B. E. SYLLABUS

ELECTRICAL & ELECTRONICS ENGINEERING

VII & VIII SEMESTER

With
Scheme of Teaching
& Examination
### DEPARTMENT: ELECTRICAL & ELECTRONICS ENGINEERING

<table>
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<tr>
<th></th>
<th>Name</th>
<th>Qualification</th>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Nagesh Prabhu</td>
<td>M.Tech, PhD</td>
<td>Professor &amp; HOD</td>
</tr>
<tr>
<td>2</td>
<td>Dr. Sathyendra Kumar</td>
<td>Ph.D</td>
<td>Professor</td>
</tr>
<tr>
<td>3</td>
<td>K. Vasudeva Shettigar</td>
<td>M.Tech</td>
<td>Associate Professor</td>
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<tr>
<td>4</td>
<td>Nayana P Shetty</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>5</td>
<td>Suryanarayana K</td>
<td>M.Tech (on PhD)</td>
<td>Asst. Prof Gd III</td>
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<td>6</td>
<td>Rajaneesh Acharya</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<td>7</td>
<td>Naveen J</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<td>Anitha Marina Colaco</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>9</td>
<td>Pradeep Kumar</td>
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<td>10</td>
<td>Latha Shenoy</td>
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<td>11</td>
<td>Mahabaleshwara Sharma</td>
<td>M.Tech</td>
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<td>12</td>
<td>Raksha Adappa</td>
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<td>Soumya Rani Mestha</td>
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<td>Md. Abdul Raheman</td>
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<td>Cifha Crecil Dias</td>
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<td>Gururaj K</td>
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<td>Dinesh Shetty</td>
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<td>Ravikiran Rao</td>
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<td>Swathi Hatwar</td>
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<td>20</td>
<td>Raghavendra Prabhu</td>
<td>B.E (on M.Tech)</td>
<td>Asst. Prof</td>
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NMAMIT, NITTE
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Vision
Pursuing excellence in Electrical & Electronics Engineering, creating a research environment to promote innovation and address global challenges.

Mission
To equip students to face global challenges by excelling in professional career and higher education.
To offer high quality graduate and post graduate programs in electrical & electronics engineering.
To promote excellence in research, collaborative activities and contribute to social development with ethical values.

Programme Educational Objectives (PEO)
1. Excel in professional career and / or higher education by acquiring knowledge in mathematical, electrical, electronics and computer engineering principles.
2. Analyze real life problems, design electrical and electronics & multidisciplinary engineering systems and solutions that are technically sound, economically feasible and socially acceptable
3. Inculcate and exhibit ethical values, communication skills and provide supportive and leadership roles in their profession to emerge as excellent professionals and adapt to current trends by engaging in lifelong learning.

Programme Outcomes (PO)
B.E, (E&E) Engineering students will attain the following outcomes at the end of the Programme.

a. An ability to apply knowledge of mathematics, science and engineering fundamentals to electrical & electronics systems.
b. An ability to analyze electrical & electronics engineering problem, identify and formulate the appropriate solution.
c. An ability to design and conduct experiments, as well as to analyze, interpret and validate data.
d. An ability to investigate and design a system, component or process to meet desired needs within realistic constraints.
e. An ability to use emerging Technologies, skills, and modern tools necessary for practicing Electrical Engineering.
f. An ability to identify, formulate and solve electrical engineering problems and contribute effectively for the development of the society
g. An ability to engage in sustainable design, keeping legal, social, environmental, health and safety issues.
h. An understanding of professional and ethical responsibility.
i. An ability to function in multidisciplinary teams.
j. An ability to communicate effectively.
k. An understanding of economical aspects of electrical & electronics engineering and management principles to manage the projects and finance.
l. An ability to strengthen the knowledge and understanding of electrical & electronics engineering systems by engage in lifelong learning.
### VII Semester

<table>
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<tr>
<th>Sub. Code</th>
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<td>EE72x</td>
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## DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
### SCHEME OF TEACHING 2011-15 Batch

<table>
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<th>VIII Semester</th>
<th>29 Hours/week</th>
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<tr>
<td><strong>Sub. Code</strong></td>
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<tr>
<td>EE801</td>
<td>Industrial Management, Electrical Estimation &amp; Economics</td>
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<td>EE811</td>
<td>Power Systems Operation and Control</td>
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<tr>
<td>EE812</td>
<td>HVDC Power transmission</td>
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<td>EE813</td>
<td>Micro electro mechanical systems</td>
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<tr>
<td>EE814</td>
<td>Computer control of Electrical drives</td>
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<td>EE821</td>
<td>Power System Dynamics and Stability</td>
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<td>EE822</td>
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<td>EE803</td>
<td>Major Project</td>
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### Recommended OPEN Electives:
- MA8X01 Graph Theory
- EC8X13 Robotics
- HU8X02 Intellectual property rights
- CS8X14 OOPS with C ++
- PH8X04 Advanced Material Technology
- BT8X05 Nanotechnology
- ME8X09 Entrepreneurship Management
- EC8X12 Information and Communication Technology
Other Open electives:

MA8X03  Probability and Statistics
BT8X06  Risk and Safety engineering
CV8X07  Environmental Impact Assessment
IS8X17  Storage Technologies
IS8X16  Information and Network Security
CS8X15  Principles of Programming languages
COMPUTER TECHNIQUES IN POWER SYSTEM ANALYSIS

Subject code : EE701  Credits : 04
Hrs / Week : 4  Total Hours : 52


Objectives: To study Digital computer applications on some of the major Power system problems like Load flow, Economic operation of Power systems, System stability etc.

Outcome /Expectation:

UNIT – I
NETWORK TOPOLOGY: Introduction, Elementary graph theory – oriented graph, tree, co-tree, basic cut-sets, basic loops; Incidence matrices –Element-node, Bus incidence, Branch – path, Basic cut-set, Augmented cut-set, Basic loop and Augmented loop; Primitive network – impedance form and admittance form. 8 Hrs

UNIT - II

UNIT - III
LOAD FLOW STUDIES: Introduction, Power flow equations, Classification of buses, Data for load flow, Gauss-Seidal Method – Algorithm and flow chart for PQ and PV buses (numerical problem for one iteration only), Acceleration of convergence; Newton Raphson Method – Algorithm and flow chart for NR method in polar coordinates (numerical problem for one iteration only); Algorithm for Fast Decoupled load flow method; Comparison of Load Flow Methods. 16 Hrs

UNIT - IV
ECONOMIC OPERATION OF POWER SYSTEM: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling including
generator limits and neglecting losses; Iterative techniques; Economic Dispatch including transmission losses – approximate penalty factor, iterative technique for solution of economic dispatch with losses; Derivation of transmission loss formula; Optimal scheduling for Hydrothermal plants – problem formulation, solution procedure and algorithm.  

UNIT - V

10 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
4. Elements of Power System Analysis: W.D Stevenson
HIGH VOLTAGE ENGINEERING

Subject Code : EE702 Credits : 04
Hrs / Week : 4 Total Hours : 52

Prerequisite: Knowledge of Electrical machines, Transmission & distribution voltages, switchgear & protection and testing of electrical apparatus.

Objective of the course: To familiarize the student with the concepts like transmission & distribution voltage levels, also voltage levels required in testing laboratories and also the generation of high voltage AC and DC and also generation of impulse voltages. Students are able to know the different voltage levels used in power transmission and voltage levels required for testing of insulators.

Outcome / Expectations: At the end of the course, the student is capable to discriminate the various types of voltage levels and testing of electrical apparatus with different voltage levels.

UNIT - I

INTRODUCTION: Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high voltage. 4 Hrs


UNIT - II

Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro-mechanic breakdown. 2 Hrs

Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble’s theory), electro convection breakdown. 3 Hrs

GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit-principle of operation and advantages. Tesla coil. HV DC- voltage
doubler circuit, cockcroft-Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop

6 Hrs

UNIT - III
GENERATION OF IMPULSE VOLTAGE AND CURRENT:

10 Hrs

UNIT - IV
MEASUREMENT OF HIGH VOLTAGES:

10 Hrs

UNIT - V
NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES:

7 Hrs

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS:
Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers

4 Hrs

TEXT BOOKS:

**REFERENCE BOOKS:**

**INDUSTRIAL DRIVES & APPLICATIONS**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>EE703</th>
<th>Credits</th>
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<td>Hrs / Week</td>
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**Prerequisites:** Basics of Power Electronics, Electrical Machines (AC, DC and Synchronous)

**Objectives:** To study and understand the need of industrial drives its characteristics, selection of different drives based on requirements, and their characteristics. Also study some examples of real industrial drives.

**Outcome /Expectation:** To be able to select electrical drives based on the requirements and should be in position to design and model them theoretically.

**UNIT - I**

**AN INTRODUCTION TO ELECTRICAL DRIVES & ITS DYNAMICS:**


Dynamics of electrical drives, Fundamental torque equation, speed torque conventions and multi-quadrant operation. Equivalent values of drive parameters, components of low torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization. 10 Hrs
UNIT - II  
**SELECTION OF MOTOR POWER RATING:** Thermal model of motor for heating and cooling, Classes of motor duty, determination of motor rating.  
**6 Hrs**  

**D C MOTOR DRIVES:**  
Starting braking, transient analysis  
**4 Hrs**  

UNIT - III  
Single phase fully controlled rectifier, control of dc separately excited motor, Single-phase half controlled rectifier control of dc separately excited motor.  
Three phase fully controlled rectifier control of dc separately excited motor, three phase half controlled rectifier control of dc separately excited motor, multi-quadrant operation of dc separately excited motor fed from fully controlled rectifier. Rectifier control of dc series motor, chopper controlled dc drives, chopper control of separately excited dc motor, Chopper control of series motor.  
**10 Hrs**  

UNIT - IV  
**INDUCTION MOTOR DRIVES:**  
(a) Operation with unbalanced source voltage and single phasing, operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply, starting braking, transient analysis.  
(b) Stator voltage control variable voltage frequency control from voltage sources, voltage source inverter control, closed loop control, current source inverter control, current regulated voltage source inverter control, rotor resistance control, slip power recovery, speed control of single phase induction motors.  
**11 Hrs**  

UNIT - V  
**SYNCHRONOUS MOTOR DRIVES:** Operation form fixed frequency supply, synchronous motor variable speed drives, variable frequency control of multiple synchronous motors. Self-controlled synchronous motor drive employing load commutated thruster inverter.  
**7 Hrs**  

**INDUSTRIAL DRIVES:** Rolling mill drives, cement mill drives, paper mill dries and textile mill drives.  
**4 Hrs**  

**TEXT BOOK:**  
REFERENCE BOOKS:

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**ELECTRICAL POWER QUALITY**

**Subject Code**: EE711  
**Credits**: 03  
**Hrs / Week**: 3  
**Total Hours**: 39

**UNIT - I**

Definitions: general classes of power quality problems, Transients, long duration voltage variation, short duration voltage variations, voltage imbalance, waveform distortion, power quality terms, CBEMA and ITI curves  
6 Hrs

Voltage sags and interruptions: Sources of sags and interruptions, estimating voltage sag performance, fundamental principles of protection, motor starting sags.  
3 Hrs

Transients over voltages: Sources of transient over voltages, principles of overvoltage protection, utility capacitor switching transients, Fundamentals of harmonics: Harmonic distortion, voltage versus transients, harmonic indexes, harmonic sources from commercial loads, harmonic sources from Industrial loads, effects of harmonic distortion, intra-harmonics  
7 Hrs

**UNIT - II**

Applied harmonics: harmonic distortion evaluations, principles for controlling harmonics, harmonic studies, devices for controlling harmonic distortion, harmonic filters, standards of harmonics  
8 Hrs

Power quality benchmark: introduction, benchmark process, power quality contract, power quality state estimation, including power quality in distribution planning, RMS voltage variation indices and harmonic indices.  
7 Hrs
UNIT - III
Power quality monitoring: Monitoring considerations, power quality measurement equipments, assessment of power quality measurement data, application of intelligent systems, power quality monitoring standards.  

TEXT BOOKS:

REFERENCES BOOKS:

REACTIVE POWER MANAGEMENT
Subject Code : EE 712  
Credits : 03
Hrs/week : 3  
Total Hours : 39

Prerequisites: Network Theory, Electric Power Transmission and Distribution, Elementary theory of Power systems

Objectives: To study the importance of reactive power control in Electrical Power System, Its Generation and absorption, Different methods of controlling, Effect of Harmonics, Reactive power coordination.

Outcome/ Expectation:
UNIT - I
Introduction, Importance of reactive power control in Electrical Power System, Generation and absorption of Reactive power, Relation between Voltage, Power and Reactive power at a node. Methods of voltage or Reactive power control: Shunt reactor, Shunt capacitor, Series capacitor, Synchronous condenser, Static VAR system 17 Hrs
UNIT - II
Principles of Transmission system compensation. Effect of Harmonics on reactive power control: Harmonic sources, Resonance, Shunt capacitors and Filters, Telephonic Interference. 13 Hrs

UNIT - III
Reactive power coordination: Reactive power management, Transmission benefits, Reactive power dispatch and equipment impact. 9 Hrs

TEXT BOOKS:

REFERENCES:
1. Prabha Kunder – Power System Stability and Control (TATA McGRAW-HILL)

ADVANCED MICROPROCESSOR
Subject Code : EE713 Credits : 03
Hrs/Week : 3 Total Hours : 39

Objectives: To study the Intel microprocessor 8086, their internal architecture, programming and interfacing in detail. Also study architectures of advanced microprocessor like 80486, Pentium and Pentium Pro. Also study some co-processors like 8087NDP, 8089IOP.

Prerequisites: Microprocessors / microcontroller, their programming and interfacing.

Outcome/ Expectation: Students will be able to understand /design 8086 based system and interface them with co-processor and external peripheral components.
UNIT - I
8086 architecture, internal operation, addressing modes, instruction formats, instruction executing timing  
8 Hrs
Assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, loop instructions, FLAG instructions, logical instructions, SHIFT AND ROTATE instructions, directives and operators, structures assembly process.  
8 Hrs

UNIT - II
Modular programming linking and relocation, stacks, procedures, procedure communication, recursive procedures, interrupts and interrupt routines, macros  
7 Hrs
Byte and string manipulations: string instructions, rep prefix  
3 Hrs
I/O programming: fundamental I/O programming, programmed I/O, interrupt I/O, DMA  
System bus structure: typical system bus architecture, 8086 configurations, minimum mode system, maximum mode systems  
4 Hrs

UNIT - III
Multiprocessor configurations: co-processor configurations, loosely coupled configurations, architecture and working of 8087 NDP, architecture and working of 8089 IOP  
6 Hrs
Architecture of 80486 Pentium and Pentium processors  
3 Hrs

TEXT BOOKS
1. Y.C.Liu & G.A.Gibson microprocessor systems: The 8086/8088 family PHI

REFERENCE BOOKS
1. Microprocessor and interfacing- Douglas V. Hall TMH
PROGRAMMABLE LOGIC CONTROLLERS

Subject Code : EE714  Credits : 03
Hrs/Week : 3 Total Hours : 39

Objectives: To introduce the world of PLC and its use in industrial automation. Also to program a given PLC (Mitsubishi) for various applications

Prerequisites: Basic Knowledge of Digital Electronics.

Outcome /Expectation: Students will be able to program a PLC using different programming tools for the required application.

Note: Total 8 questions to be set. 3 from Unit-I, 3 from Unit-II and 2 from Unit-III. Students have to answer any 5 selecting 2 from Unit-I, 2 from Unit-II, and 1 from Unit-III

UNIT - I

Introduction: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. 8 Hrs

Programming: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, Functional blocks, Program examples, location of stop and emergency switches 7 Hrs

UNIT - II

Programming Languages: Instruction list, sequential functions charts, Structured Text 5 Hrs

Internal Relays: Ladder programs, battery- backed relays, one - shot operation, set and reset, master control relay, Example Programs, Jump and call, subroutines. 5 Hrs

Timers and counters: Types of timers, programming timers, Off-delay timers, pulse timers, Programming examples, forms of counter, programming, up and down counting, timers with counters, sequencer. 6 Hrs

UNIT - III

Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, closed loop control, temperature control and bottle packing applications. 8 Hrs

Note: Discussing the programming should be restricted to only one type of PLC (Mitsubishi)
TEXT BOOKS:

REFERENCE BOOKS:

ENERGY MANAGEMENT AND AUDIT

Subject Code : EE721
Credits : 03
Hrs/Week : 3
Total Hours : 39

UNIT - I
Introduction: Energy situation – world and India, energy consumption, conservation. Codes, standards and Legislation. 4 Hrs
Energy Economic Analysis: The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems. 5 Hrs
Energy Auditing: Introduction, Elements of energy audits, energy use profiles, measurements in energy audits, presentation of energy audit results. 7 Hrs

UNIT - II
Electrical Equipment and power factor –correction & location of capacitors, energy efficient motors, lighting basics, electrical rate tariff. 8 Hrs
Electrical System Optimization: The power triangle, motor horsepower, power flow concept. 7 Hrs
UNIT - III

Demand Side Management: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning, load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs.  

**TEXT BOOKS:**
3. Pabla “Electrical distribution”, TMH, 2004

**REFERENCES BOOKS:**
4. Hand book on energy auditing - TERI (Tata Energy Research Institute)

MODERN POWER SYSTEM PROTECTION

Subject Code : EE722  
Credits : 03  
Hrs/Week : 3  
Total Hours : 39  

Prerequisites: Electric Power Transmission and Distribution, Switch gear & Protection, working of relays , Elementary theory of Power systems.  

Objectives: To study the importance of electromagnetic, electromechanical and Static relays . Study of comparator circuits – amplitude comparator and phase comparator circuits.
Outcome/ Expectation: Students are able to write / analyze the general equation of phase and amplitude comparators, able to discriminate between the electromagnetic, electromechanical and static/digital relays

UNIT - I

Static Relays: Introduction, Basic construction, Classification, Basic Circuits, Smoothing Circuits, Voltage regulation, square wave Generator, Time delay Circuits, Level Detectors, Summation device, Sampling Circuits, Zero crossing detector, output devices. 8 Hrs

Comparators: Replica impedance, Mains Transformers, General equation of phase and Amplitude Comparators, Realization of ohm, mho, Impedance and offset impedance characteristics, Dualist principle, Static amplifier comparator – Rectifier bridge circulations current type, sampling comparator, static phase comparator accident circuits type Rectifier phase comparator, Block split comparator, Zenar diode phase comparator, 7 Hrs

UNIT - II

STATIC OVER CURRENT, TIMER AND VOLTAGE RELAYS:
Instantaneous over current Relay, Definite time lag relay, inverse time over current relay, static timer relay, Basic relay circuits, monostable delay circuits Single phase Instantaneous over voltage and under voltage relays, instantaneous over voltage relay using Opamp. 8 Hrs

Distance Relay: General Principle of operation, Zone discrimination, Fault area on impedance diagram, Basic measuring elements, Different characteristics used in distance relaying- Impedance, Reactance, Admittance, Ohm, Distance relay settings, Distance measurement Problems. 6 Hrs

UNIT - III

Principles of Digital/ Numerical Relays: Definition of Numerical Protection System, Advantages of Numerical relays, Block diagram of Numerical Relays, Processing Unit, non-machines Interface, communication in protective relays, Information handling with substation monitoring system. 5 Hrs

Digital Relays: Block Schematic approach of microprocessor based relays, over current relay, Protection Transformer differential protection, Directional relay scheme, Impedance relay scheme. 5 Hrs
TEXT BOOKS:

REFERENCE BOOKS:
2. Ravindranath. B and Chanda M. “Power System Protection and switchgear” New age

ELECTRICAL POWER UTILIZATION
Subject Code : EE723 Credits : 03
Hrs/Week : 3 Total Hours : 39

UNIT - I
HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building, electric welding, resistance and arc welding, control device and welding equipment 10 Hrs
ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals, electroplating. Factors affecting electro deposition process, power supply for electrolytic process. 6 Hrs

UNIT - II
ELECTRIC TRACTION: System of traction, speed time curve, tractive effort at /co-efficient of adhesions, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, train lighting system, specific energy, factors affecting specific energy consumption 13 Hrs
UNIT - III

**ILLUMINATION:** Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps, incandescent, fluorescent, vapor and CFL and their working, Glare and its remedy 8 Hrs

**INTRODUCTION ELECTRIC AND HYBRID VEHICLES:**
Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption 2 Hrs

**TEXT BOOKS:**
1. *Utilization Of Electric Energy* - Openshaw Taylor

**REFERENCE BOOKS:**
2. *Electrical Power* by Dr. S.L.Uppal Khanna Publications

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**VLSI CIRCUITS AND DESIGN**

**Subject Code:** EE722  
**Credits:** 3  
**Hrs/Week:** 3  
**Total Hours:** 39

**UNIT - 1**
Introduction to IC Technology, Moore’s law, the integrated circuit era, MOS and related VLSI Technology, VLSI design flow, fabrication of MOSFETS, fabrication of nMOS Transistor, CMOS n-well and P-well process, twin tub process

**MOS TRANSISTORS:** Two terminal MOS structure, flat band voltage, MOS system under external bias, structure and operation of MOS transistors, threshold voltage, drain to source current $I_{ds}$ verses $V_{ds}$ relationships, body effect ,channel length modulation, mobility variation, Tunneling, punch through, hot electron effect MOS, models, small signal AC Characteristics 15 Hrs
UNIT - II
MOSFET SCALING AND GEOMETRY EFFECTS: Introduction, constant field scaling, short channel Effects, narrow channel effects, other limitations imposed by small device geometries, MOSFET capacitance, oxide elated capacitance, junction capacitances, problems
MOS INVERTERS STATIC CHARACTERISTICS: Introduction, voltage transistor characteristics, noise immunity and noise margin, power and area considerations, resistive load inverter calculation of Voh, Vol, Vil, Vih, inverters with n type MOSFET load (enhancement, depletion) characteristics,(excluding derivation),CMOS inverter static characteristics(excluding derivation) design of CMOS inverters, supply voltage scaling in CMOS inverters, problems ,latch up bulk cmos 15 Hrs

UNIT - III
MASK LAYERS,STICK DIAGRAMS,DESIGN SYMBOLIC DIAGRAMS: Sheet resistance, capacitance layer, inverter delays, wiring capacitance choice of layers, pass transistors, transmission gate characteristics
CIRCUIT CHARACTERISTICS AND PERFORMANCE ESTIMATION: Introduction, delay estimation, RC delay model, linear delay model, logical effort, parasitic delay ,logical efforts and transistor sizing, delay in logic gate, delay in multistage logic network
OTHER FORMS OF CMOS LOGIC: Pseudo nMOS logic, dynamic CMOS logic, clocked CMOS logic, CMOS domino logic, parity generator, multiplexer, dynamic shift register 9 Hrs

TEXT BOOKS:
2. Basic VLSI design by Douglass a Pucknell, Amran Esharaghian,3rd edition, PHI Publication
3. CMOS VLSI design by Neil Weste,David Harris, Ayan Bannergee,3rd edition, Pearson education

REFERENCE BOOKS:
2. Carver Mead and Lynn Conway” Introduction to VLSI Systems” BS Publication
RELAY AND HIGH VOLTAGE LAB
(Total 10 experiments are to be conducted)

Subject Code : EE704  
Credits : 2  
Hrs/week : 0-0-3

PART - A
(Choose at least two experiments)
1. Over current relay:
   a. IDMT non-directional characteristics
   b. Directional features
   c. IDMT directional
2. IDMT characteristics of over voltage or under voltage relay. (solid stare or electromechanical type)
   a. To determine 50% probability flashover voltage for air insulation subjected to impulse voltage.
   b. Generation of standard lightning impulse voltage and to determine efficiency and energy of impulse generator. Operating characteristics of over voltage or under voltage relay. (Solid stare or electromechanical type).
3. Operation of negative sequence relay.
4. Bias characteristics of differential relay.
5. Current-time characteristics of fuse.

PART - B
(Choose at least one experiment)
1. Operating characteristics of microprocessor based (numeric) over –current relay.
2. Operating characteristics of microprocessor based (numeric) distance relay.
3. Operating characteristics of microprocessor based (numeric) over/under voltage relay.

PART - C
(Choose at least one experiment)
1. Generator protection –Merz-Price- protection scheme.
2. Feeder protection scheme-fault studies.
PART - D

(Choose at least two experiments)

1. Spark over characteristics of air insulation subjected to high voltage AC with spark over voltage corrected to STP.
2. Spark over characteristics of air insulation subjected to high voltage AC, with spark over voltage corrected to STP for uniform and non-uniform field configuration.
4. Breakdown strength of transformer oil using oil-testing unit.
5. Field mapping using electrolytic tank for any one-model cable/capacitor/transmission line/ Sphere gap models.

POWER SYSTEM SIMULATION LAB

Subject Code : EE705  
Credits : 2
Hrs/week : 0-0-3

Power system simulation using MATLAB, Software Packages and C++

1. Determination of Power angle diagrams for Salient and Non- Salient pole Synchronous machines, reluctance power, excitation e.m.f. and regulation.
2. Y Bus formation for power system with & without mutual coupling by Singular transformation.
3. Y Bus formation for power system by Inspection method.
4. ABCD Parameters:
   i) For symmetric Π/T configuration.
   ii) Verification of AD-BC = 1.
   iii) Determination of Efficiency and Regulation.
5. Determination of bus current, bus power & line flows for a specified system voltage (bus) profile.
6. To determine fault current and voltage in a single transmission system with ‘Y-Δ’ transformers at a specified location for SLGF, DLGF and LLF
7. Load flow analysis using Gauss – Seidel method for both P – Q and P-V buses
9. Optimal Generator scheduling for thermal power plants.
10. Plot swing curve for a single machine connected to infinite bus through a pair of identical transmission lines, for a 3 phase fault on one of the lines for variation of inertia constant/line parameters/fault location/clearing time/pre fault electrical output.

MAJOR PROJECT PHASE I

Sub Code: EE706 Credits : 3
Hrs/week : 0-0-6

INDUSTRIAL MANAGEMENT, ELECTRICAL ESTIMATION & ECONOMICS

Subject Code : EE801 Credits : 4
Hrs/Week : 4 Total Hours : 52

UNIT - I
INTRODUCTION:
Historical prospective, contribution of Taylor, Henry Foyol, Gilberth and HL Gnatt to the evolution of management as a scientific discipline concept of scientific management and it relevance in the Indian context.  
4 Hrs

ORGANIZATION: Types of organization; their merits and demerits
2 Hrs

MANAGEMENT FUNCTIONS: Planning, organizing, staffing, directing, controlling. 
4 Hrs

UNIT - II
MANAGEMENT AND BEHAVIORAL APPROACH: contribution of Elton mayo and skinner and others to behavioral
science, skills of a manager at various levels in an organization and inter related systems, understanding past behavior, predicting future behavior, directing, changing and controlling behavior; Maslow’s hierarchy of needs and satisfaction, goal oriented behavior, integration of organizational goals and needs of employees, Hawthorn’s studies and its finding, theory X and Y

UNIT - III

PERSONNEL MANAGEMENT: Recruitment and selection, training of personnel, employer and employee relationship, causes and settlement of disputes.

PRODUCTION MANAGEMENT: Plant location, plant lay-out, CPM and PERT strategies, line balancing, automation statistical quality control; control chart, motion study.

UNIT - IV

INTERIOR WIRING SYSTEM: Wiring system, earthing, and estimation of wiring installation.

POWER INSTALLATION: Load calculation, wire size selection, wiring materials for power circuits,

UNIT - V

The estimate for motor installation, pump set, workshop, theater etc.,

Depreciation and valuation of machinery, Inventory, Economic order quantity, break-even analysis

TEXT BOOKS:
1. “Introduction to Management”- S. S. Chatterjee,
2. “Engineering Economics and Management” - N. Narasimhaswamy,

REFERENCE BOOKS:
POWER SYSTEM OPERATION AND CONTROL

Subject Code : EE811  Credits : 3
Hrs/Week : 3  Total Hours : 39

Objectives: To study the operation of power system components, control area problems, Real and Reactive power control, System optimization and security.

Prerequisites: Network theory, Electric power Generation, Transmission and Distribution, Theory of Synchronous Machines, Elementary theory of Power systems, Stability and other power system problems.

UNIT - I
CONTROL CENTER OPERATION OF POWER SYSTEMS:
Introduction to SCADA, control center, digital computer configuration, automatic generation control, area control error, operation without central computers, expression for tie-line flow and frequency deviation, parallel operation of generators.

AUTOMATIC GENERATION CONTROL: Automatic voltage regulator, automatic load frequency control, AVR control loops of generators, performance of AVR, ALFC of single area systems, concept of control area, multi-area systems, POOL operation-two area systems.

15 Hrs

UNIT – II
CONTROL OF VOLTAGE AND REACTIVE POWER:
Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus systems, methods of voltage control, sub synchronous resonance, voltage stability, voltage collapse.

UNIT COMMITMENT: Statement of the problem, need and importance of unit commitment, methods-priority lists method, dynamic programming method, constraints, spinning reserve, and examples.

15 Hrs

UNIT – III
POWER SYSTEM SECURITY Factors affecting power system security, power system contingency analysis, detection of network problems, network sensitivity methods, calculation of network sensitivity factor, contingency ranking.

9 Hrs
TEXT BOOKS:
2. “Electrical Energy Systems Theory” – 0.I.Elgard, TMH
4. “Electric Power Systems”-B. M. Weedy,
5. “Power Systems Operation and Control” – P.S.R.Murthy,TMH

REFERENCE BOOKS:
2. “Elements of Power System Analysis”- W.D Stevenson

HVDC POWER TRANSMISSION

Subject Code : EE812  
Credits : 3
Hrs/Week : 3  
Total Hours : 39

UNIT - I
General aspects of DC transmission and comparison of it with Ac transmission: Historical sketch, constitution of EHV AC and DC links, Limitations and Advantages of AC and DC Transmission. 8 Hrs
Converter circuits: Valve Characteristics, Properties of converter circuits, assumptions, single phase, three phase converters, choice of best circuits for HV DC circuits. 7 Hrs

UNIT - II
Analysis of the bridge converter:- Analysis with grid control but no overlap, Analysis with grid control and with overlap less than 60 deg, Analysis with overlap greater than 60 deg, complete characteristics of rectifier, Inversion 8 Hrs
Control of HVDC converters and systems: grid control, basic means of control, power reversal, limitations of manual control, constant current versus constant voltage, desired feature of control, actual control characteristics, constant -minimum -Ignition –angle control, constant –current control, constant –extinction –angle control, stability of control 8 Hrs
UNIT - III
Protection: general, DC reactor, voltage oscillations and valve dampers, current oscillations and anode dampers, DC line oscillations and line dampers, clear line faults and reenergizing the line. 8 Hrs

TEXT BOOKS:
1. EW Kimbark, “Direct current Transmission”
2. K.R Padiyar – HVDC Transmission

MICRO ELECTRO MECHANICAL SYSTEMS

Subject Code : EE813  Credits : 3
Hrs/Week : 3  Total Hours : 39

Objectives: To study the details of MEMS technology, design and its applications.

Prerequisites:

Expectation: To be able to select proper MEMS device.

UNIT - I
INTRODUCTION TO MEMS TECHNOLOGY: Introduction to MEMS and motivation, Basic definitions, history of MEMS

SCALING IN MICRODOMAIN: How small is different- some natural examples, Scaling laws in electrostatic, electromagnetic, rigidity of structures, heating & cooling, Fluid viscosity and fluid interfaces, etc. Scaling in overall system performance considering multiple physical domains 8 Hrs

MEMS MATERIALS: Mechanical and other properties of materials used in MEMS

MICROFABRICATION / MICROMACHINING: Overview of microfabrication, Review of microelectronics fabrication processes like photolithography, deposition, doping, etching, structural and sacrificial materials, other lithography methods, MEMS fabrication methods like surface, bulk, LIGA and wafer bonding methods 8 Hrs
UNIT - II
TRANSDUCTION PRINCIPLES: Transduction principles in micro-domain
MEMS MODELING: Basic modeling elements in electrical, mechanical, thermal and fluid systems, analogy between 2nd order mechanical and electrical systems. Modeling elastic, electrostatic, electromagnetic systems 8 Hrs
RADIO FREQUENCY (RF) MEMS: Introduction, Review of RF-based communication systems, RF –MEMS like MEMS inductors, varactors, tuners, filters, resonators, phase shifters, switches 5 Hrs
OPTICAL MEMS: Preview, passive optical components like lenses and mirrors, actuators for active optical MEMS 4 Hrs

UNIT - III
CASE STUDIES: Case studies of Microsystems including micro cantilever based sensors and actuators with appropriate selection of material properties: thermal; mechanical properties. Static and dynamic mechanical response with different force mechanisms: electrostatic, electromagnetic, thermal etc.
Tutorials: The above case study examples are to be implemented in either Coventor Ware or ANSYS Multiphysics.
NANOTECHNOLOGY AND MEMS: Relation between micro and nanotechnologies. Need and issues in handling nano products with the help of MEMS 9 Hrs

REFERENCE BOOKS:


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**COMPUTER CONTROL OF ELECTRICAL DRIVES**

Subject Code : EE814  
Credits : 3  
Hrs/Week : 3  
Total Hours : 39

**Objectives:** To study the computer and microprocessor/controller control of various electrical drives.

**Prerequisites:** microprocessors / microcontroller, Electrical Machines.

**Expectation:** To be able to design and use proper computer based systems to control the electrical drives in hand.

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**UNIT - I**

**REVIEW OF MICRO CONTROLLERS IN INDUSTRIAL DRIVES**

**SYSTEM:** Typical Micro controller’s 8 bit 16 bit (only block diagram) Digital Data Acquisition system, voltage sensors, current sensors, frequency sensors and speed sensors.  
4 Hrs

**EVOLUTION OF POWER ELECTRONICS IN DRIVES:** Power semiconductors devices used for drives control, GTO, BJT, power MOSFET, IGBT, MCT and IGCT structures, Ratings, comparison and their applications. Block diagram of power integrated circuit for D C motor drives.  
4 Hrs

**A C MACHINE DRIVES:** general classification and National Electrical Manufacturer Association (NEMA) classification, Speed control of Induction motors with variable voltage constant frequency,
constant voltage variable frequency, (v/f) constant operation, drive operating regions. Variable stator current operation. Effect of Harmonics.  

UNIT - II
SYNCHRONOUS MACHINE DRIVES: Wound field machine, comparison of Induction and wound field synchronous machines, Torque angle characteristics of salient pole synchronous machines, synchronous reluctance permanent magnet synchronous machines (SPM), variable reluctance machines (VRM)  

PHASE CONTROLLED CONVERTERS: Converter controls, Linear firing angle control, cosine wave crossing control, phase locked Oscillator principle  

Electromagnetic Interference (EMI) and line power quality problems, cyclo converters, voltage fed converters, Rectifiers, Current fed Converters.  

PRINCIPALS OF SLIP POWER RECOVERY SCHEMES: Static Kramer’s drive system, block schematic diagram, phasor diagram and limitations, Static Scherbins scheme system using D.C link converters with cyclo converter modes of operation, modified Scherbins Drive for variable source, constant frequency (VSCF) generation  

UNIT - III
PRINCIPLE OF VECTOR CONTROL OF A C DRIVES: Phasor diagram, digital Implementation block diagram, Flux vector estimation, indirect vector control block diagram with open loop flux control, synchronous motor control with compensation  

EXPERT SYSTEM APPLICATION TO DRIVES (ONLY BLOCK DIAGRAM): Expert system shell, Design methodology, ES based P-I tuning of vector controlled drives system, Fuzzy logic control for speed controller inverter control drives, structure of fuzzy control in feedback system  

TEXT BOOKS:

REFERENCE BOOKS:
1. “Advanced Microprocessor and Interfacing”- Badri Ram TMH,  

27
POWER SYSTEM DYNAMICS AND STABILITY

Subject Code : EE821 Credits : 3
Hrs/Week : 3 Total Hours : 39

Objectives: To study the modeling of power system components. This helps to analyze various power system problems.

Prerequisites: Study state and transient system analysis, Theory of Synchronous Machines, Elementary theory of Power systems and Stability, Power system operation and Control.

UNIT - I
SYSTEM MODELING AND DYNAMICS OF SYNCHRONOUS GENERATOR: Basic concepts, Review of classical methods, modeling of synchronous machine, Swing equation, Park’s transformation – Park’s voltage equation, Park’s mechanical equation (torque). Applications— (a) Voltage build up in synchronous machine, and (b) Symmetrical short circuit of generator. Solution for transient analysis, Operational impedance, Relationship between Tdo’ and Tdo”

LOAD MODELING: Introduction, Two approaches – Polynomial model and Exponential model. Small Signal Angle Stability: Small signal angle stability with SMIB system, detailed model of SMIB.

16 Hrs

UNIT - II
EXCITATION AND PRIME MOVER CONTROLLERS: Introduction, Types of excitation, AVR with and without ESS, TGR, Amplifier PSS, Static exciters.

MODELING OF PRIME MOVERS: Introduction, Three major components, Block diagram, Hydraulic turbine, Steam turbine.

14 Hrs

UNIT – III
TRANSIENT STABILITY ANALYSIS: Simulation for Transient stability Evaluation, Transient stability controllers.

7 Hrs

TEXT BOOKS:

REFERENCE BOOKS:


FLEXIBLE AC TRANSMISSION SYSTEMS (FACTS)

Subject Code : EE822  
Credits : 3  
Hrs/Week : 3  
Total Hours : 39

UNIT - I
Facts, Concepts and general system configuration. Transmission, interconnection, flow of power in AC system, power flow and dynamic stability consideration, of a transmission interconnection, relative importance of controllable parameters, basic types of FACTs controllers, shunt, series, combined shunt and series connected controllers  

POWER SEMICONDUCTOR DEVICES: types of high power devices, principle of high power device characteristics and requirements, power device material, diode, MOSFET, MOS turn OFF thyristor, emitter turn OFF thyristor, integrated gate commutated thyristor (GCT & IGCT).  

UNIT - II

VOLTAGE SOURCED CONVERTERS: basic concepts, single phase full wave bridge converter operation, square wave voltage harmonics for a single phase bridge 3 phase full wave bridge converter.  

SELF AND LINE COMMUTATED CURRENT SOURCE CONVERTER: basic concepts, 3 phase full wave diode rectifier, thyristor based converter, current sourced converter with turnoff devices, current sourced versus voltage source converter.
STATIC SHUNT COMPENSATORS SVC AND STATCOM: objective of shunt compensation, methods of controllable VAR generation, static VAR compensator, SVC and STATCOM, comparison between, SVC and STATCOM.  

UNIT - III
STATIC SERIES COMPENSATORS: GCSC, TSSC, TCSC and SSSC, objectives of series compensation; variable impedance type of series compensation, switching converter type series compensation, external control for series reactive compensators.  

TEXT BOOK:

REFERENCE BOOK:

ARTIFICIAL NEURAL NETWORKS
Subject code : EE823  
Credits : 3  
Hrs/Week : 3  
Total Hours : 39

UNIT - I
Supervised learning, single layer networks, perceptrons, linear separability, perceptron training algorithm, guarantees of success, modifications.  
Multiclass networks-I, multilevel discrimination, preliminaries, back propagation, setting parameter values, theoretical results.  

UNIT - II
Accelerating learning process, application, mandaline, adaptive multilayer networks.
Prediction networks, radial basis functions, polynomial networks, regularization, unsupervised learning, winner take all networks. **5 Hrs**

Learning vector quantizing, counter propagation networks, adaptive resonance theorem, topologically organized networks, distance based learning, neocognition. **5 Hrs**

**UNIT - III**

Associative models, hop field networks, brain state networks, Boltzmann machines, hetero associations. **5 Hrs**

Optimization using hop field networks, simulated annealing, random search, evolutionary computation.

**TEXT BOOKS:**

**REFERENCES BOOKS:**

**EMBEDDED SYSTEMS**

Subject Code : EE824  
Credits : 3  
Hrs/Week : 3  
Total Hours : 39

**Objectives:** To study the Motorola/Intel based embedded system, ASIC and their design considerations.

**Prerequisites:** 8085/ 8051.

**Expectation:** To be able to design Intel/Motorola based embedded system theoretical.

UNIT – I

Concept of embedded system design: Components, classification, skills required.
Embedded Micro controller cores: Architecture of 6808 and 6811. Embedded Memories ROM variants, RAM. Applications of embedded system: Examples of Embedded systems SOC for cell less bar code scanner. 8 Hrs

Technological aspects of Embedded System: Interfacing between analog and digital blocks, Signal conditioning, digital signal processing, DAC & ADC interfacing, Sample & hold, multiplexer interface Internal ADC interfacing (excluding 6805 & 6812), Data Acquisition System and Signal conditioning using DSP. 8 Hrs

UNIT – II
Design trade offs due to process incompatibility, thermal considerations:
Issues in embedded system design. Design challenge, design technology, trade offs. Thermal considerations. 8 Hrs
Software aspects of Embedded Systems, real time programming Languages, operating systems. Programming concepts and embedded programming in C.
Round Robin, Round Robin with interrupts, function queue-scheduling architecture,
Real time OS architecture, selecting architecture. Introduction to RTOS. 7 Hrs

UNIT – III
Subsystem interfacing with external systems user interfacing, Serial I/O devices, Parallel port interfaces: Input switches, Key boards and Memory interfacing. 8 Hrs

TEXT BOOKS:
2. Ganssle, Jack, “The art of Designing Embedded systems”, Newness

REFERENCE BOOKS:
2. Motorola and Intel Manuals
Open Electives Offered in VIII Semester for the year 2014-15

MA8X 01 Graph Theory
MA8X 02 Linear Algebra
HU8X 03 Intellectual Property Rights
PH8X 04 Advanced Materials Technology for CV & ME
BT8X 05 Nano Technology
BT8X 06 Instrumental methods of Analysis for CV & ME
CV8X 07 Environmental Impact Assessment
ME8X 08 Industrial Pollution Control
ME8X 09 Management and Entrepreneurship
EE8X 10 Non-Conventional Energy Systems
EE8X 11 Linear Systems Theory
EC8X 12 Information and Electronic Communication Technology
EC8X 13 Robotics
CS8X 14 Object Oriented Prog. with C++
CS8X 15 Essentials of Information Technology
EC8X 18 Consumer Electronics
PH8X 19 Optoelectronic devices for EE, EC, CSE & ISE
HU8X 20 Value Education
CH8X 21 Natural Products Chemistry for Bio-Tech
CS8X 22 Essentials of IT Service Industry
MA8X 23 Statistical design and analysis of experiments
HU8X 24 Professional & Cognitive Communique
MA8X 25 Introduction to Topology

GRAPH THEORY

Subject code : MA8X01 Credits : 3
Hours/Week : 3 Total Hours : 39

UNIT - I
Introduction to graphs, digraphs, sub graphs-spanning and induced graphs, paths, cycles, connectivity, cut points, bridges, blocks.

8 Hrs.

UNIT – II
Trees, Eularian graphs, characterizations, Hamiltonian graphs.

7 Hrs
UNIT – III
Planar graphs, outer planar graphs, Euler’s polyhedron formula, Colorability: chromatic number, Five colour theorem, four colour conjecture, Chromatic polynomial. 8 Hrs.

UNIT – IV
Representations of graphs: The adjacency matrix and incidence matrix. Circuit matrix, cutest matrix, Shortest paths in weighted graphs, Dijkstra’s algorithm to find shortest paths. 8 Hrs.

UNIT – V
Spanning trees: Algorithms to find a spanning tree A minimal spanning tree – Kruskal’s & Prims algorithm. Connectivity test: Warshall’s algorithm, algorithm to locate an Euler Circuit from Incidence matrix. Algorithm to locate an Euler Circuit from the adjacency matrix for an undirected graph. 8 Hrs.

Text Book:
1. F. Harary, Graph theory, Narosa Publishing House, 1988
2. Narsing Deo, Graph Theory with applications to Engg. and Comp. Sciences- PHI

Reference Books:
2. D.B. West, Introduction to Graph Theory, PHI

LINEAR ALGEBRA

Sub code : MA8X02 Credits : 3
Hrs/Week : 3 Total Hours : 39

UNIT - I
Linear equations: System of linear equations and its solution sets; elementary row operations and echelon forms; matrix operations; invertible matrices, LU-factorization. 7 Hrs

UNIT - II
Vector spaces: Vector spaces; subspaces; bases and dimension; coordinates; summary of row-equivalence; computations concerning subspaces.
UNIT - III

Linear Transformations: Linear transformations; algebra of linear transformations; isomorphism; representation of transformations by matrices; linear functions; transpose of a linear transformation. Determinants and elementary properties 10 Hrs

UNIT - IV

Canonical Forms: Characteristic values; similarity of matrices, Cayley Hamilton theorem, annihilating polynomials; invariant subspaces; direct –sum decompositions; invariant direct sums; diagonalization of symmetric matrices, iterative estimates of characteristic values. 8 Hrs

UNIT - V

Inner Product Spaces: Inner products; inner product spaces; orthogonal sets and projections; Gram-Schmidt process; QR-factorization; least-squares problems; symmetric and unitary operators. 7 Hrs

Text Books:

INTELLECTUAL PROPERTY RIGHTS (IPR)

Subject Code : HU8X03
Hrs/week : 3 Hrs
Credits : 03
Total hours : 39

UNIT - I

Introduction to Intellectual Property
Invention and Creativity - Intellectual Property (IP) – Importance, Jurisprudential definition and concept of property, rights, duties and
their correlation; History and evaluation of IPR – like Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications

**UNIT - II**

**Agreements and Treaties**

**UNIT - III**

**Basics of Patents and Concept of Prior Art**
Introduction to Patents; Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; Specifications: Provisional and complete; Forms and fees, Invention in context of “prior art”; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, WIPO, IPO, etc.)

**UNIT - IV**

**Patent filing procedures**
National & PCT filing procedure; Time frame and cost; Status of the patent applications filed; Structure of Patent document, Precautions while patenting – disclosure/non-disclosure; Financial assistance for patenting – introduction to existing schemes, Patent licensing and Agreement, Patent infringement- meaning, scope, litigation.

**UNIT - V**

**Case Studies on Patents** (Basumati rice, turmeric, Neem, etc.) non-biological cases may be included– Copyright and related rights – Trade Marks – Trade secrets - Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition Technology transfer and license agreement.

**References:**
Advanced Materials Technology

Subject Code : PH8X04
Credits : 03
Hrs/Week : 3
Total Hours : 39

The objectives of the course:
1. To provide our students adequate education in materials technology to have a basis for a complete understanding of current and future scientific and technological developments
2. To provide our students, adequate education regarding the material properties to handle the design problem involving materials, effectively.
3. To select a right material for a specified application from the thousands of available materials available.
4. To select a cost effective material to reduce the cost of finished product.

UNIT - I

**Structures and Properties of Ceramics** - Introduction, Ceramic structures: Crystal structures, Silicate Ceramics, Carbon, Imperfection in ceramics, ceramic phase diagram, Mechanical properties: Brittle Fracture of Ceramics, Stress-Strain Behavior, mechanisms of plastic deformation, Miscellaneous mechanical Considerations.

**Types, processing and Applications of Ceramics** - Glasses and Glass Ceramics, clay Products, Refractories, Abrasives, Cements, Advanced Ceramics, Fabrication and processing of Ceramics and applications, Fabrication and processing of Glasses and applications, Fabrication and processing of Clay Products, Powder Pressing, Tape casting.

08 Hrs

UNIT - II


**Polymer Synthesis and Processing** - Polymerization, polymer additives, Forming Techniques for Plastics, Fabrication of fibers and Films and applications

08 Hrs

UNIT - III

**Structure and Properties of Composites**: Introduction Particle-Reinforced Composites - Large-Particle composites, Dispersion-Strengthened Composites, Fiber-Reinforced Composites- Influence of Fiber Length, Influence of Fiber Orientation and Concentration, The Fiber Phase, The matrix Phase, Polymer-Matrix Composites, Metal-
Matrix Composites, Ceramic- Matrix Composites, Carbon- Carbon Composites, Hybrid Composites, Processing and Applications: Fiber- Reinforced Composites, Structural Composites, Laminar Composites, and Sandwich Panels

**UNIT - IV**

**Shape memory alloys and Metallic glasses:**
Introduction to shape memory alloys, Fundamental characteristics, shape memory effect (psuedoelasticity), Advantages and disadvantages of SMA, Methods of processing, Commercial shape memory alloys and applications.
Introduction to metallic glasses, principle, properties, processing, applications - bulk metallic glass in nanotechnology, metallic glasses for air craft structure.

**UNIT - V**

**Introduction to Nano materials:** Properties of individual nanoparticles, **Semiconducting nanoparticles:** optical properties, photofragmentation, coulombic explosion, **Carbon clusters:** small carbon clusters, C_{60} crystals, alkali doped C_{60}, larger and smaller fullerenes, other bucky balls, **nanostructured crystals:** natural nanocrystals, photonic crystals, **nanostructured ferromagnetism:** Dynamics of nanomagnets, nanopore containment of magnetic particles, ferrofluids.

**Text books**

**REFERENCE BOOKS:**

1. Van Vlack L.H. “Elements of Material Science” Addison-Wesley Publishers
Scheme:

1) SEE to be conducted out of 100 marks and will be reduced to 50 marks
2) Two Questions are to be set from each unit, carrying 20 marks each.
3) Students have to answer any one full question from each Unit.

NANOTECHNOLOGY

Subject Code: BT8X05  
Credits: 03  
Hrs/Week: 3  
Total Hours: 39

OBJECTIVE
The objectives of this course includes introduction to nanotechnology, detailed study of MEMS, applications of nanotechnology. Beneficiary Branches of Engineering: EC, Mechanical, Civil.

UNIT - I
INTRODUCTION

UNIT - II
NANOMATERIAL AND NANO TOOLS
Buckyballs (Fullerenes), Nanotubes, nanowire, Dendrimers, Nanoshells, magnetic nanoparticle, Quantum Dot (Nanocrystals), self assembled monolayers, Scanning probe microscopy (Scanning tunneling microscopy, Atomic force microscopy).  

UNIT - III
NANOTECHNOLOGY FOR DRUG DISCOVERY & DRUG DELIVERY

UNIT - IV
MICROFLUIDICS
Microflows (Laminar flow), Hagen-Poiseuille equation, micromixing, microvalves & micropumps, Need for the microfluidics, Fabrication of Soft Materials, application of microfluidics. 8 Hrs

UNIT - V
MEMS & APPLICATIONS
Introduction and Overview, Design of MEMS, Sensors, Electromagnetic Transducers, Mechanical Transducers, Chemical Transducers, Optical Transducers - Applications of optical and chemical transducers. Recent Developments in MEMS and Nanochips. DNA based MEMS, application of MEMS. 9 Hrs

Text books:
2. Transducers and instrumentation, D.V.S. Murthy, Prentice Hall of India.
5. Microfluidics for biotechnology by Jean Berthier Pascal Silberzan
INSTRUMENTAL METHODS OF ANALYSIS

Subject Code : BT8X06  Credits : 03
Hrs / Week : Total Hours : 39

Beneficiary Branches of Engineering: Mechanical, Civil.

UNIT - I

INTRODUCTION

Types of analytical instrumental methods and their selection, role of computers in analytical methods, performance requirements of analytical instruments, and instrument calibration techniques. Principle of microscopy, light field microscopy, scanning electron microscopy, tunneling electron microscopy and applications 7 Hrs

UNIT - II

SPECTROSCOPIC TECHNIQUES

Basic principles and applications of UV-Visible spectrometry, infrared spectrometry, nuclear magnetic resonance spectrometry, molecular mass spectrometry. Surface spectroscopic techniques: electron spectroscopy and ion spectroscopy; atomic absorption spectroscopy. 9 Hrs

UNIT - III

CHROMATOGRAPHIC TECHNIQUES

Introduction to chromatographic separations. Basic principles and theory. Gas chromatography and HPLC: principle, instrumentation, column, detector, mobile phase, sample preparation. Application of chromatographic techniques. 9 Hrs

UNIT - IV

THERMAL AND ELECTROCHEMICAL TECHNIQUES

Principles and applications of thermo-gravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC). Electrochemical methods for analysis, electrochemical cells, types of electrodes, electrode potentials. 8 Hrs

UNIT - V

ENVIRONMENTAL APPLICATIONS

Types and concentration of various gas pollutants, instrumental techniques and measurement range for carbon dioxide, sulfur dioxide,
nitrogen oxides, hydrocarbons and ozone. Types of water pollutants and detection techniques.  

6 Hrs

Text Book:

Reference Books:
1. R. S. Khandpur, Handbook of analytical instruments, TMH.

ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code : CV 8X07  
Credits : 03  
Hrs/ Week : 3  
Total Hours : 39

Objective: To equip the students with the various key elements of EIA.
Pre-requisites of the course: CV 113

UNIT - I
Developmental activity and ecological factors; EIA, EIS, FONSI. Need for EIA studies, Baseline information, Procedure for conducting EIA, Limitation of EIA; Environmental Acts/policies. 8 Hrs

UNIT - II
Frame work of impact assessment in developmental projects; Environmental setting, EIA- Objective, content, methodologies, techniques, Rapid and comprehensive EIA. 9 Hrs
UNIT - III
Assessment and prediction of attributes: Air, Water, Noise, Land, Ecology, Soil, Socio-economic environment. 7 Hrs

UNIT - IV
Public participation in environment decision making, practical consideration in preparing EIA and EIS, salient features of the project activity, Environmental parameter – activityrelationshipmatrices. 8 Hrs

UNIT - V
EIA for construction project, power projects, mining projects. 7 Hrs

TEXT BOOKS

REFERENCE BOOKS
1. Guidelines for EIA of developmental projects, Ministry of Environment and Forest, GOI

INDUSTRIAL POLLUTION CONTROL

Subject Code : ME 8X08  Credits : 03
Hrs/ Week : 03  Total Hours : 39

UNIT - I
1. Introduction to Pollution
Man and the environment, environmental degradation due to energy generation, consequences of pollution, sustainable industrial growth, air water and soil pollution, carbon audit.Ill effects of pollutants, Photochemical Smog, permissible concentrations. 8 Hrs

UNIT - II
2. Meteorology
Meteorology, Wind rose, plume dispersion studies & Numerical problems 8 Hrs
UNIT - III

3. Separation techniques
Particulates and fly ash separation techniques. Sources of Particulates Matter, fly ash properties, theory of settling processes- (problems), Single & parallel plate ESP- (problems), Bag House, Cyclone separator, Spray Tower, Scrubbers & Venturi Scrubber, merits and demerits of each. 8 Hrs

UNIT - IV

4. Smoke and gaseous pollutants
Smoke and gaseous pollutants: formation, measurement and control techniques T.T.T.O principle-(Ringlemann Chart, Smokescope, Bosch smoke meter), Coal firing- Under feed and overfeed stocker, Domestic and Industrial Incinerators, Pollutant gaseous (So2, Co, UBHC & NOx) Their sources, measurement and control. So2-Colorimetric, scrubbing & lime stone injection method. CO-Colorimetric, IR CO analyzer & control by oxidation. UBHC- Gas chromatography, Control by after burning & floating tanks. NOx- Iso-kinetic sampling, colorimetric method, control methods in brief for Low peak combustion temperature. 7 Hrs

UNIT - V

Water, soil, noise, plastic and odor pollution, their control methods. Pollution control Acts, Legal aspects of pollution control. 8 Hrs

Reference Books:
2. "Air Pollution control", W. L. Faith, John Wiley
3. "Environmental Pollution Control Engineering, Wiley Eastern Ltd.,

Scheme Examination:
TWO questions to be set from each UNIT and Students shall answer FIVE full questions choosing at least ONE question from each UNIT.
MANAGEMENT & ENTREPRENEURSHIP

Subject Code : ME 8X09  Credits : 03
Hrs/ Week : 03  Total Hours : 39

UNIT - I
PLANNING: Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning Only), Steps in planning & planning premises, Hierarchy of plans.  9 Hrs

UNIT - II
DIRECTING & CONTROLLING: Meaning and nature of directing - Leadership styles Classification and meaning only), Motivation Theories (Meaning of motivation and Classification of theories; content, process and contemporary), Communication - Meaning and importance. Coordination - meaning, importance and Techniques of Coordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control (inbrief).  10 Hrs

UNIT - III
ENTREPRENEURSHIP: Concept of Entrepreneurship, Evolution of Entrepreneurship, Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship - its Barriers. Meaning of Entrepreneur; Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur - an emerging Class.
Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.  8 Hrs
UNIT - IV
SMALL SCALE INDUSTRIES: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI, Steps to start and SSI, Government policy towards SSI; Different Policies of SSI, Impact of Liberalization, Privatization, Globalization on SSI. Effect of WTO/GATT on SSI, Supporting Agencies of Government for SSI, Ancillary Industry and Tiny Industry (Definition Only)
INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC. 7 Hrs

UNIT - V
PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; Formulation; Guidelines by Planning Commission for Project report; Errors of Project Report; Project Appraisal, Network Analysis (Simple numerical problems to find early and late, start and finish times, critical path and total project duration). 8 Hrs

TEXT BOOKS:
2. Dynamics of Entrepreneurial Development & Management - Vasant Desai - Himalaya Publishing House

REFERENCE BOOKS:
1. Management Fundamentals - Concepts, Application, Skill Development - Robers Lusier - Thomson -
NON CONVENTIONAL ENERGY SYSTEMS

Subject Code : EE8X10
Credits : 03
Hrs / Week : 3
Total Hours : 39

UNIT – I
Energy Sources: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario.

5 Hrs

4 Hrs

UNIT – II

3 Hrs

UNIT – III

TEXT BOOKS:

REFERENCE BOOKS:

LINEAR SYSTEMS THEORY

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<tr>
<th>Subject Code</th>
<th>EE8X11</th>
<th>Credits</th>
<th>03</th>
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<tr>
<td>Hrs / Week</td>
<td>3</td>
<td>Total Hrs</td>
<td>39</td>
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UNIT - I
State variable analysis & design: Introduction, concept of state, state variables & state model, state model of linear systems, linearization of state equations.
State space representation using physical variables, phase variables & canonical variables.  
6 Hrs

Derivation of transfer function from state model, diagonalisation, eigen values, Eigen vectors, generalized Eigen vectors.  
6 Hrs

UNIT- II

Solution of state equation, state transition matrix & its properties, computation using Laplace transformation, power series method, Cayley-Hamilton method,  
8 Hrs

Concept of controllability & observability, methods of determining the same.  
6 Hrs

UNIT - III

Pole placement techniques: stability improvements by state feedback, necessary & sufficient conditions for arbitrary pole placement  
5 Hrs

Liapunov stability criteria, Liapunov functions, direct method of Liapunov & the linear system, Hurwitz criterion & Liapunov’s direct method  
5 Hrs

Text Books:


Reference Books:
INFORMATION AND ELECTRONIC COMMUNICATION TECHNOLOGY

Subject Code : EC 8X12
Credits : 03
Hrs/ Week : 03
Total Hours : 39

Common elective from Electronics and Communication department - for the students of Other branches

UNIT - I
Introduction: measure of information, information content, symbols, entropy, communication channel, noise and channel capacity, discrete channels, error control, codes.
Noise & signal processing, AM/FM/PM..., sampling, PAM, TDM, PCM..,
Concept of spread spectrum, multiple access, cells, mobility, inter-cell handshake. 15 Hrs

UNIT - II
Microwaves: microwave devices, microwave systems and antennas, propagations, reflections and refractions terrestrial communications, ground and space components, SNR, FDMA, TDMA Etc, satellite systems and services.
Optical fiber: optical devices, transmission networks, multiplexing, WDM, OTDM, n/w management, lasers. 16 Hrs

UNIT - III
Computers communications: OSI, TCP/IP, languages, adhoc networks, security, multimedia, audio/video compression, 3G/4G N/Ws, latest trends. 8 Hrs

REFERENCE BOOKS:
R2. Kamilo Feher, "Wireless Communication & Application ", PHI.
R3. Faraouzan, "Data Communication", TMH.
R4. Gerd keiser, "Optical fiber Communication", MGH.
R5. Fred Halsall, "Multimedia Communication", Pearson Education.
ROBOTICS

Subject Code : EC 8X13       Credits : 03
Hrs/ Week : 03            Total Hours : 39

Common elective from Electronics and Communication department - for Students from other branches

UNIT - I
Introduction: Historical developments, arm kinematics and dynamics, manipulated trajectory, planning and control, sensing, robot languages, machine intelligence.
Robot arm kinematics: Direct kinematics problem and inverse kinematics solution.
Robot arm dynamics: Lagrange-Euler formulation, Newton -Euler formulation equation of motion.
Planning trajectories: General considerations, joint interpolated trajectories, planning Cartesian path trajectories. 16 Hrs

UNIT - II
Sensing: Range, proximity, touch, force and torque sensing.
Low level vision: Image acquisition, illumination, geometry processing.
High level vision: Segmentation, description, 3D structure recognition, interpretation.
Robot programming languages: Characteristics of robot languages, task languages. 16 Hrs

UNIT - III
Robot intelligence: State space search, predicate logic, means-ends analysis, robot learning, task planning expert systems. 7 Hrs

TEXT BOOK:
T1. Fu K S. etal, "Robotics-control, sensing, machine and intelligence", McGraw Hill

REFERENCE BOOKS:
R2.Groover MP etal., "Industrial robotics", TMH
OBJECT ORIENTED PROGRAMMING with C++

Subject Code : CS 8X14 
Credits : 03
Hrs/ Week : 03
Total Hours : 39

UNIT - I
Principles of object - oriented programming:
A look at Procedure Oriented Programming, object Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, Object oriented languages ,Applications of OOP.

Beginning with c++:
What is c++, Applications of C++, Structure of C++ program, Basic Data types, derived data types, user defined data types, variables in c++, dynamic initialization of variables, reference variables, operators in c++, scope resolution operator, memory management operators, type cast operators, manipulators, namespace. 7 Hrs

UNIT - II
Functions in C++:
Function prototyping, Inline Functions, Default Arguments, Function Overloading

Classes and objects:
Introduction, C Structure Revisited, Specifying a Class, Defining Member Functions, Static Data Members, and Static Member Functions. Arrays of Objects, Objects as Functions Arguments, this pointer, Friend Functions, Returning Objects, Constant Member Functions. 8 Hrs

UNIT - III
Constructors and Destructors
Introduction, Constructors, Parameterised Constructors, Multiple Constructors in a Class. Constructors with Default Arguments, Copy Constructors, Dynamic Constructors, Constant Objects, Destructors.

Operator Overloading and Type Conversions
Introduction, Defining Operator Overloading, Overloading the Various Operators, Overloading the Increment and the Decrement
Operators (Prefix and Postfix), Overloading the Unary Minus and the Unary Plus Operator, Overloading the Arithmetic Operators. Overloading the Relational Operators, Overloading the Assignment Operator, Overloading the Insertion and Extraction Operators, Rules for overloading operators. Type Conversions.  

UNIT - IV

Inheritance
Introduction, Defining Derived Classes, Single Inheritance, Protected Access Specifier, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes.

Pointers, Virtual Functions and Polymorphism
Introduction, Pointers, Pointers to Objects, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT - V

Templates and Exception Handling

Working with files
Classes for Files Stream Operations, Opening and Closing a File, Error Handling during File Operations.

Text Books:
1. E. Balagurusamy: Object - Oriented Programming with C++, Third Edition, Tata McGraw Hill. (Chapters 1.3 to 1.8, 2.1, 2.2, 2.6, 3.5 to 3.7, 3.10 to 3.18, 4.3, 4.6 to 4.9, 5, 6, 7, 8, 9, 11, and 12).

Reference:
1. Robert Lapore: Object - Oriented Programming in Turbo C++
3. K.R. Venugopal: Mastering C++
ESSENTIALS OF INFORMATION TECHNOLOGY

Subject Code : CS 8X15
Credits : 03
Hrs / Week : 03
Total Hours : 39

Introduction to Computer Systems (Self-Study)
Introduction to Computer Systems - Basics of computer systems - Various hardware components - Data storage and various Memory units - Central Processing Unit - Execution cycle - Introduce to software and its classifications.

UNIT - I
Operating Systems

UNIT - II
Problem Solving Techniques
Introduction to problem solving - Computational problem and it's classification - Logic and its types - Introduction to algorithms - Implementation of algorithms using flowchart - Flowcharts implementation through RAPTOR tool - Searching and sorting algorithms - Introduction and classification to Data Structures - Basic Data Structures - Advanced Data Structures.

UNIT - III
Programming & Testing
UNIT - IV
Object Oriented Concepts using JAVA: Introduction of OOP -
Object Oriented Concepts - Introduction to Object Oriented Analysis
and Design - Java Architecture and Program Structure - Java language
fundamentals - Classes and objects - Inheritance and polymorphism -
Abstract classes - Introduction to Packages and Interfaces -
Introduction to Eclipse IDE.  

UNIT - V
RDBMS
- RDBMS- data processing - the database technology - data models
- ER modeling concept -notations - Extended ER features
- Logical database design - normalization
- SQL - DDL statements - DML statements - DCL statements
- Joins - Sub queries - Views
- Database design Issues

Integrated Project:
Project based on C/C++/JAVA & RDBMS.

References:
1. Andrew S. Tanenbaum , : Structured Computer Organization ,
PHI, 4th edition, 1999
2. John L. Hennessy, David Goldberg, David A. Patterson,
Published by Morgan Kaufman Publishers, 1996
3. Silberschatz and Galvin, Operating System Concepts, John
Wiley & Sons ,Sixth edition
4. Andrew Tanenbaum, Modern Operating Systems, Pearson
Education
5. Milan Milenkovic, "Operating Systems: concepts and design",
McGraw-Hill
6. Charles Crowley, "Operating Systems: A Design-Oriented
Approach"
7. Dromey, R.G., How to solve it by computers, Prentice Hall,
2005
8. Alfred V.Aho, Ullman, Hopcroft, Data Structures and
Algorithms, Addison-wesely.
9. Lipschutz, Seymour & G A V Pai, Data Structures, Tata
McGraw - Hill
14. Programming Pearls , by Jon Bentley, Pearson Education publication
16. Tharp Alan L, File Organization and Processing, John Willey and Sons.

Note:
1. Courseware for the subject (power point and the notes) is provided by the teacher. List of references is only for additional reading.
2. Project is a team work with 3 or 4 students in a team. Project need to be carried out offline (outside the lecture hours).
3. Project work includes implementation of some information system using the concepts of programming, testing and RDBMS. Following activities are involved in the project:
   - Preparation of High level design and Detailed design document.
   - Unit Test Plan and Integrated Test Plan.
   - Coding and Unit Testing, Integration Testing.
Students can use the following to implement the Project:
   - Programs using C/C++/JAVA Language
   - Embedded SQL can be used to connect the Front-End with the backend Database systems
   - Visual studio .NET 2005 (or Visual studio 6), RAPTOR tool and oracle 9i/10g to be used for the project.
4. CIE carries 50 Marks which includes Theory Assessment (40 Marks) and Project Work (10 marks). Theory Assessments will be conducted based on CAMP methodology. Project evaluation will be done using Rubrics methodology.
5. Number of hours listed for each unit are only for the class room teaching. Students are expected to give much more time to study each of the topics outside the class hours.

CONSUMER ELECTRONICS
Subject Code : EC 8X18
Credits : 03
Hrs/ Week : 03
Total Hours : 39

Common elective from Electronics and Communication department - for the students
Of other branches

UNIT - I
FUNDAMENTALS: Electricity, Particle and Wave Motions, Conduction and Radiations, dielectrics, inductors, Vac. tubes, S.S. devices, IC's further advances, Power supply, Circuit functions.
SOUND: Transducers (Micro Phone, Loud Speakers), enclosures, Recordings - disc, Magnetic, Optical, mono-stereo, Amplifiers, Multiplexers, mixers, Synthesizers, Theatre Sound, Studios, Editing.

15 Hrs

UNIT - II
VISION: B/W TV, CTV, Video tapes/discs, recording/ play back, Standards, Broad-casting, Video systems, Studios, editing, B/W, Displays, Filters, Cameras, Color displays.

15 Hrs

UNIT - III
UTILITIES: - Fax, Xerox, Calculators, Microwave ovens, Washing Machines, A/C & refrigeration, Dishwashers, ATMS, Set -Top boxes, Auto Electronics, Industrial Electronics, Robotics, Electronics in health / Medicine, nano-technologies.

9 Hrs

TEXT BOOK:

REFERENCES:
R2. Kamilo Feher, "Wireless Communication & Application", PHI
OPTO ELECTRONIC DEVICES

Subject Code : PH 8X19  Credits : 03
Hrs/ Week : 3  Total Hours : 39

The objectives of the course:
* To know the basics of solid state Physics and understand the nature and characteristics of light
* To understand different methods of luminescence, display devices and laser types and applications
* To learn the principle of optical detection, mechanisms in different detection devices
* To understand different light modulation techniques and the concepts and applications optical switching
* To study the integration process and application of optoelectronic integrated circuits in transmitters and receivers.

PART-A
UNIT – I
Display Devices
Introduction- Fluorescence, Phosphorescence, Photo Luminescence, Cathode Luminescence, , Electro Luminescence, LED, plasma displays, Liquid Crystal displays, Numeric displays.  7 Hrs

UNIT – II
Lasers & Fibre Optics

PART-B
UNIT - III
Optical Detectors
Photo detector- thermal detectors, thermoelectric detectors-types, Photon Devices-types, Photoconductive detectors, Junction detectors-Photo diodes (PIN and APD), Photo Transistors, Detector Performance – characteristics, frequency response, noise aspect and sensitivity  8 Hrs
UNIT - IV

Optoelectronic Modulators
Introduction, Polarization, Birefringence, Optical activity, Electro-optic effect, Kerr modulators, scanning & switching, Magneto-optic devices, Acousto-optic effect 8 Hrs

UNIT - V

Optoelectronic Waveguides
Hybrid and Monolithic Integration, Applications of Optoelectronic wave guide devices, Construction and working of integrated transmitters and receivers-Front end photo receiver, PIN-HBT Photo receiver & OEIC transmitters 8 Hrs

TEXT BOOK:

REFERENCES:
Bhattacharya “Semiconductor Optoelectronic Devices” Prentice Hall of India Pvt., Ltd., New Delhi
Ghatak and Thyagarajan, “Introduction to Opto Electronics” New Age International Publishers

Scheme:
1) SEE to be conducted out of 100 marks and will be reduced to 50 marks
2) Two questions carrying 20 marks each will be set from each unit and students have to answer any one.
VALUE EDUCATION


Subject Code : HU 8X20  Credits : 03
Hrs/ Week : 3  Total Hours : 39

The Objectives of the course:
1. To make the students realize the significance of values in self-development.
2. To train the students in techniques of mind control, time management and stress management.
3. To make students use the fundamentals learnt in the course in solving
   a) The problems in their own lives like intoxication, gambling, extra marital relations, generation gap, ragging, peer pressure, addiction to social networking sites.
   b) The problems pertaining to the society in general like corruption, irresponsible media, distractions among youth, gender discrimination, westernization, child abuse & animal cruelty.
4. To make students understand value of sustainable civilization, simple living and high thinking.

UNIT - I
Three components of human personality (IQ, EQ and SQ), separating men from animals, real problems of life, how to acquire knowledge. Why sense gratification is opium of the masses, three kind of people and their symptoms, ethical degradation of the society today, how mind gets out of control, anger management, different levels of consciousness (bodily platform, sensual platform, mental and intellectual), regulative principles of freedom, difference between moderation and abstinence.

UNIT - II
Intoxication, harmful effect of alcohol on liver, central nervous system, blood, gastro intestinal tract, muscles, etc. myths and facts regarding alcohol. Harmful effect of smoking on respiratory health, strokes and heart diseases, cognitive dysfunction, passive smoking myths and facts about smoking, Drug addiction, common neurological effects of drug addiction, physical effects. Negative impacts of gambling, gambling vs. substance abuse, Forms of illicit sex, forms of animals cruelty, alternatives for animal experimentation.
Knowledge, attitudes and skills needed to achieve a sustainable value based global culture.  

UNIT - III  
Generation gap, ragging, peer pressure, addiction to social networking sites, corruption, irresponsible media, distractions among youth, gender discrimination, westernization, child abuse, euthanasia, capital punishment, female feticide, terrorism.  

9 Hrs  

Scheme:  
1) SEE to be conducted out of 100 marks and will be reduced to 50 marks.  
2) Three questions from units 1&2 each and two questions from unit 3 shall be set, carrying 20 marks each.  
3) Students have to answer 5 full questions, selecting at least two questions from units 1&2 each and one from unit 3.  
4) Break Up of CIE (50 marks) :  
   □ First Mid Semester Exam - 10 marks  
   □ Second Mid Semester Exam - 10 marks  
   □ Class Quiz - 05 marks  
   □ Students' solution of problems discussed in the form of video skits - 25 marks  

NATURAL PRODUCTS CHEMISTRY  

Subject Code  :  CH8X21  
Credits  :  03  
Hrs/Week  :  3  
Total Hours  :  39  

UNIT - I  
Terpenoids: Introduction and classification, isoprene rules, general methods of determination of structure of terpenoids. Structure elucidation, synthesis and biosynthesis of the following terpenoids; Monoterprenoids-Geraniol, α-pinine, and camphene. Sesquiterpenods-Farnesol, and α-santonine, Diterpenoids- gibberillic acid. Triterpenoids-Squaline, Cyclisation of squaline into α-lanosterol and friedelene.  

UNIT - II  
Sex hormones: Chemistry of estrogen, progesterone, androsterone and testosterone. Structure and synthesis of cortisone and aldosterone

UNIT - III
Prostaglandins: Introduction, nomenclature, classification and biological role of prostaglandins. Structure elucidation and stereochemistry of PGE1, PGE2 and PGE3. Total synthesis of PGE1 (Corey’s method)

UNIT - IV
Chemistry of Porphyrins: Introduction to porphyrins, structure and degradation products of haemoglobin and chlorophyll.

UNIT - V
Alkaloids: Definition, Classification and isolation of alkaloids. General methods of structural determination of alkaloids. Detailed study of structure elucidation, rearrangement, synthesis and biogenesis of the following alkaloids - papaverine, cinchonine, and morphine.

References:
ESSENTIALS OF IT SERVICE INDUSTRY
(SPAN TECHNOLOGIES)

Subject Code : CS8X22  Credits : 03
Hrs/week : 03  Total Hours : 39

UNIT - I
Fundamentals of Software Industry  3 Hrs
Introduction to SDLC Process; Life cycle models; Requirement Gathering Techniques; Functional, Non Functional, Statutory and Regulatory Requirements; Configuration Mgmt; Workshop on Requirement Analysis.

UNIT - II
Relational Database  6 Hrs
Fundamentals of Relational Databases; Primary key, Unique Key, Foreign keys and Indexes; Logical & Physical Databases; Simple Queries.

UNIT - III
Basics of DOTNET & coding techniques  9 Hrs
Introduction to .NET framework 3.5 with additional features of .NET 4.0; Language construct C#; Visual Studio Developer environment IDE; Coding Standards and General Coding guidelines.

UNIT - IV
ASP.NET  12 Hrs
Page life cycle; Web.config; types of apps, control structure; HTML controls; Server controls; Custom controls; User controls; Form validation; Master Pages, Themes, Skins, CSS, Passing data between forms, Session object, view state, Request / Response; ADO.Net.

UNIT - V
Code Enabler  9 Hrs
Error/Exception handling; XML – Overview; Creating XML; XML validation; XPATH; XML schema, attributes, XML in SQL; Usage of Code Analysis Tools – Face, Style Cop; Jquery;IIS.

Note:
1. Courseware for the subject (Power Point Presentation) will be provided by the teacher. List of references is only for additional reading.
2. Assignment will be provided for each theory sessions. These assignments need to be carried out by each student (outside the lecture hours) independently and must be submitted within the timeframe specified by the instructor.

3. Tests will be conducted on each topics separately and test assignment score will be used for final evaluation.

4. Test score will carry a weightage of 20%, assignment 30% and rest 50% weightage would be given to the final examination.

STATISTICAL DESIGN AND ANALYSIS OF EXPERIMENTS

Subject code : MA8X23   Credits : 03
Hrs/Week : 3   Total Hours : 39

UNIT – I
Curve fitting and Regression: Least square principle, curve fitting of linear, quadratic and exponential. Correlation and properties, correlation coefficients, regression analysis. 8 Hrs

UNIT – II
Probability Theory: Review of pdf’s, expectation, variance, moment generating function and properties, Moment generating functions and their properties, random samples, sampling distributions, central limit theorem and applications. 10 Hrs

UNIT - III
Estimation and Testing of hypothesis: Consistency and unbiased statistics, point and interval estimation, mean and variance, tests of hypothesis concerning mean and variances. 8 Hrs

Functions of random variables, t, F and chi-square distributions 7 Hrs
UNIT - V
Analysis of variance of one-way, two-way classified data, experimental designs: CRD, RBD, LSD, factorial experiments.
6 Hrs

Text Books:
1. Irwin Miller, John E. Frund, “Probability and Statistics for Engineers” 3rd edition

Reference books:

PROFESSIONAL & COGNITIVE COMMUNIQUÉ

Subject Code : HU8X24 CIE Marks : 50
Hrs/Week : 3 Total Hours : 39

UNIT - I
Common sense: Understand the term ‘common sense’ & commonsensical consensus, unsettling commonsensical consensus. (Role of language in the growth of an individual)
Emotional Intelligence: Nature, function and types of intelligence; emotion, intelligence and creativity; Growth and development of emotional intelligence. 8 Hrs

UNIT - II
Manners and Etiquettes - work place etiquettes, Significance of Cross Cultural understanding; Cultural Sensitivity, Impact of social Media Self-Presentation Skills.
Workplace: Physical and Psychological working conditions; Workplace Readiness Skills. 8 Hrs
UNIT - III
Writing: Creative Writing, Formal writings/Informal writing, Plagiarism.
Reading and Interpretation: Styles of reading, scanning, skimming, detailed reading. 8 Hrs

UNIT - IV
Presentation Skills: Event planners coordinate and manage conferences meetings and parties. 8 Hrs

UNIT - V
Diaspora: exile, migration, old and new diasporas, the heterogeneity of diasporas, groups, especially by gender, class, sexuality, caste, religion, the role of language and other cultural practices in migratory experiences; Films and Indian Diaspora. 7 Hrs

References:
Ray French : Cross Culture Management, Universities Press
Urmila Rai : Business Communication, Himalaya Publishing House
Neil Fiore; The Now Habit at Work: Perform Optimally, Maintain Focus, and Ignite Motivation in Yourself and Others ,Publisher: Wiley ISBN: 9780470593462
V. Geetha; Gender
http://writingexercises.co.uk/index.php
http://www.studyskills.soton.ac.uk/studytips/reading_skills.htm
http://pages.minot.k12.nd.us/votech/File/workplace.htm
INTRODUCTION TO TOPOLOGY

Subject code : MA8X25  
Credits : 03  
Hrs/Week : 3  
Total Hours : 39  

UNIT – I  
**Basics of set theory and logic:** Functions, relations, arbitrary cartesian products, principle of recursive definition, countable and uncountable sets, infinite sets and axiom of choice, well ordered set and maximum principle.  
8 Hrs.  

UNIT - II  
Topological spaces, basis for a topology, order topology, product topology on $X \times Y$, The subspace topology, closed sets and limit points, continuous functions  
8 Hrs.  

UNIT - III  
Product topology, Metric topology, Examples  
8 Hrs.  

UNIT - IV  
**Connectedness and compactness:** Connected spaces, connected sets in the real line, compact spaces, compact sets in the real line.  
8 Hrs.  

UNIT - V  
Countability and separation axioms. T₁,T₂,T₃,T₄ Spaces  
7 Hrs.  

**Reference books:**  