL HOURS FOR THE COURSE	**50**

References

1. Data Communications and Networking by Behrouz A. Forouzan, Tata McGraw Hill
2. Computer Networks by Andrew S. Tanenbaum, Pearson Education
3. Data Communications and Computer Networks by W. Stallings
4. Cryptography and Network Security by Forouzan, PHI 4.

Course No.	Subject	Teaching Periods		Credits
		L	T	
BSCECE83	**Organization of Engineering Systems & HR Management**	2	1	3

Section	Course contents	Hours
1	Introduction to the subject and the course	1
2	**Module A: Basics of organizations and human resources management** Understanding organizations: nature and functions, Concerns of organizing engineering business and systems, Structure and process issues in running organizations, Design issues in running organizations, Operating organizations	12
3	**Module B: Effectiveness and performance** Cybernetics and systems framework, Socio-technical systems, Dealing with efficiency and excellence, Man-machine relationship, Longitudinal Thinking	12
4	**Module C: Human elements of functioning organizations** Concerns of recruitment, selection, skill formation and redeployment, Developing teams and leadership, Understanding motivation, Elements of human resources planning, Indian Industrial Law and managing industrial relations	13
TOTAL HOURS FOR THE COURSE		**38**

References

1. Beer, Stafford(1975) *The Heart of Enterprise*, Preguin Press, London
2. Coulson-Thomas Colin,((1997) *The Future of Organisation: Achieving Excellence through Business Transformation* .Kogen Page
3. Constantin Virgil Negoita (1992). *Cybernetics and Applied Systems*, CRS Press, USA
4. Dimitris N. Chorafas (2011). *Business, Marketing, and Management Principles for IT and Engineering*, Taylor and Francis,USA
5. Gautam Vinayshil(1988) Comparative Manpower Planning Practices-Select Indian Experiences, National Publishing House, New Delhi

Course No.	Subject	Teaching Periods P	Credits
PCCECE81L	Wireless Communication Lab	2	1

List of Experiments

1. Study of Dual SIM Phone.
2. Study of GSM.
3. Study of 3G.
4. Study of CDMA.
5. Study of Bluetooth

Note: Simulators used include following, where ever applicable OPNET, NS2, NS3.

Course No.	Subject	Teaching Periods	Credits
		P	
PCCECE82L	**Computer Network & Security Lab**	2	1

List of Experiments

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Install and Configure Wired and Wireless NIC and transfer files between systems in LAN and Wireless LAN.
3. Install and configure Network Devices: HUB, Switch and Routers.
4. Connect the computers in Local Area Network.
5. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).
6. Establish Peer to Peer network connection using two systems using Switch and Router in a LAN.
7. Configure Internet connection and use IPCONFIG,PING / Tracer and Net stat utilities to debug the network issues.
8. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
9. Study of basic network command and Network configuration commands.
10. Configure Network topologies using packet tracer software.
11. Demonstrate firewalls and Intrusion Detection System (IDS)

Course No.	Subject	Teaching Periods P	Credits
PSIECE84	**Project (Phase-II)**	8	4

DESCRIPTION:

The Project work shall be carried out by a group of students .The maximum number of students in a group can be four (4). In the project work student shall choose a specific topic/area for the project. The selected areas shall encompass recent and emerging trends in technologies that prove beneficial for society in general and humanity in particular. Supervisor/mentor will be assigned to each student in the beginning of the 8th semester of their course. The Project Phase-II can encompass any of the following.

1. A fresh project to be chosen after the evaluation of 7th semester minor project is over .The deliverables include The working prototype of the project, Project Report and PPT presentation to be submitted at the end of the 8th semester.
2. The Remaining part of the 8th semester project (Project-phase-II), that the students had chosen as full project at the seventh semester level. The students must have completed a part of it, duly evaluated by the examination committee at the 7th semester level. The uptake of the project is subjected to the condition that the evaluation committee gives a nod for further uptake of the project. The deliverables include The working prototype of the project, Project Report and PPT presentation to be submitted at the end of the 8th semester.

3. The Remaining Part of the major Research based project (Project-phase-II) that the students had chosen as full project at the seventh semester level. The students must have completed a part of it, (as described in the project-Phase-I plan), duly evaluated by the examination committee at the 7th semester level. The uptake of the project is subjected to the condition that the evaluation committee gives a nod for further uptake of the project. The deliverables include: The working prototype of the project, Project Report and PPT presentation to be submitted at the end of the 8th semester.

METHOD OF EVALUATION:

The Project Phase-II will be evaluated at the end of the 8th Semester. The students need to present themselves before an examination committee (Internal + External) with the working prototype/Software of the project, The Thesis report and the power point presentation of the project.

The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Internal project guides and Project Faculty in-charge.

Course No.	Subject	Teaching Periods	Credits
		P	
PSIECE85	**Professional Viva**	0	1

DESCRIPTION:

A viva voce is an oral test, which literally translated means 'with the living voice'. It's a focused discussion giving you the opportunity to defend your Professional and Technical Abilities in front of a panel of academic experts. The Technical abilities include the core concepts and the skills gained by the student during the process of the four (4) Years of the Degree. While students need to be sure that this isn't a memory test, it is still important to gain a good understanding of the knowledge about your field of study. The professional abilities include the way a student presents himself in-front of an interview panel.

METHOD OF EVALUATION:

The Professional Viva is conducted at the end of the 8th Semester. The students need to present themselves before an examination committee (Internal + External) with professional/Formal attire.
The evaluation committee evaluates the students on the basis of subjective knowledge and soft skills.
The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Internal project guides and Faculty in-charge.

Course No.	Subject	Teaching Periods P	Credits
PSIECE86	**Industrial Internship**	0	1

DESCRIPTION:

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical/ managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.

The Framework for Internship is as per AICTE Guidelines.

Schedule	Duration	Activities
During Vacation after 3rd Semester	4-6 weeks	Industrial/Govt./NGO/ MSME/ Rural Internship/ Innovation/ Entrepreneurship/ Private Enterprise/ Skill development Inst.
During Vacation after 5th Semester	4-6 weeks	Industrial/Govt./NGO/ MSME/ Rural Internship/ Innovation/ Entrepreneurship/ Private Enterprise/ Skill development Inst.
During Vacation after 7th Semester	4-6 weeks	Industrial/Govt./NGO/ MSME/ Rural Internship/ Innovation/ Entrepreneurship/ Private Enterprise/ Skill development Inst.

EVALUATION:

The student can go for more than one internship/ Skill development course in his/her curriculum. But for the necessary evaluation, the student needs to submit one of his/ her best Internship reports and certificates to the college. The evaluation will be done through Seminar Presentation/ Viva-Voce.

The student will give a seminar based on his training report, before an expert committee constituted by the concerned department on the basis of:

1. Quality of content presented
2. Proper planning for presentation.
3. Effectiveness of presentation.
4. Depth of knowledge and skills.
5. Attendance record, daily diary.

The Evaluation committee must minimally comprise of the External Examiner, Head of the Department, Senior Faculty and T&P Faculty Incharge.

Professional Elective Courses -I

PEC1ECE601E

SOLID-STATE DEVICES

UNIT I:

Crystal Structure: Fundamental concepts, Closed packed structures, Crystal systems, Crystallographic planes and directions, Miller indices, Point defects. Free electron Theory, classification of solids into conductors, Semiconductors and insulators, Effective mass.

UNIT II:

Dielectric Properties: Dielectric materials, Polarization mechanisms, Dipole moment, Dielectric strength, Methods for producing polarization, Application of dielectric materials. Magnetic Properties: Basic concepts, Soft and hard magnetic materials, Ferrites Selection techniques for applications, Magnetic recording, Magnetic memories. Optical Properties: Index of refraction, Damping constant, characteristic penetration depth and absorbance, Reflectivity and transmissivity, Atomic theory of the optical properties, Optical storage devices.

UNIT III:

Device Materials: Materials for resistors, capacitors and inductors. Superconductivity: Properties of superconductors, Applications of superconductors. Semiconductor Materials: Intrinsic and extrinsic materials, Electron and hole concentration sate equilibrium, Temperature dependence of carrier concentrations, Conductivity and mobility.

UNIT IV:

Effect of temperature and doping on mobility, Direct and indirect recombination of electron and holes, Diffusion and drift of carriers, Diffusion length, Contact potential. Hall Effect and its Applications. Si, Ge, GaAs and other binary semiconductors.

References

1. HummelRE,"ElectronicPropertiesofMaterials",NarosaPublishingHouse.
2. William D Callister, Jr "Materials Science and Engineering", John Wiley and Sons, Inc.
3. Dekker A J "Solid State Physics", Mac Milan, India Limited, Madras.
4. Pillai S O "Solid State Physics", New Age International Publishers.
5. VanVlack L H "Elements of Material Science and Engineering", Addison Wesley Publishers
6. Streetman BG and Banerjee S "Solid State Electron Devices", Prentice Hall of India.

PEC1ECE602E

ADVANCED EMBEDDED SYSTEMS PROTOTYPING

UNIT I

Introduction to open source embedded systems: Components of embedded system. Advantages and applications of embedded systems. Examples of real time embedded systems and how they are manufactured industry ready. Different Microcontroller Architectures (CISC, RISC, ARISC). Internal Resources & Hardware Chips in Details. History of AVR Microcontrollers and Features. Memory Architectures (RAM/ROM).

UNIT II

Learning Arduino Platform: Introduction to ARDUINO, ARDUINO History and Family. ARDUINO flavours, ARDUINO Architecture, Basic ARDUINO KIT Circuits, Programming in Embedded-C, Concepts of C language. Installing the Integrated Development Environment (IDE)-Setting up the Arduino Board-Using the Integrated Development Environment (IDE) to prepare an Arduino Sketch-Uploading and Running the Blink Sketch.

UNIT III

Serial Communications: Introduction to Serial communications, Synchronous and asynchronous Serial communication, UART and Serial Teletypes and standards. Different types of protocol converter IC's used in serial communication interfaces. Anatomy of PC and microcontroller based Serial communications.

UNIT IV

Digital and Analog Input/Output: Introduction to digital inputs and outputs, Types of Digital Inputs and outputs, Introduction to Digital Sensors ,signal conditioning the outputs of sensors for digital input operation, Voltage and Current Specifications of Digital outputs, Signal conditioning of Digital outputs. Types of Switches and their interfacing with microcontrollers, Introduction to AD and DA converters, inbuilt AD, DA converters in microcontrollers. Introduction to PWM and inertial Loads.

References

1. Arduino Cookbook by Michael Margolis. Orielly Media Publications
2. Exploring Arduino: Tools & Techniques by Jeremy Blum. Wiley Publications

PEC1ECE603E

ADVANCED MICROPROCESSORS

UNIT I

Introduction to 8086 Microprocessor Architecture, features and signals.

UNIT II

80286- A Mircroprocessor with Memory Management & Protection. Salient features of 80286, Internal architecture of 80286, Signal descriptions of 80286, Real addressing mode, Protected virtual address mode, Privilege, Protection, Special operation, 80286 Bus interface, Basic Bus operation, Fetch cycles of 80286, 80286 Minimum system configuration, Interfacing memory and I/O devices with 80286, Priority of bus use by 80286, Bus Hold and HLDA sequence, Interrupt acknowledge sequence, Instruction set features.

UNIT III

80386, 80486 – THE 32 Bit Processor: Salient feature of 80386, Architecture and signal description of 80386, Register organization of 80386, Addressing modes, Coprocessor 80387.

UNIT IV

An Introduction to the Pentium Microprocessor.

UNIT V

Interfacing and Programmable Devices for 8086 Based systems, Interfacing of Co-Processor, Switches, LED's, Analog to Digital Converter, Digital To Analog Convertor, DC and Stepper Motor, Seven segment and LCD display with 8086.

References

1. A. K. Ray & K. M. Bhurchandi- Advanced Microprocessor and Peripherals- Tata Mcgraw Hill.
2. B. P. Singh – Advanced Microprocessor and Microcontrollers- New Age International.
3. Brey, Barry B – Intel Microprocessor.
4. D. V. Hall – Micro process Interfacing.
5. "An Introduction to the Intel Family of Microprocessor," by J. L. Antonacos.

PEC1ECE604E

POWER SYSTEMS

UNIT I

DC and AC Distribution System: Introduction to a power system (an overall view), distribution systems Feeder, distribution, service. Mains classification, connection schemes, various types of DC and AC distributors, voltage drop calculations.

UNIT II

Overhead AC Transmission lines: Line Parameters, Types of conductors. Aluminum Core Steel Reinforced (ACSR) etc. Stranding, bundling of conductors. Resistance calculations, skin effect, proximity effect, Inductance and capacitance and capacitance of single Phase, 3 phase, single circuit and double circuit lines.

UNIT III

Representations and performance of short medium and long lines, ABCD constants, Surge impedance, Feranti effect, Power flow through a transmission lines.

UNIT IV

Insulators for overhead lines: Materials for insulators, types of insulators, potential distribution over a string of suspension insulators, methods for equalizing the potential Interference of power lines with communication circuits.

UNIT V

Electrostatic and electromagnetic effect. Corona: Visual and critical disruptive voltage, conditions effecting corona, former loss due to corona, Practical consideration, Mechanical design of transmission lines. Sag and tension calculations.

References

1. Elements of Power System Analysis by W. D. Stevenson
2. Transmission & Distribution of Electrical Energy by H. Cotton & Barber
3. Power System Engg. by Nagrath & Kothari
4. Electrical Power Systems by C. L. Wadwa

PEC1ECE605E

SYSTEM DESIGN

UNIT I

Introduction: Understanding a system, Components of a system: inputs, internal processes, outputs, feedback, assessment and evaluation, learning, Ways of Thinking: Logical Thinking, Causal Thinking, Reductionist Thinking, Holistic Thinking.

UNIT II

Interconnect: The Wire, Interconnect Parameter: Capacitance, Resistance, and Inductance, Electrical Wire Models, SPICE Wire Models, Signal Integrity and High Speed Behavior Of Interconnects: Ringing, Cross Talk and Ground Bounce.

UNIT III

System Hardware decomposition: Data Path And Control Path, Register Transfer Level Description, Control Flow And Data Flow Pipelines with special reference to digital filters, Communication Between Subsystems, Dead Lock and Live Lock problems.

UNIT IV

Subsystem design: HDL based design flow for system design, Introduction to Verilog: various components of Verilog code, Design of combinational circuits, sequential circuits, barrel shifter register, multi-bit adders, multipliers.

UNIT V

MPSoC as System Design Paradigm: Introduction to MPSoC, Need for MPSoC Architectures, Interconnection requirements of sophisticated systems, Network-on-Chip as a interconnection solution, Problems of traditional interconnection techniques, Arbiter for NoC.

References

1) Rabaey Jan M., Chandrakasan Anantha and Borivoje Nikolic, "Digital Integrated Circuits (Design Perspective)", Prentice Hall of India, 2nd Ed., 2003.
2) Laung-Terng Wang, Cheng-Wen Wu and Xiaoqing Wen,"VLSI Test principles And Architectures Design For Testability", Morgan Kaufmann Publishers, 1st Ed., 2006.

PEC1ECE606E

MATHEMATICS FOR MACHINE LEARNING

UNIT I

Linear Algebra: Vectors, Modulus & inner product, Cosine & Dot product of vectors, Projection, Basis, changing basis, vector space, and linear independence of a set of vectors, Applications of changing basis, Linear dependency of a set of vectors, Matrices, vectors, and solving simultaneous equation problems, Types of matrix transformation, Composition or combination of matrix transformations, Gaussian elimination, Inverse matrix, Determinants and inverse, Identifying special matrices, eigenvalues and eigenvectors, Calculating eigenvectors, Visualising Matrices and Eigen

UNIT II

Multivariate Calculus: Functions, Definition of a derivative, Differentiation examples & special cases, Product rule, Chain rule, Matching functions visually, Matching the graph of a function to the graph of its derivative, Let's differentiate some functions, Practicing the product rule, Practicing the chain rule, Differentiate with respect to anything, The Jacobian, Jacobian applied, The Sandpit, The Hessian, Practicing partial differentiation, Calculating the Jacobian, Bigger Jacobians, Calculating Hessians, Multivariate chain rule, Simple neural networks, Training Neural Networks, Building approximate functions, Power series, Power series derivation, Power series details, Linearisation, Multivariate Taylor

UNIT III

Statistics: Exploring one-variable quantitative data: Displaying and describing, exploring one-variable quantitative data: Summary statistics, exploring one-variable quantitative data: Percentiles, z-scores, and the normal distribution, exploring two-variable quantitative data, collecting data

UNIT IV

Probability: Introduction to Probability, Conditional probability and independent events, Visualization of conditional probabilities and Independence, Bayes's rule, Probability distribution, Binomial distribution, Variance of random variable. Discrete random variables with infinite number of values, Geometric and Poisson distributions, Systems of random variables; properties of expectation and variance, covariance and correlation, Linear transformations of random variables, Probability density function (PDF), Cumulative distribution function (CDF), Properties of CDF, Linking PDF and CDF, Histogram as approximation to a graph of PDF.

References

1. Bayesian Statistics the Fun Way: Understanding Statistics and Probability by Will Kurt published by O'Reilly
2. Think Stats by Allen Downey published by O'Reilly
3. Think Bayes: Bayesian Statistics in Python by Allen Downey published by O'Reilly
4. *Mathematics for Machine Learning* by. Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong. published by Cambridge University Press
5. Linear Algebra and Learning from Data, by Gilbert Strang Wellesley Publishers
6. Highlights of Calculus, by Gilbert Strang Wellesley Publishers2nd Edition

PEC1ECE607E

OPERATIONS RESEARCH

UNIT I
Introduction to OR Modelling Approaches & various Real-life Situations, Linear Programming Problems (LPP), Basic L L P 's Applications, Various Components of LPP formulation, Solving LPP.

UNIT II
Simultaneous Equations and Graphical Methods, Simplex Method, Duality Theory, Big-M Method, Transportation problems & Assignments Problems.

UNIT III
Network Analysis: Shortest Path, Dijkstra Algorithm, Floyd Algorithms, Maximal Flow Problem ((Ford-Fulkerson), PERT- CPM.

UNIT IV
Queuing Theory: Introduction, Basic Definitions & Notations, Axiomatic Derivation of the Arrival & Departure (Poisson Queue), Poisson Queue Models: M/M/1: ∞/FIFO, M/M/1: N/ FIFO.

References

1. H.A. Taha, "Operations Research", Macmillan Publishing Company.
2. Hadley G., "Linear Programming", Narosa Publishers.
3. Mital, "Optimization Methods", New Age International.
4. Rao, "Engineering Optimization", New Age International.

Professional Elective Courses - II

PEC2ECE701E

INTRODUCTION TO MACHINE LEARNING

UNIT I
Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation. Linear Regression, Multiple Variable Linear Regression, Logistic Regression, Naive Bayes Classifiers, k-NN Classification

UNIT II
Neurons and biological motivation. Linear threshold units. Perceptron's: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

UNIT III
Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators. Kernels for learning non-linear functions. Decision Trees, Random Forest, Using committees of multiple hypotheses. Bagging, boosting, and Active learning with ensembles.

UNIT IV
Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies. Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

UNIT V
Learning from unclassified data. Clustering. Hierarchical Clustering. k-means clustering. Dimensionality reduction (PCA), Expectation maximization algorithm (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled.

UNIT VI
Feature engineering Model selection and tuning Model performance measures K fold cross-validation, Regularising Linear models ML pipeline Bootstrap sampling Grid search Cross Validation,

References

1. Introduction to Machine Learning with Python by Andreas C. Muller & Sarah Guido O'Reilly
2. Hands on Machine Learning with Scikit-Learn and Tensor Flow by Aurélien Géron O'Reilly
3. Python Machine Learning for Beginners: Handbook for Machine Learning, Deep Learning and Neural Networks Using Python, Scikit-Learn and TensorFlow by Sanders, Finn

PEC2ECE702E

INTRODUCTION TO MACHINE LEARNING LAB

List of Experiments

1. Basic concepts of object programming in Python A short journey from procedural to object approach Properties Methods Inheritance - one of object programming foundations Exceptions once again Generators and closures Processing files Working with real files

2. Introduction to Python Packages NumPy, Pandas, Matplotlib, Seaborn, ScikitLearn

3. Introduction to traditional Datasets used in Machine Learning

4.Introduction to Classification: Intuitive understanding of the Naïve Bayes Classification, Mathematical Formulation, Implementation of Naïve Bayes Classification using Python-ScikitLearn

5. Introduction to Regression: Intuitive understanding of the Linear Regression, visualizing linear regression, Machine learning applications of linear regression.

PEC2ECE703E

DIGITAL IMAGE PROCESSING

UNIT I
Introduction: imaging and imaging devices. Image sampling and quantization, relationship between pixels and imaging geometry

UNIT II
Image enhancement techniques: Frequency domain, spatial domain, and fuzzy logic based.

UNIT III
Image Segmentation: using edge detection and edge linking techniques, Image threshold and region-oriented segmentation.

UNIT IV
Image representation schemes: Chain codes, polygonal approximation, and signatures.

UNIT V
Shape descriptors: Fourier descriptors. Descriptor using moments. Descriptor using AR and CAR modeling.

UNIT VI
Texture: Introduction to texture, different techniques of texture analysis and their comparison

References

1. Digital Image Processing, R. C. Gonzalez and R. E. Woods
2. Fundamentals of Digital Image Processing by Anil. K. Jain
3. Two-Dimensional Signal and Image Processing by J S Lim

PEC2ECE704E

DIGITAL IMAGE PROCESSING LAB

List of Experiments in MATLAB:

1. Image acquisition, digitization and display
2. Application of edge detection techniques on Images
3. Enhancement of images using histogram equalization, histogram modification, and fuzzy Logic
4. Segmentation of images using thresholding and region growing.

Tools Required: MATLAB Software, Hardware support for DIP toolbox

PEC2ECE705E

OPTICAL COMMUNICATION SYSTEMS

UNIT I

Structures, wave guiding and Fabrication: Nature of Light, Basic optical laws and definitions, Single mode fibers, Graded index fiber structure, Attenuation, Signal Dispersion in fibers. Optical Sources- LEDs, Laser Diodes, Line Coding.

UNIT II

Photo detector Noise, Detector Response Time, Avalanche Multiplication Noise. Optical Receiver Operation- Fundamental receiver operation, Digital receiver performance, Eye diagrams. WDM Concepts and Components- Passive optical Couplers, Isolators and Circulators

UNIT III

Point to point links, power penalties, error control, Coherent detection, Differential Quadrature Phase Shift Keying. Analog Links: Carrier to noise ratio, Multichannel Transmission Techniques, RF over Fiber, Radio over fiber links, Microwave Photonics.

UNIT IV

Network Concepts, Network Topologies, SONET/SDH, High speed lightwave links, Optical add/ Drop Multiplexing, Optical Switching, WDM Network, Passive Optical Networks, IP over DWDM, Optical Ethernet, Mitigation of Transmission Impairments

UNIT V

Measurement standards, Basic Test Equipment, Optical power measurement, Optical fiber characterization, Eye diagram tests, optical time domain reflectometer, optical performance monitoring, optical fiber system performance measurements.

Recommended Books:

1. Gerd Keiser, "Optical Fiber Communications", 5th Edition, McGraw Hill.
2. Rajeev Ramaswamy and Kumar N Sivarajan, "Optical Networks: A Practical Perspective", 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An imprint of Elsevier).

Reference Books:

1. John. M. Senior, "Optical Fiber Communications: Principles and Practice", 2nd Ed, 2000, PE.
2. Harold Kolimbris, "Fiber Optic Communication", 2nd Ed, 2004, PEI

PEC2ECE706E

OPTICAL COMMUNICATION SYSTEMS LAB

List of Experiments:

1. Measurement of Numerical Aperture.
2. Measurement of Attenuation and Bending Loss.
3. Study of Analog Link and Digital Link.
4. Study of BER and Q-factor estimation in the optical system simulation.
5. EDFA design for DWDM link.
6. Study the Characteristics of a Communication channels AWGN BSC.
7. Analog and Digital Modulation Frequency Modulation and Demodulation QPSK Modulation and Demodulation.
8. Design Conventional Encoder and Decoder.
9. Construction of MUX and DEMUX for WDM systems.
10. Design of Fiber Optic WDM link.
11. Calculate and simulate the attenuation and signal degradation due to intermodal and intramodal distortion.
12. Calculate power coupling losses due to connectors, splices, source output pattern and fiber numerical aperture.
13. Understand, compute and simulate the modes in step index fiber and graded index fiber.
14. Design, implement and test WDM communication system using its basic components.

Tools Required: Optiwave systems, OptSim, Optical Loss test set(OLTS), OTDR, VPIphotonics

PEC2ECE707E

RF CIRCUIT DESIGN

UNIT I:

Importance of Radio Frequency Design, Frequency Spectrum, RF Behavior of Passive Components, Chip Components and Circuit Board Considerations, RF Circuit Manufacturing Process, Transmission Line Analysis, Example of Transmission Lines, Equivalent Circuit Representation, Theoretical Foundation, Circuit Parameters for a Parallel-Plate Transmission Line, Summary of Different Transmission Line Configurations, General Transmission Line Equations, Microstrip Transmission Lines, Terminated Lossless Transmission Line, Special Termination Conditions

UNIT II:

The Smith Chart (From Reflection Coefficient to Load Impedance, Impedance Transformation, Admittance Transformation, Parallel Series Connection)

UNIT III:

Single- and Multi-port Networks (Interconnecting networks, Network properties and Applications, Scattering Parameters), Impedance Matching and Tuning

UNIT IV:

Passive RF Components (Coupler Design, Power Combiner and Power Divider: analytical techniques; Multi-band Component Design Techniques), RF Filter Design, Multi-Frequency Design Techniques, Vector Network Analyzer and Simple Calibration Approach, Active RF Components (RF Field Effect Transistors, MOSFETs, HEMTs),

UNIT IV:

Power Amplifier (Biasing and Matching Networks Design Techniques; Stability Considerations, Constant Gain, Constant VSWR Circles, Power Amplifier Topologies, Power Amplifier Operation Modes, Multi-band Matching Techniques for Power Amplifiers)

Recommended Books:

1. RF Circuit Design Theory and Applications, 2nd edition – R. Ludwig and G. Bogdanov, Pearson Economy

Reference Books:

1. Microwave Engineering, 3rd Edition – D. M. Pozar, Wiley
2. Secrets of RF Circuit Design – Joseph Carr, McGraw Hill
3. RF Circuit Design – R. Bowick, Newnes
4. IEEE Xplore, and IEL

PEC2ECE708E

RF CIRCUIT DESIGN LAB

List of Experiments:

Section I: Learning the CAD tool. Introduction to ADS, ADS Design Guides (Smith Chart and its applications)

Section II:

1. Design various transmission line configurations and study their performance and various termination conditions.
2. Design impedance matching networks for different types of load networks
3. Design and Analysis of multi-port networks
4. Design and implementation of a coupler
5. Design and implementation of Power Combiner and Divider
6. ·Design and implementation of different classes of Power Amplifiers.

Tools Required: Advanced Design System

PEC2ECE709E

COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

UNIT I

Review of Basic Computer Organization, Performance Evaluation Methods, Introduction to RISC Instruction Pipeline, Instruction Pipeline and Performance. Pipeline Hazards and Analysis, Branch Prediction, MIPS Pipeline for Multi-Cycle Operations.

UNIT II

Compiler Techniques to Explore Instruction Level Parallelism, Dynamic Scheduling with Tomasulo's Algorithm and Speculative Execution.

UNIT III

Advanced Pipelining and Superscalar Processors, Exploiting Data Level Parallelism: Vector and GPU Architectures, Architectural Simulation using gem5.

UNIT IV

Introduction to Cache Memory, Block Replacement Techniques and Write Strategy, Design Concepts in Cache Memory.

UNIT V

Basic and Advanced Optimization Techniques in Cache Memory, Cache Optimization using gem5, Introduction to DRAM System, DRAM Controllers, and Address Mapping, Secondary Storage Systems, Design Concepts in DRAM and Hard Disk.

UNIT VI

Tiled Chip Multicore Processors (TCMP), Routing Techniques in Network on Chip (NoC), NoC Router Microarchitecture, TCMP, and NoC: Design and Analysis, Future Trends in Computer Architecture Research.

References

1. Computer Architecture - A Quantitative Approach,5th edition, John L. Hennessy, David A. Patterson. 2.
2. Computer Systems Design and Architecture, 2nd Edition, Vincent P. Heuring 3.
3. Computer Organization and Architecture, 6th Edition, William Stallings 4.
4. Advanced Computer Architectures-A Design Space Approach, Dezsosima, Terence Fountain, Peter Kacsuk.

PEC2ECE710E

COMPUTER ARCHITECTURE AND PARALLEL PROCESSING LAB

List of Experiments:

1. Simulating the implementation of the pipeline.
2. Simulating the implementation of instruction level parallelism
3. Simulating the implementation of Vector Architecture
4. Simulating the implementation of GPU architecture
5. Simulating the implementation of super scalar architecture.

Tools Required: GEM5 simulator, MATLAB and GEMS or SIMICS

PEC2ECE711E

NETWORK SECURITY AND CRYPTOGRAPHY

UNIT I

Security: Need, security services, Attacks, OSI Security Architecture, one time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

UNIT II

Number Theory: Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

UNIT III

Private-Key (Symmetric) Cryptography: Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

UNIT IV

Public-Key (Asymmetric) Cryptography: RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

UNIT V

Authentication and System Security: IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer, Secure Electronic Transaction Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Trusted Systems.

Recommended Books:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, Private Communication in a Public World", Prentice Hall, 2 nd Edition.

Reference Books:

1. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Pres,
2. Stephen Northcutt, Leny Zeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, "Inside Network Perimeter Security", Pearson Education, 2nd Edition
3. Richard Bejtlich, "The Practice of Network Security Monitoring: Understanding Incident Detection and Response", William Pollock Publisher, 2013.

PEC2ECE712E

NETWORK SECURITY AND CRYPTOGRAPHY LAB

List of Experiments:

1. Write a program to perform encryption and decryption using substitution and transposition cipher.
2. Write a program to implement DES algorithm logic
3. Write a program for evaluation of AES
4. Write a program for evaluation Triple DES
5. Write a program to implement Blowfish algorithm logic
6. Write a program to implement RSA algorithm logic
7. Implement Diffie-Hellman key exchange mechanism using html
8. Write a program to implement Euclid algorithm
9. Calculate the message digest of a text using SHA-1 algorithm
10. Implement the signature scheme digital signature standard
11. Implement electronic mail security
12. Case study on web security requirement

Note:

1. Perform above experiments using C/C++/JAVA/MATLAB/Python.
2. Minimum 10 experiments must be performed from the List.

PEC2ECE713E

MIXED SIGNAL DESIGN

UNIT I

Simple CMOS Current Mirror, Common-Source Amplifier, Source-Follower, Source Degenerated Current Mirrors, cascode Current Mirrors, MOS Differential Pair and Gain Stage Process and temperature independent compensation

UNIT II

Sampling Circuits Performance of Sample-and-Hold Circuits, Testing Sample and Holds, MOS Sample-and-Hold Basics, Examples of CMOS S/H Circuits, Bipolar and BiCMOS Sample-and-Holds. Sample-and-Hold Architectures- Open-loop & closed-loop architectures, open-loop architecture with miller capacitance, multiplexed-input architectures, recycling architecture, switched capacitor architecture.

UNIT III

D/A Converter Architectures Input/output characteristics of an ideal D/A converter, performance metrics of D/A converter, D/A converter in terms of voltage, current, and charge division or multiplication, switching functions to generate an analog output corresponding to a digital input. Resistor-Ladder architectures, Current steering architectures

UNIT IV

A/D Converter Architectures Input/output characteristics and quantization error of an A/D converter, performance metrics, Performance Limitations, Resolution, Offset and Gain Error, Accuracy and Linearity, Successive approximation architectures, Flash architectures.

UNIT V

Integrator Based Filters Low Pass filters, active RC integrators, MOSFET-C integrators, transconductance-c integrator, discrete time integrators. Filtering topologies - bilinear transfer function and biquadratic transfer unction, phase-locked loop basics; PLL dynamics; frequency synthesis; all-digital PLLs.

References

1.Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.

2.Razavi, "Principles of data conversion system design", Wiley IEEE Press, 1st Edition, 1994.

3.Jacob Baker, "CMOS Mixed-Signal circuit design", IEEE Press, 2009.

4.Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986.

5.Baker, Li, Boyce, "CMOS: Circuit Design, layout and Simulation", PHI, 2000.

6. P.E. Allen, Doug Holberg, "CMOS Analog Circuit Design", Oxford University Press, 2011.

PEC2ECE714E

MIXED SIGNAL DESIGN LAB

List of Experiments:

Section I: ***Learning the CAD tool.***
Introduction to Cadence, Learning Cadence design framework and Virtuoso environment, Design with Virtuoso schematic editor, Layouts etc.

Section II: ***List of Experiments:***

1. Simulation and analysis of a basic Current mirror circuit.
2. Simulation and analysis of a bipolar current mirror circuit.
3. Design of Common Source Amplifier with different Loads
4. Simulation and design Differential Amplifier
5. Design, Simulation and analysis of an open loop track and hold using MOS technology.
6. Design, Simulation and analysis of Sample and Hold circuit with clock feedthrough circuitry.
7. Design and analysis of a voltage comparator circuit.
8. Design and analysis of ADC (e.g Flash)
9. Design, Simulation and analysis of first order RC filter circuit.
10. Design, Simulation and analysis of low Q and high Q bi-quad filters.
11. Design, Simulation and analysis of first order Gm-C filter circuit.

Tools Required: Cadence Virtuoso/ Advanced Design System/ any other industry grade CAD tool.

PEC2ECE715E

ANTENNA DESIGN

UNIT I

Antenna Fundamentals and Types: Radiation mechanism - over view, Electromagnetic Fundamentals, Solution of Maxwell's Equations for Radiation Problems, Ideal Dipole, Antenna Parameters.

Antenna types: Wires, Patches and Broadband, Dipole Antennas, Yagi - Uda Antennas, Micro strip Antenna, Travelling-wave Wire antennas, Helical antennas. Log - Periodic Antennas, spiral antennas, lens antennas etc

UNIT II

Antenna Arrays: Array factor for linear arrays, uniformly excited, equally spaced Linear arrays, pattern multiplication, directivity of linear arrays, non- uniformly excited -equally spaced linear arrays, Mutual coupling, multidimensional arrays, phased arrays, feeding techniques.

UNIT III

Aperture/Reflector Antennas: Radiation from Aperture and Huygen's principle, uniqueness theorem, Application of the equivalence principle to Aperture problems, uniform Rectangular aperture and radiating slit. Techniques for evaluating Gain .Reflector antennas - Parabolic reflector antenna principles, Axi - symmetric parabolic reflector antenna, offset parabolic reflectors, dual reflector antennas, Gain calculations for reflector antennas, feed antennas for reflectors, field representations, matching the feed to the reflector, general feed model.

UNIT IV

Antenna Synthesis: Formulation of the synthesis problem, synthesis principles, line sources shaped beam synthesis, linear array shaped beam synthesis — Fourier series, Woodward — Laws on sampling method, etc

UNIT V

CEM for Antennas: General Introduction. **Method of Moments**: Introduction to method of Moments, Pocklington's integral equation, integral equations and Kirchoff's Networking Equations, Source Modeling Weighted residuals formulations and computational consideration, calculation of Antenna and scatter characteristics. **Finite Difference Time Domain Method**: Maxwell equations for FTDT method, E - Plane analysis of Horn antennas. **High Frequency Methods:** Geometric optics, Wedge diffraction theory, E - Plane analysis of Horn antennas. Cylindrical parabolic antenna, radiation by a slot and monopole on a finite ground plane. Application of UTD to wireless mobile propagation.

UNIT VI

Basic Concepts of Smart Antennas: Concept and benefits of smart antennas, Fixed weight beam forming basics, Adaptive beam forming. **Instructional Activities:** Design, simulation and analysis of different antennas for wireless applications using related simulation tools.

References

1. Stutzman and Thiele, "Antenna Theory and Design", 2nd Ed, John Wiley and Sons Inc.
2. C. A. Balanis: "Antenna Theory and Design", John Wiley, 3rd Edition, 2005
3. Kraus J D and Marhefka R J, "Antennas for All Applications", 3rd Edition, Tata McGraw Hill, 2002.
4. Elliot R S, "Antenna Theory and Design", Revised Edition, John Wiley and Sons, India, 2006.
5. F . B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005.
6. Jordan E C and Balmain K G, "Electromagnetic Waves and Radiating Systems", 2nd Edition, Pearson Education, 2015.

PEC2ECE716E
ANTENNA DESIGN LAB

List of Experiments

A: Using Antenna Training System

1) Study different types of Antennas
2) Measurement of Radiation pattern of monopole, dipole, folded dipole, helix, Loop (rectangular and circular) antennas.
3) Study the structure, operation and radiation pattern of wired, aperture, planar and array antennas.
4) Proof of Inverse square law and Reciprocity theorem
5) Measurement of radiation pattern of reflector antennas
6) Study of variation in the radiation strength at a given distance from the antenna
7) Study of Yagi-UDA 5 Element Simple dipole antenna

B: Simulation using HFSS/CST:

1) Analysis of co-polarization and cross polarization.
2) Measurement of radiation pattern of planar antennas
3) Antennas Arrays and beamforming
4) Design micro strip patch antennas
5) Design reflector antennas
6) Design Horn antennas

Tools Required: HFSS Antenna design Suite, MATLAB, CST, Antenna Training System

Open Elective Courses

OECECE801E
INTERNET OF THINGS

UNIT I

What is IoT, why IoT matters, the power of IoT, Examples and Applications, How an IoT System Actually works, Structure of IoT.

UNIT II

Sensors and Devices: Hardware Capabilities Scaling & Operations, Industrial sensors, First Generation – Description, Advanced Generation, Integrated IoT Sensors, Polytronics Systems, Sensors' Swarm ,Printed Electronics ,IoT Generation Roadmap ,Wireless Sensor Structure– Energy Storage Module–Power Management Module–RF Module–Sensing Module

UNIT III

Connectivity: An introduction to Connectivity, LPWAN, Cellular, Satellite, WiFi, Bluetooth, Data Processing: Introduction to Cloud, Introduction to IoT platforms, Choosing an IoT Platform, API's, Data Analytics vs Machine Learning

UNIT IV

User Interface & User Experience in IoT, Introduction to UIs & UX for IoT2, Key Considerations for UIs, The Future of IoT and Case Study: Smart Cities, Healthcare, Agriculture

References

1. Dr. Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024', Yole Development Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
4. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014

OECECE802E
INTERNET OF THINGS LAB

List of Experiments:

1. Arduino Uno Architecture, Arduino Simulation Environment, Setup the IDE, Introduction Arduino Libraries.

2. Basics of Embedded C programming for Arduino.

3. Interfacing LED, push button and buzzer with Arduino.

4. Interfacing Arduino with LCD.

5. Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino.

6. Interfacing of Relay Switch and Servo Motor with Arduino.

7. Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library.

8. Web server- introduction, installation, configuration.

9. Posting sensor(s) data to web server.

10. Study of IOT Cloud platforms Thing Speak API and MQTT.

11. Interfacing ESP8266 with Web services.

12. Introduction to Contiki-Cooja Platform.

Tools Required:

1. **Hardware:** Arduino, Raspberry Pi, Intel Galileo, BeagleBone, Smart Phones.
2. **Software:** Contiki on Ubuntu machine.

OECECE803E
SENSORS AND ACTUATORS FOR IOT

UNIT I

Sensors / Transducers: Principles – Classification – Parameters – Characteristics - Environmental Parameters (EP) – Characterization Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer – Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors:– Electrostatic Transducer– Force/Stress Sensors Using Quartz Resonators – Ultrasonic Sensors

UNIT II

Thermal Sensors: Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermos sensors – Resistance Change Type Thermometric Sensors –Thermo emf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Introduction – Sensors and the Principles Behind – Magneto-resistive Sensors – Anisotropic Magneto resistive Sensing – Semiconductor Magneto resistors– Hall Effect and Sensors – Inductance and Eddy Current Sensors– Angular/Rotary Movement Transducers – Synchros– Synchro-resolvers - Eddy Current Sensors – Electromagnetic Flowmeter – Switching Magnetic Sensors SQUID Sensors

UNIT III

Radiation Sensors: Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential - Standard Hydrogen Electrode (SHE) – Liquid Junction and Other Potentials – Polarization – Concentration Polarization— Reference Electrodes - Sensor Electrodes – Electro ceramics in Gas Media.

UNIT IV

Smart Sensors: Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation Sensors –Applications: Introduction – On-board Automobile Sensors (Automotive Sensors)– Home Appliance Sensors – Aerospace Sensors — Sensors for Manufacturing – Sensors for environmental Monitoring

UNIT V

Actuators: Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection Electrical Actuation Systems-Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors

Recommended Books:

1. D. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.

2. W. Bolton – "Mechatronics" –Pearson Education Limited.

Reference Books:

1. Sensors and Actuators – D. Patranabis – 2nd Ed., PHI, 2013.

OECECE804E
SENSORS AND ACTUATORS FOR IOT LAB

List of Experiments:

1. Calibration of various electromechanical sensors and Interfacing with PC or Microcontrollers.
2. Calibration of various Thermal sensors and Interfacing with PC or Microcontrollers.
3. Calibration of various Optical sensors and Interfacing with PC or Microcontrollers.
4. Calibration of various automation sensors and Interfacing with PC or Microcontrollers.
5. Study of various off the shelf sensor modules and interfacing with PC or Microcontrollers.
6. Design and implementation of Signal conditioning circuits for basic transduction elements.
7. Interfacing of various actuators with PC or microcontrollers.
8. Design of a full automation system with sensors, actuators and processing elements.

Tools Required: MATLAB, LABVIEW, Proteus, Arduino.

OECECE805E
DEEP LEARNING

UNIT I

Introduction: Course logistics and overview. Linear Algebra Review: Brief review of concepts from Linear Algebra. Optimization: Types of errors, bias-variance trade-off, overfitting-underfitting, brief review of concepts from Vector Calculus and optimization, variants of gradient descent, momentum.

UNIT II

Logistic Regression: Basic concepts of regression and classification problems, linear models addressing regression and classification, maximum likelihood, logistic regression classifiers.

UNIT III

Neural Networks: Basic concepts of artificial neurons, single and multi-layer perceptrons, perceptron learning algorithm, its convergence proof, different activation functions, softmax cross entropy loss function.

UNIT IV

ConvNets: Basic concepts of Convolutional Neural Networks starting from filtering. Convolution and pooling operation and arithmetics. Regularization, Dropout, Batchnorm, etc. Convnet architectures - AlexNet, VGG, GoogLeNet, ResNet, MobileNet-v1, InceptionNet, etc.

UNIT V

Deep Learning Tasks: Detection, segmentation problem definition, challenges, evaluation. Classification, region proposals, RCNN and other architectures and techniques. Applications of deep learning to computer vision, speech recognition, etc.

References

1. "Deep Learning", I Goodfellow, Y Bengio and A Courville, 1st Edition, MIT Press
2. Python Machine Learning for Beginners: Handbook for Machine Learning, Deep Learning and Neural Networks Using Python, Scikit-Learn and TensorFlow by Sanders, Finn
3. Deep Learning with Python, François Chollet

OECECE806E
DEEP LEARNING LAB

List of Experiments:

1. Introduction to Python based Deep Learning-I
2. Introduction to Python based Deep Learning-II
3. Introduction to online Python Coding Platforms: Google COLAB, KAGGLE, etc.
4. Designing, training and evaluating a basic shallow neural net in Python.
5. Designing, training and evaluating a deep neural net in Python.
6. Using Transfer Learning for fine-tuning of a pre-trained CNN
7. Experiment on Computer Vision using Deep Learning.
8. Experiment on Speech Recognition using Deep Learning.
9. Using Tensor Processing Units (TPUs) for Deep Learning.

Tools required:

1. Python Software
2. MATLAB Software
3. Online Computing Platforms: Google Colab, Kaggle.

OECECE807E
INDUSTRIAL IOT

UNIT I

Introduction to Industrial Internet of Things• Embedded systems & computer networks• Machine-to-machine (M2M) communication• Internet of Everything (IoE)• Machine learning & artificial intelligence• Distributed computing• Industrial automation• Interoperability, identification localization, communication, and software-defined assets• Evolution of IIoT – understanding the IT & OT convergence• OT components like Industrial control systems, PLC, SCADA, and DCS• IT components like hardware, software, and people processes• Adoption of IIoT• Market trends and opportunities in IIoT

UNIT II

Industrial automation – PLC & SCADA• History of automation – plants to parts• Knowledge discovery process• The DIKW (Data, Information, Knowledge, and Wisdom) pyramid and its relevance in IoT• PLC vs. Microcontrollers• Industrial networks• Machine-to-machine networks

UNIT III

Sensor data mining and analytics• Transducers: Sensors & actuators• Data acquisition, storage, and analytics• Real-time analytics• Understanding the differences between IoT and Big Data• Improving operational efficiency with IoT• Edge analytics & data aggregation

UNIT IV

Wireless Sensor Area Networks (WSAN)• Sensor nodes• WSN communication technology• Fundamentals and applications of Bluetooth, Zigbee, and WiFi• Fundamentals and applications of Cellular communication and LPWAN technology

UNIT V

Design & development of IIoT systems• IIoT reference architectures• Standardization initiatives• Interoperability issues• Industrial internet reference architecture from Industrial Internet Consortium (IIC)• IIoT design considerations• Centralized vs. distributed architectures• Industrial networks, communication technologies, protocols

UNIT VI

Industry 4.0 – Smart Factories• Integration of products, processes, and people• Smart factories and cyber-physical systems• Design principles• Challenges on the path to be a smart factory

UNIT VII

Industrial cloud platforms• Industrial gateways• Commercial gateways by Intel and Cisco• Cloud-based gateway solutions• IaaS, PaaS, and SaaS models• Cloud components and services• Device management, databases, visualization, and reporting• Notification management• Security management• Cloud resource monitoring and management• AWS IoT• Microsoft Azure IoT• GE Predix• PTC Thingworx

References

1. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0 Paperback – 1 January 2018 by Giacomo Veneri Antonio Capasso
2. Introduction to Industrial Internet of Things and Industry 4.0 1st Edition CRC Press by Sudip Misra
3. IoT Fundamentals | Networking Technologies, Protocols, and Use Cases for the Internet of Things | First Edition Pearson Paperback – 16 August 2017 by Hanes David, Salgueiro Gonzalo, Grossetete Patrick
4. IoT - Internet of Things for Beginners: An Easy-to-Understand Introduction to IoT Paperback – February 21, 2020 by Charles Crowell
5. Getting started with the Internet of Things O'RELLY publications by Cuno Pfister

OECECE808E
INDUSTRIAL IOT LAB

List of Experiments:

1: Study hardware and software used in PLC

2: Implementation of Logic Gates

3: Develop a ladder program for DOL Starter

4: Develop an application using On-Delay Timer

5: Develop an application using Up-Down Counter

6: Implementation of PLC Arithmetic Instructions for a pilot plant

7: Study of PID controller instruction for a pilot plant

8: Study hardware and software platforms for DCS

9: Simulate analog and digital function blocks

10: Study, understand and perform experiments on timers and counters

11: Logic implementation for traffic Control Application

12: Logic implementation for Bottle Filling Application

Tools Required: PLC kits, DCS kits, SCADA software.

OECECE809E
ROBOTICS ENGINEERING

UNIT I

Introduction, History of robots, Classification of robots, Present status and future trends. Basic components of robotic system. Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Mechanisms and transmission, End effectors, Grippers-different methods of gripping, Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, Cam type gripper, Magnetic grippers, Vacuum grippers, Air operated grippers; Specifications of robot.

UNIT II

Drive systems and Sensors Drive system- hydraulic, pneumatic and electric systems Sensors in robot – Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.

UNIT III

Kinematics and Dynamics of Robots 2D, 3D Transformation, Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformation, Simple problems. Matrix representation, Forward and Reverse Kinematics Of Three Degree of Freedom, Homogeneous Transformations, Inverse kinematics of Robot, Robot Arm dynamics, D-H representation of robots, Basics of Trajectory Planning.

UNIT IV

Robot Control, Programming and Applications Robot controls-Point to point control, Continuous path control, Intelligent robot, Control system for robot joint, Control actions, Feedback devices, Encoder, Resolver, LVDT, Motion Interpolations, Adaptive control. Introduction to Robotic Programming, On-line and off-line programming, programming examples. Robot applications-Material handling, Machine loading and unloading, assembly, Inspection, Welding.

Recommended Books:

[T1] Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.

[T2] Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 1999.

Reference Books:

[R1] S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education., 2009.
[R2] Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning., 2009.
[R3] Francis N. Nagy, Andras Siegler, "Engineering foundation of Robotics", Prentice Hall Inc., 1987.
[R4] P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing company Ltd., 1995.
[R5] Carl D. Crane and Joseph Duffy, "Kinematic Analysis of Robot manipulators", Cambridge University press, 2008.
[R6] Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987
[R7] Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc.,1985

OECECE810E

ROBOTICS ENGINEERING LAB

List of Experiments:

1. Basic experiments on introduction to Robot Configuration.
2. Demonstration of Robot with 2 DOF, 3 DOF, 4 DOF, etc.
3. Experiments on programming a robot for applications.
4. Two case studies of Robotics Applications in Industry.
5. Experiments on Robotic Simulation Software.

OECECE811E

MECHATRONICS

UNIT I

Introduction, Examples of Mechatronic systems, Electric circuits and components, Semiconductor Electronics, Transistor Applications

UNIT II

Sensors and transducers: Performance terminology of sensors, Displacement, Position & Proximity Sensors-I, Displacement, Position & Proximity Sensors-II, Force, Fluid pressure, Liquid flow sensors, temperature, light sensor, Acceleration and Vibration measurement, Semiconductor sensor and MEM, SAW

UNIT III

Actuators and mechanisms: Mechanical Actuation System, Hydraulic & Pneumatic Actuation System, Electrical Actuation System-I, Electrical Actuation System-II, Data Presentation system

UNIT IV

Signal conditioning: Introduction to signal processing & Op-Amp, Op-Amp as signal conditioner, Analogue to Digital Converter, Digital to Analogue Converter, Artificial intelligence

UNIT V

Microprocessors and microcontrollers: Digital circuits-I, Digital circuits-II, Microprocessor Micro Controller, Programming of Microcontrollers

UNIT VI

Modeling and system response: Mechanical system model, Electrical system model, Fluid system model, Dynamic response of systems, Transfer function and frequency response.

UNIT VII

Closed loop controllers: P, I, PID Controllers, Digital Controllers, Program Logic Controllers, Input/output & Communication systems, Fault findings

References

1. William Bolton, "Mechatronics electronic control systems in mechanical and electrical engineering", 6th Edition, Pearson Education, 2002.
2. David G. Alciatore, Micheal B. Histand "Introduction to MECHATRONICS and measurement systems", 4th edition, Mc Graw Hill Education-2014
3. M.D. Singh, J.G. Joshi, "Mechatronics", PHI Publications

OECECE812E
MECHATRONICS LAB

List of Experiments:

1. Interfacing of various sensor and actuator modules with microcontrollers.

2. Use of A/D and D/A converters for signal conditioning of sensor signals.

3. Design and Implementation of OP-AMP based signal conditioning circuits for optical and thermal sensors.

4. Mechanical system modeling on PC.

5. Electrical system modeling on PC.

6. Working with PID controllers.

7. Project using Microcontroller-Atmega 328, Myoelectrically Controlled Robotic Arm, Design of a Legged Robot

Tools Required: MATLAB, MATLAB supported EMBEDDED hardware, LABVIEW.

OECECE813E
MICROPROCESSORS IN AUTOMATION

UNIT I

Number Systems, codes, digital electronics: Logic Gates, combinational circuits design, Flip-flops, Sequential logic circuits design: Counters, Shift registers. Introduction to 8085 Functional Block Diagram, Registers, ALU, Bus systems, Timing and control signals.

UNIT II

Machine cycles, instruction cycle and timing states, instruction timing diagrams, Memory interfacing

UNIT III

Assembly Language Programming: Addressing modes, Instruction set, simple programs in 8085; Concept of Interrupt, Need for Interrupts, Interrupt structure, Multiple Interrupt Requests and their handling, Programmable interrupt controller; Interfacing peripherals: Programmable peripheral interface (8255).

UNIT IV

Interfacing Analog to Digital Converter & Digital to Analog converter, Multiplexed seven segments LED display systems, Stepper Motor Control, Data Communication: Serial Data communication (8251), Programmable Timers (8253); 8086/8088 Microprocessor and its advanced features,

UNIT V

Introduction to Digital Control: Sampling theorem, Signal conversion and Processing, Z-Transform, Digital Filters, Implementation of Digital Algorithm.

References

1. Digital Electronics: An Introduction to Theory and Practice by William H. Gothmann, PHI Learning Private Limited
2. Digital Computer Electronics: An Introduction to Microcomputers by Albert Paul Malvino, Tata McGraw-Hill Publishing Company Ltd
3. Microprocessor Architecture, Programming, and Applications with the 8085 by Ramesh Gaonkar, PENRAM International Publishers.
4. Digital Control Systems by Benjamin C. Kuo, Oxford University Press
5. Microcomputer Experimentation with the Intel SDK-85, Lance A. Leventhal Prentice Hall

OECECE814E
MICROPROCESSORS IN AUTOMATION LAB

1. Design and implementation of:
   a. basic Gates: AND, OR, NOT.
   b. Universal gates.
   c. Basic Flip-Flops
2. Using 8085 microprocessor:
   i. develop a program to add two double byte numbers.
   ii. develop a subroutine to add two floating point quantities.
   iii. develop program to multiply two single byte unsigned numbers, giving a 16-bit product
   iv. develop subroutine which will multiply two positive floating-point numbers.
   v. To write program to evaluate P* Q*+R* & S where P, Q, R, S are 8-bit binary numbers.
   vi. To write a program to divide an 8-bit number by another 8-bit number up-to a
   vii. fractional quotient of 16 bit.
   viii. Write a program for adding first N natural numbers and store the results in memory location X.
   ix. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
   x. Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
   xi. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
3. Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a program by which the data stored in a RAM table is displayed.
4. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
5. To design and interface a circuit to convert digital data into analog signal using the 8255A in the memory mapped I/O.
6. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
7. To design a circuit to interface a memory chip with microprocessor with given memory map
8. Write a program to control the operation of stepper motor using 8085 and 8255 PPI

Annexure "BF"

Syllabus for the post of Photographer

Total Marks 120 **Time 2 Hours**

(HISTORY OF INDIAN PHOTOGRAPHER (1840 to 1900) **15 Marks**

Importance of photography before independence – Photojournalists and Free lancing - Amateurs on and after Indian Mutiny in 1857- Indian Photographers Dr. Narayan Dajee – Lala Deen Dayal –Raja Savai Man singh.

(**HISTORY OF INDIAN PHOTOGRAPHER 1900 ONWARDS)**

Honors of Deen Dayal before 1905-06- His establishments at Hyderabad - - Early photography Societies and its impact on Indian photography-Federation of Indian Photography- India International Photographic Council – Contemporary Indian Photographers – Atul Lasbekar, Mittal Bedi Brother – O.P. Sharma – Goutham Rathyesa – Dr. G. Thomas – Dr. N,Bhagwandas – O.C. Edwards – Raghubir Singh-Raghu Rai – T.N. Perumal – Raja Thriambak Raj Rau Bhahadur- P.N. Mehara-

BASIC PHOTOGRAPHER **15 Marks**

UNIT- I

Camera-Type of Cameras-Pinhole Camera-Box Camera-View Camera-Ranger finder Camera-Single lens reflex Camera-Twin lens Reflex Camera – Polaroid Camera-Panoramic Camera-Process Camera- Cine Camera- Video Camera-Digital Camera- Different formats of Camera-Large Format-Medium Format-Small format.

UNIT- II

Optics-positive and negative lenses-Focal Length-Resolving power of lens-lens aberration and rectification- spherical chromatic-coma-astigmatism-distortion-Curvature of field-types of lenses-Normal-wide angle-telephoto-zoom lenses-supplementary lenses-digital Lenses.

UNIT- III

Anatomy of camera-body -lens-view finder-Aperture-Shutter-Horizontal -vertical moving shutters-Shutter Speed-Shutter efficiency—merits and de-merits of between the lens shutter and focal plane shutters-aperture and shutter relation-film compartment-self timer.

UNIT- IV

Focusing-rack and pinon focusing-scale focusing-automatic focusing- types of Focusing in Digital-Exposure-Exposure meters-incident Light meters-reflected light meters-built in light meters-Depth of field-Circle of confusion-Depth of focus-Hyper focal distance.

PHOTO AESTHETICS **15 Marks**

UNIT- I

Definition of Light-Principles of Light-Properties of Light-Reflection-Refraction-Absorption-Transmission-Dispersion-Light-Characteristics-Quality-Quantity-Color-Direct Light-Indirect Light-Diffused light-light as subject-Shadow as subject.

UNIT- II

Need for the light in photography -Light Sources-Natural Light-Sunlight-Moon Light-Ambient- Artificial Light Source-Flood Light-Spot Light-Halogens Light-Electronic flash light-Digital lights.

BASIC PHOTO TECH **15 Marks**

UNIT- I

1. Key light or main light or principle light.
2. Fill in light
3. Bounce light.
4. Diffused light & Directional Diffused Light.
5. Exposure Calculation & Light Meters.

UNIT- II

Digital Basics-Introduction to Digital Imaging Principles.

UNIT- III

The digital Camera-Components of Digital Camera-Sensor-Sensor Characteristics & Configuration-LCD Display-Menu & Operations.

UNIT- IV

Digital Camera Lenses-Digital Zoom-Auto Focus System-Optical Zoom-Focal Length-Depth of field-Depth of focus.

DIGITAL PHOTOGRAPHY TECH **15 Marks**

UNIT- I

How to use Digital Camera- shooting images with correct Exposure – Application of Histogram.

UNIT - II

Understanding the applications of ISO settings and Noise Problems.

UNIT – III

Shooting with manual Settings Auto Exposure Modes in Indoor & Studio Exercises.

ADVERTISING PHOTOGRAPHY **7 Marks**

UNIT-I

Evolution of Advertising-The age of technology Print Media-Newspapers-Magazines-Electronic Media-Radio-Television-Luterult.

APPLIED PHOTOGRAPHY **15 Marks**

UNIT-I

Forms & Specializations in Photography-Agriculture-Sports-Table Top-Commercial Photography-Architectural Photography-Interiors Photography—Jewelry-People Photography-War Photography.

UNIT-II

Scientific application-Ultra Violet Photography-Infrared Photography-Forensic Photography.

UNIT-III

Medium format-Large format cameras-Working Principles-Camera Movements-Tripods-Digital Backs-Industrial Photography-Various Branches-Interactions-Shooting Machineries-Shooting large Indusial Set Up-Techniques involved in shooting.

PRODUCT PHOTOGRAPHY TECH **8 Marks**

UNIT-I

Electronic Products-Shooting Script-Lighting Schemes-Exercise

UNIT-II

House Hold Products-Shooting Scripts-Lighting Schemes-Exercises

PORTRAIT PHOTOGRAPHY **15 Marks**

UNIT-I
LIGHTING & EQUIPMENT

UNIT-II
CHARACGTERSTIC PORTRAIT- LIGHTEN FOR DIFFERENT PREDOMINANT FACES (Big forehead/chin/nose, etc.)

UNIT-III
Window light portrait

UNIT-IV
GLAMOUR PORTRAIT/CHILD PORTRAIT/CHARACTER PORTRAIT

UNIT-V
WEDDING PORTRAIT-ON LOCATION-PROPOSAL PORTRAIT

Annexure "BG"

Post:- Career Counselling Officer

Multiple Choice Based Written test

Reference Guidelines and Syllabus

120 Marks/120 Minutes

GENERAL KNOWLEDGE AND CURRENT AFFAIRS WITH SPECIAL REFERENCE TO J&K

24 Marks

- Abbrevations, Important dates, popular names of personalities and their achievements/Contribution (National and International).
- Constitution of J&K – Formation, Fundamental rights, Directive Principles.
- Weather, Climate, Crops, Means of Transport.
- Important power projects and their impact on State Economy.
- Rivers and Lakes.
- Important Tourist Destinations.
- History of J&K State.
- Historical places of the State and their importance.
- RTI Act.
- Indus Water Treaty and its impact on State economy.
- Current Affairs related to Policies of Govt. of India
- Other events of National importance

English or Verbal Section **24 Marks**

Grammar, Para Completion and inference, Reading Comprehension, Verbal Logic, Parajumbles, Syllogisms, Contextual usage, Analogies, Different usage of same word, Antonyms, Jumbled Paragraphs, Sentence correction, Idioms and One word Substitution.

Analytical Reasoning Section **24 Marks**

Blood Relations, Direction Sense, Puzzles, Data Arrangement, Data Structures, Series Coding-Decoding, Clocks and Calenders, Family Tree, Venn Diagram, Syllogism, Proposition, Assumptions, Statements, Binary Logic and Sets.

Mathematics or Quantitative Section **24 Marks**

Geometry, Trigonometry Mensuration Ratios and Proportion, Number System, Work and Time, HCF & LCM, Algebra, Profit and Loss, In-equations Quadratic and Linear Equations, Geometric Progression, Percentages, Averages, Partnership (Accounts), Time-Speed-Distance, Surds and Indices, Inequalities and Logarithsms.

Data Interpretation Section **24 Marks**

Tables, Bars, Pie Charts, Line Graphs, Caselets and Data Sufficiency

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