Faculty of Engineering
Scheme of Instruction and Syllabi

of

BE IV - YEAR

OF
FOUR YEAR DEGREE COURSE

IN

ELECTRICAL & ELECTRONICS ENGINEERING

(With effect from the Academic Year 2015-2016)

July, 2015
Osmania University
Hyderabad - 500 007.

WITH EFFECT FROM THE ACADEMIC YEAR 2013 - 2014

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR

(ELECTRICAL & ELECTRONICS ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 401	Power System Operation and Control.	4	-	3	75	25
2.	EE 402	Electric Drives and Static Control.	4	-	3	75	25
3.	EE 403	Electrical Machine Design.	4	-	3	75	25
4.		ELECTIVE - I	4	-	3	75	25
		PRACTICALS					
1.	EE 431	Electrical Simulation Lab.	-	3	3	50	25
2.	EE 432	Microprocessors and Microcontrollers Lab	-	3	3	50	25
3.	EE 433	Power Systems Lab	-	3	3	50	25
4.	EE 434	Project Seminar	-	3	3	-	25
		Total	**16**	**12**	**24**	**450**	**200**

ELECTIVE – I

EE 411 High Voltage DC Transmission
EE 412 High Voltage Engg.
EE 413 Power Quality
EE 414 Nuclear Energy
ME 411 Entrepreneurship
CS 403 Information Security
CS 467 Embedded Systems

EE 401

POWER SYSTEM OPERATION AND CONTROL

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Load Flow Studies: Formulation of Y bus for a system, modeling of tap changing and phase shifting transformer, Formulation of load flow problem, Solution of load flow by Gauss-Seidel, Newton-Raphson, Decoupled and Fast Decoupled methods, comparison of different load flow methods.

UNIT-II

Economic Operation of Power System: Input-Output curves, Heat rates and incremental cost curves, Equal Incremental cost criterion neglecting transmission losses with and without generator limits, B_{mn} coefficients, Economic operation including transmission losses.

UNIT-III

Load Frequency Control: Governor Characteristics, Regulation of two generators, coherency, concept of control area, Incremental power balance of a control area, Single area control, Flat frequency control, Flat tie-line frequency control, Tie-line bias control, Advantages of pool operation, Development of model for two-area control.

UNIT-IV

Power System Stability: Definitions of Steady state stability and Transient stability, Steady state stability of a synchronous machine connected to infinite bus, calculation of steady state stability limit, synchronous machine models with and without saliency, Equal area criterion, Application of equal area criterion, Swing equation, Step by step solution of Swing equation, factors effecting transient stability, Auto Reclosures, mathematical formulation of voltage stability problem.

UNIT-V

Reactive Power Control: Reactive power generation by synchronous generators, Automatic voltage regulators, FACTS Controllers-TCSC, STATCOM, UPFC.

Suggested Reading:

1. D.P.Kothari and I.J.Nagrath, *Modern Power System Analysis,* 3rd edition, Tata McGraw Hill, 2004.
2. John, J, Grangier, William D.Stevenson Jr., *Power System Analysis,* Tata McGraw Hill, 2003.
3. C.L.Wadhwa, *Electric Power Systems,* 3rd edition, New Age International (P) Ltd., 2002.
4. Haadi Sadat, *Power System Analysis,* Tata Mc Graw Hill.
5. Elgard, *Electrical energy Systems Theory*
6. Chakravarthy, *Power System Operation and Control.*
7. Narain G. Hingorani, Laszlo Gyugyi, *Understanding Facts: Concepts and Technology of Flexible AC Transmission Systems.*

EE 402

ELECTRIC DRIVES AND STATIC CONTROL

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Electric Drives: Concept and classification, four quadrant operation, Dynamics of Electric Drives, Types of Loads, Torque characteristics of Load, characteristics of Motor-Load combination, Dynamics of Motor-Load combination, Steady-state and Transient stability of Electric Drive. Characteristics of Electric Drives: Modified Speed-Torque Characteristics of D.C Shunt motors, D.C Series motor and Induction motors.

UNIT-II

Starting of Electric Motors: Methods of Starting Electric Motors, Acceleration time, Energy relation during starting, D.C Shunt and series motor and Induction motors, Methods to reduce the energy loss during starting.

Electric Braking: Types of Braking- Regenerative braking, dynamic braking and Plugging, Braking of D.C Shunt motor, DC Series motor and 3-phase Induction motor, Energy relation and Dynamics of Braking. Effect of load inertia and load equalization.

UNIT-III

D.C Motor Control: Single-phase controlled rectifier and chopper circuit arrangement for continuous armature current operation. Dual converter control, Circulating current and non-circulating current modes of operation, Principles of closed loop control for D.C drives.

UNIT-IV

Induction Motor Control: Speed control of 3-phase induction motor with A.C voltage regulators, Voltage source inverters and Cyclo-converters, Static rotor resistance control, slip power recovery schemes: Static Krammer drive and Scherbius drive.

UNIT-V

Synchronous Motor Control: Self controlled and Separately controlled synchronous motors, Brushless D.C motors, Switched reluctance motors.

Suggested Reading:

1. S.K.Pillai, *A First Course in Electrical Drives,* New Age International, 2000.
2. G.K.Dubey, *Fundamentals of Electric Drives,* Narosa Public House, Delhi, 2001
3. M.D.Singh and K.B.Khanchandani, *Power Electronics,* Tata McGraw Hill Publishing Company Ltd., 2000.
4. Bimal.K.Bose, *Modern Power Electronics and AC Drives,* Pearson Education Asia, 2002.

EE 403

ELECTRICAL MACHINE DESIGN

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Electrical Engineering Materials Insulating Materials: Properties of ideal insulating materials, classification and types of insulating materials – conducting materials- general properties of copper, aluminum and steel, high resistance alloys, carbon and other conducting materials, Super conductors – Magnetic materials: Classification of magnetic materials, soft and hard magnetic materials, sheet steel, Cold rolled steels solid core and laminated core materials.

UNIT-II

Magnetic Circuit: Basic principles, magnetic circuit calculations, flux density in airgap and tooth – Carter's coefficient, ampere turns for gap and teeth, real and apparent flux density, magnetic leakage, armature leakage, leakage flux from salient poles, field distribution curves, field turns, armature reaction ampere turns.

Thermal Circuit: Type of enclosures ventilation and cooling methods in electrical machines – losses, temperature rise time curve- rating of electrical machines, calculation for quantity of cooling medium.

Rating of Motors: Heating effects, Load conditions and classes of duty, determination of power rating.

UNIT-III

DC Machine Design: Output equation – main dimensions, choice of specific magnetic and electric loading, selection of number of poles, choice of armature core length, Armature diameter, length of air gap, armature design, design of field system.

UNIT-IV

AC Machine Design: Transformer Design - Main dimensions, Output equation, Core design, cooling system design. Three phase Induction Motors - Output equation, main dimensions, design of stator and rotor, design of squirrel cage rotor, design of end-rings.

Synchronous machines - Output equation, Main dimensions, short Circuit Ratio (SCR). Length of air gap, selection of armature slots, design of field system, design of turbo alternators.

UNIT-V

Computer Aided Design: Introduction, Advantages of Digital computers, Computer Aided Design - different approaches: Analysis method, Synthesis method, Hybrid method, Optimization, General procedure for optimization, variable constraints, Computer aided design of 3-phase induction motor, List of symbols used, General design procedure.

Suggested Reading:

1. A.K.Sawhney, *A Course in Electrical Machines Design,* Dhanpat Rai and Sons, 1996.
2. R.K.Agarwal, *Principles of Electrical Machines Design,* S.K.Kataria & Sons, 4th edition, 2000, Nai Sarak, New Delhi.

EE 411

HIGH VOLTAGE DC TRANSMISSION
(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

General Consideration of DC and AC Transmission Systems: Comparison of AC and DC transmission systems, Application of DC transmission, Economic Consideration, Kinds of DC links, planning for HVDC transmission, Modern trends in DC transmission, Corona loss in AC & DC systems

UNIT-II

Converter Circuits: Properties of Converter circuits, Different kinds of arrangements, Analysis of Bridge converters with grid control, With and without overlap angle, Equivalent circuit of rectifier.

Inversion: Operation as Inverter, Equivalent circuit of Inverter

UNIT-III

Control: Basic means of control, Limitations of manual control, Desired features of control, Combined characteristics of rectifier and inverter, Power reversal, constant minimum angle Ignition angle control, Constant current control, Constant Extinction angle control.

UNIT-IV

Protection: Short circuit current, Arc-back, Commutation failure, Bypass valves, DC reactors, DC circuit breakers, Protection against over voltages, Harmonic filters.

UNIT-V

Multi-Terminal DC Systems: Application of MTDC systems, Types of MTDC systems, Comparison of series and parallel MTDC systems, Control of MTDC system.

Suggested Reading:

1. Kimbark E.W., *Direct Current Transmission Vol.1,* John Wiley, 1971.
2. Padiyar KR., *HVDC Power Transmission Systems,* Wiley Eastern, 1990.
3. Arrillaga J., *High Voltage Direct Current Transmission,* Peter Peregrinus Ltd., London, Pergamon Press, 1983.

EE 412

HIGH VOLTAGE ENGINEERING
(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Breakdown Mechanism of Gases, Liquids and Solid Materials: Mechanism of breakdown of Gases, Townsend's First Ionization coefficient, Cathode processes, Secondary effects, Townsend's Second Ionization coefficient, Townsend's breakdown mechanism,

The sparking potential, Paschen's Law, Penning effect, Corona discharges, Time lag, breakdown in liquid dielectrics, treatment of transformer oil, Testing of transformer oil, Breakdown in solid dielectrics.

UNIT-II

Generation of High D.C and A.C Voltages: Half wave rectifier circuit, Cockroft Walton voltage multiplier circuit, Electrostatic generator, Van de Graf generator, Generation of high A.C voltages, series resonant circuit.

UNIT-III

Generation of Impulse Voltages and Currents: Impulse generator circuits, Analysis of circuits 'a' and 'b', Multistage Impulse generator circuit, Construction of Impulse generator, Impulse current generation.

UNIT-IV

Measurement of High Voltage and Currents: Sphere gap, Uniform field spark gap, Rod gap, electrostatic voltmeter, Generating voltmeter, Chubb Fortescue method, Impulse voltage, measurement using voltage dividers, Measurement of high D.C, A.C and Impulse currents.

UNIT-V

Testing of Power Capacitors: Testing of power transformers, Testing of circuit breaker, Test voltages, Voltage and power ratings of test equipment, layout of high voltage laboratories. Lightning phenomena and Line design.

Suggested Reading:

1. M.S.Naidu and V.Kamaraju, *High Voltage Engineering,* Tata McGraw Hill 2001.
2. C.L.Wadhwa, *High Voltage Engineering,* Wiley Eastern Ltd., 1994.
3. E.Kuffel and W.S. Zaengl, *High Voltage Engineering,* Pergamon Press, 1984.

EE 413

POWER QUALITY
(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring. Power Quality Data: Data collection, Data analysis, Database structure, Creating PQ databases, Processing PQ data.

UNIT-II

Voltage Sag – Characterization: Voltage sag – definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, voltage sag duration.

Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT-III

PQ Considerations in Industrial Power Systems: Adjustable speed drive (ASD) systems and applications, mitigation of harmonics. Characterization of voltage sags experienced by three-phase ASD systems: Types of sags and phase - angle jumps. Effects of momentary voltage dips on the operation of induction and synchronous motors. Voltage sag coordination for reliable plant operation.

UNIT-IV

Effects of Harmonics on Power Quality: Harmonic analysis of industrial customers, technical barriers in ASDs. Methods of evaluation of harmonic levels in industrial distribution systems. Harmonic effects on transformers. Impact of distribution system capacitor banks on PQ. Guidelines for limiting voltage harmonics.

UNIT-V

Power Quality Monitoring: Introduction, site surveys, Transducers, IEC-measurement techniques for Harmonics, Flicker, IEC Flicker meter.

Suggested Reading:

1. Math HJ Bollen, *"Understanding Power Quality Problems"*, IEEE Press.
2. C. Sankaran, *"Power Quality"*, CRC Press.
3. R.Sastry Vedam, M.Sarma, *"Power Quality- Var Compensation in Power Systems"*, CRC Press, 2009.

EE 414

NUCLEAR ENERGY
(Elective-I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to Nuclear Physics: Basic nuclear properties, mass and abundance of nuclides, nuclear mass and binding energy, radio active decay, units for measuring nuclear radiation and radiation dose. Alpha decay, beta decay, gamma decay; detection of nuclear radiation, nuclear reactions, neutron physics, nuclear fission, chain reaction, controlled fission reactors, atom bomb, nuclear fusion, controlled fusion reactors, hydrogen bomb.

UNIT-II

Various Types of Nuclear Reactors: Types of nuclear materials-fuels, moderators, coolants, control rods, shielding materials etc. PWR, BWR, Heavy water, CANDU, gas-cooled, liquid-metal cooled reactors, fast breed reactors.

UNIT-III

Nuclear Power Plants: Heat transfer aspects of nuclear power plants, Nuclear power plants: layout, site selection, controls and instrumentation, India's Programme for nuclear power, Survey of present nuclear power plants in India and future scenario.

UNIT-IV

Safety Aspects of Nuclear Power Reactors: Biological effects of nuclear radiation. Reactor shielding, Reactor safety, Nuclear power and environment, nuclear reactor accidents; review of the Three-Mile-Island accident, and the Chernobyl accident. Storage and disposal of nuclear waste.

UNIT-V

Nuclear Fusion Reactors: Basic properties of nuclear fusion and thermo nuclear reactions, technology of controlled fusion reactors, International Thermonuclear Energy Research (ITER) project in France.

Suggested Reading:

1. Samuel Glasstone and A. Sesonke, *"Nuclear Reactor Engineering"* Vol. 1 & 2
2. J. Kenneth Shultis and Richard E. Faw, *"Fundamentals of Nuclear Science and Engineering"*.
3. John R.Lamarsh and Antony J.Baratta, *"Introduction to nuclear power engineering"*

ME 411

ENTREPRENEURSHIP
(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Unit-I

Indian Industrial Environment-competence, Opportunities and Challenges. Entrepreneurship and Economic growth. Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries. Types of enterprises.

Unit-II

Identification and characteristics of entrepreneurs. Emergence of First generation entrepreneurs, environmental influence and women entrepreneurs. Conception and evaluation of ideas and their sources. Choice of Technology - Collaborative interaction for Technology development.

Unit-Ill

Project formulation, Analysis of market demand, Financial and profitability analysis and Technical analysis, project financing in India.

Unit-IV

Project Management during construction phase, project organization, project planning and control using CPM, PERT techniques. Human aspects of project management. Assessment of tax burden.

Unit-V

Behavioural aspects of entrepreneurs: Personality - determinants, attributes and models. Leadership concepts and models. Values and attitudes. Motivation aspects. Change behaviour. Time Management: Various approaches of time management, their strengths and weaknesses. The urgency addiction and time management matrix.

Suggested Reading:

1. Vasant Desai, *"Dynamics of Entrepreneurial Development and Management"*, Himalaya Publishing House, 1997.

2. Prasanna Chandra, *"Project-Planning, Analysis, Selection, Implementation and Review"*, Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. Stephen R. Covey and A. Roger Merrill, *"First Things First"*, Simon and Schuster Publication, 1994.
4. G.S. Sudha, *"Organizational Behaviuor"*, 1996.
5. Robert D. Hisrich, Michael P. Peters, *"Entrepreneurship"*, Tata Me Graw Hill Publishing Company Ltd., 5th Ed., 2005.

CS 403

INFORMATION SECURITY
(Elective-I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction: History, critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC

Need for Security: Business needs, Threats, Attacks-secure software development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in information security, relevant U.S laws-international laws and legal bodies, Ethics and information security

Risk Management: Overview, Risk Identification, risk assessment, Risk Control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, recommended risk control practices

UNIT-III

Planning for Security: Security policy, Standards and practices, Security blue print, Security education, Continuity strategies.

Security Technology: Firewalls and VPNs: Physical design, firewalls, protecting remote connections.

UNIT-IV

Security Technology: Intrusion detection, Access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

Cryptography: Foundations of cryptology, cipher methods, Crypryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems

UNIT-V

Implementing Information Security: information security project management, technical topics of implementation , Non- technical aspects of implementation, Security certification and accreditation

Security and Personnel: Positioning and staffing security function, Employment policies and practices, internal control strategies.

Information security Maintenance: Security management models. The maintenance model, Digital forensics

Suggesting Reading:

1. Michael E. Whitman and Hebert J Mattord, *Principles of Information Security,* 4th edition, Ed. Cengage Learning 2011.
2. Thomas R Peltier, Justing Peltier, John Blackley, *Information Security. Fundamentals,* Auerbacj Publications 2010.
3. Detmar W Straub, Seymor Goodman, Richard L Baskerville, *Information Security. Policy Proceses and Practices,* PHI 2008
4. Marks Merkow and Jim Breithaupt, *Information Security. Principle and Practices,* Pearson Education, 2007.

CS 467

EMBEDDED SYSTEMS
(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-1

Introduction to embedded systems, Characteristics and quality attributes of embedded systems, Challenges in embedded system design, Application and domain specific embedded systems.

UNIT-II

Embedded System Architecture: Instruction set architecture, CISC and RISC instruction set architecture, basic embedded processor/ microcontroller architecture, CISC examples Motorola(68HC11), RISC example-ARM,DSP processor, Harvard architecture microcontroller example-PIC.

UNIT-III

Embedded Computing Platform: programming for embedded systems using C, Device drivers, Program modeling concepts.

Process of Embedded System Development: Embedded software development on microcontroller platform, Network-based embedded applications and embedded control applications.

UNIT-IV

Operating System for Embedded System: Real time operating systems based embedded system design, Introduction to embedded systems design with micro C/OS-II and Vx works.

Performance Issues of an Embedded System: CPU performance, Analysis and optimization of CPU power consumption, Program execution time, Energy and power, Program size.

UNIT-V

Embedded Systems Development Environment: IDE, cross compilation, Disassembler, Simulators, Emulators and debugging, Target hardware debugging, Boundary scan.

Product enclosure design and development tools, Embedded product development life cycle-different phases and approaches of EDLC. Trends in embedded industry.

Suggested Reading:

1. Shibu K V, *Introduction to Embedded Systems*, Tata McGraw Hill, 2010.
2. Raj Kamal, *Embedded Systems Architecture, Programming & Design*, Tata McGraw Hill, 2010.
3. Dr.K.V.K.K. Prasad, *Embedded/Real time Systems: Concepts, Design and Programming*, Dreamtech Press, (2004).

EE 431

ELECTRICAL SIMULATION LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

Simulation experiments should be conducted in the following areas using MATLAB /Simulink with DSP Tool Box, Control System Tool Box & Power System Tool Box/PSpice /PSCAD /MiPower /SABER / PowerTrans etc.

1. Verification of Network theorems (i) Thevinin's theorem (ii) Superposition theorem (iii) Maximum power transfer theorem
2. Transient responses of Series RLC, RL and RC circuits with Sine and Step inputs.
3. Series and Parallel resonance.
4. Bode plot, Root-Locus plot and Nyquist plot.
5. Transfer function analysis (i) Time response for Step input (ii) Frequency response for Sinusoidal input.
6. Design of Lag, Lead and Lag-Lead compensators.
7. Load flow studies.
8. Fault analysis.
9. Transient stability studies.
10. Economic power scheduling
11. Load frequency control
12. Chopper fed D.C motor drives.
13. VSI /CSI fed Induction motor drives.

At least ten experiments should be completed in the semester.

EE 432

MICROPROCESSORS AND MICROCONTROLLERS LABORATORY
(Common to EEE & EIE)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

List of Experiments:

For 8086:

Section 1: ***Using MASM/TASM***

1. Programs for signed/unsigned multiplication and division.
2. Programs for finding average of N 16-bit numbers.
3. Programs for finding the largest number in an array.
4. Programs for code conversion like BCD numbers to 7-Segment.
5. Programs for compute factorial of a positive integer number

Section 2: ***Using 8086 Kit (Interfacing)***

1. 8279 – Keyboard Display: Write a small program to display a string of characters.
2. 8255-PPI: Write ALP to generate triangular wave using DAC.
3. 8253- Timer/Counter: Application of different modes.
4. 8251-USART: Write a program in ALP to establish Communication between two processors.
5. Traffic Signal Controller.

For 8051:

Section 3: ***Using 8051 Kit (Simple Programs)***

1 Data Transfer – Block move, Exchange, sorting, Finding largest element in an array.

2 Arithmetic Instructions: Multibyte operations.

3 Boolean & Logical Instructions (Bit manipulations).

4 Programs to generate delay, programs using serial port and on-Chip timer/Counter.

5. Use of JUMP and CALL instructions.

Section 4 : *Program Development using 'C' cross compiler for 8051*

1. Square Wave Generation using timers.
2. Interfacing of keyboard and 7-segment Display Module.
3. ADC interfacing for temperature monitoring.
4. DAC interfacing for Generation of Sinusoidal wave.
5. Stepper motor control (clockwise, anticlockwise and in precise angles)

List of Equipment:

1. 8086 Kit (with inbuilt assembler/disassembler).
2. MASM/TASM software.

EE 433

POWER SYSTEMS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

List of Experiments:

1. Determination of regulation & efficiency of Short, Medium and Long transmission lines.
2. IDMT characteristics of Over-current relay & Study of Bucholz relay.
3. Determination of A, B, C, D constants of Short, Medium and Long lines. Drawing of circle diagrams.
4. Differential protection of transformer.
5. Sequence impedance of 3-Phase Alternators.
6. Determination of positive, negative and zero-sequence reactance of 3- Phase transformers using sequence current excitation fault calculation.
7. Synchronous machine reactance and time constant from 3-Phase S.C test.
8. Characteristics of Static relays.
9. Static excitation of Synchronous Generator.
10. Determination of dielectric strength of oils and study of Megger.
11. Parallel operation of Alternators.
12. Measurement of capacitance of 3-core cables.
13. Fault location of Underground cables.
14. Simulation of string of insulators for determination of Voltage distribution and String efficiency.

Atleast ten experiments should be completed in the semester.

EE 434

PROJECT SEMINAR

Instruction	3 Periods per week
Duration of University Examination	3 Hours
Sessional	25 Marks

Oral presentation is an important aspect of Engineering education. The objective of the Seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his/ her specialization.

Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to following aspects of a Seminar presentation.

* Literature survey
* Organization of the material
* Presentation of OHP slides / PC presentation
* Technical writing

Each student is required to:

1. Submit a one page synopsis before the Seminar talk for display on the notice board.
2. Give a 20 minutes presentation through OHP or PC or Slide projector followed by a 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled from 3rd week to the last week of semester and any change in schedule should be discouraged

For award of sessional marks, students are to be judged by at least two faculty members on the basis of an oral and written presentation as well as their involvement in the discussion.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR
(ELECTRICAL & ELECTRONICS ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 451	Utilization	4	-	3	75	25
2.		ELECTIVE – II	4	-	3	75	25
3.		ELECTIVE - III	4	-	3	75	25
4.	ME 472	Industrial Administration and Financial Management	4	-	3	75	25
		PRACTICALS					
1.	EE 481	Digital Signal Processing Lab	-	3	3	50	25
2.	EE 482	Project	-	6	Viva Voce	Gr*	50
3.	EE 483	Seminar	-	3	3	-	25
		Total	**16**	**12**	**18**	**350**	**200**

NOTE: * Excellent / Very Good / Good / Satisfactory / Unsatisfactory

ELECTIVE-II

EE 461 Electrical Power Distribution Engineering.
EE 462 Advanced Control Systems
EE 463 Optimization Methods
EC 402 VLSI Design
LA 454 Intellectual Property Rights
CE 452 Disaster Mitigation and Management

ELECTIVE-III

EE 471 Renewable Energy Sources
EE 472 Transducers
EE 473 Power System Reliability
EE 452 Electronic Instrumentation Systems
CS 413 Image Processing
CS 415 Soft Computing

EE 451

UTILIZATION

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Industrial Heating: Advantages and methods of electric heating.Description, operation and performance of resistance ovens. Design of elements. Core type furnace, Coreless type furnace, High frequency eddycurrent heating, Dielectric heating, Arc furnace. Electric Welding: Resistance welding, Welding transformer and its rating. Various types of Electric arc welding and Electric resistance welding.

UNIT-II

Schematic Utilization and Connection Diagram for Motor Control: Two supply sources for 3-phase Induction motors. Direct reversing, remote control operation, Jogging operation of induction motor. Contactor control circuit. Pushbutton control stations. Over load relays, limit switches, Float switches. Interlocking methods for reversing control. Starting of Synchronous motor and motor protection.

UNIT-III

Illumination: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, Solid angle, Lighting calculations, determination of M.S.C.P, Rousseau's construction, Discharge lamps, Sodium vapour lamps, Mercury vapour lamps, Flourescent lamps, Starting and power factor corrections, Stroboscopic effects, Neon signs, Application to factory lighting, Street lighting and Flood lighting.

UNIT-IV

Electric Traction: System of Electric Traction, transmission of Drive, system of track electrification, Traction mechanics, Speed time curves,tractive effort, Power of Traction motor, Specific energy consumption, Mechanics of train movement, Coefficient of adhesion.

UNIT-V

Traction Motors: Desirable characteristics, d.c series motors, a.c series motors, 3-phase induction motors, d.c motor series & parallel control, Shunt bridge transition, Energy saving. Batteries: Lead acid batteries, SMF batteries, Construction and maintenance, Charging and rating of batteries.

Suggested Reading:

1. Partab G, *Art and Science of Utilization of Electric Power,* Dhanpatrai & Sons,1990.
2. K.B.Raina & S.K.Bhattacharya, *Electrical Design, Estimating and Costing,* Wiley Eastern Ltd., 1991.
3. G.K.Dubey, *Fundamentals of Electric Drives,* Narosa Public House, Delhi, 2001.
4. Openshaw Taylor, *Utilization of Electrical energy.*
5. C.L.Wadhwa, *Generation, Distribtion & Utilization of Electrical Energy.*

EE 461

ELECTRICAL POWER DISTRIBUTION ENGINEERING

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction, load characteristics, Diversified demand, Non-coincident demand, Coincidence factor, Contribution factor problems, Rate structure, Customer billing, Application of Distribution transformers, Types of Distribution transformers, single-phase transformer connections, Three-phase transformer connections, Auto-transformer, Booster transformer, phasor diagrams.

UNIT-II

Design of sub-transmission lines and distribution substations, Sub-station bus schemes, Rating of distribution substation, Service area with multiple feeders, Sub-station application curves, Percent voltage drop calculations.

UNIT-III

Design considerations of primary systems, Radial type, Loop type primary feeder, primary feeder loading, Uniformly distributed load application to a long line, Design consideration of secondary systems, secondary Banking, Secondary networks, Network transformers, General Total Annual cost(TAC), equation with and without constraints, Unbalanced loads and voltages.

UNIT-IV

Voltage drop and power loss calculations, 3-phase, Non 3-phase primary lines, Single phase two-wire laterals with ungrounded neutral, Single phase two wire ungrounded laterals. Application of capacitors to distribution systems, Effect of series and shunt capacitors, power factor correction, Economic justification for capacitors, Best capacitor location.

UNIT-V

Distributed Automation: Project planning, Communication, SCADA, Consumer Information Service (CIS), Automatic Meter Reading (AMR)

Suggested Reading:

1. Turan Gonen, *"Electric Power Distribution Engineering"*, McGraw Hill Book Co., International Student Edition, 1986.
2. A.S.Pabla, *"Electric Power Distribution"*, Tata McGraw Hill Publishing Ltd., 1997.
3. Kamalesh Das, *"Electrical power Systems for Industrial Plants"*, Jaico Publishing House, 2007.

EE 462

ADVANCED CONTROL SYSTEMS

(Elective-II & Common to EEE & EIE)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Review of state-space representation of continuous time systems and their solution, state models for discrete time systems described as difference Equations and transfer functions, Transfer function from State model, State-Transition matrix and solution of state equations for discrete time systems.

UNIT-II

Controllability and Observability: Concepts of Controllability and Observability, Controllability tests for continuous time, discrete-time, time-invariant systems. Observability tests for continuous time, discrete-time, time-invariant systems. And Controllability and Observability modes in State. Jordan's canonical form, Controllable and Observable companion forms for single input single output Systems, pole placement by State feedback.

UNIT-III

Nonlinear Systems: Behavior of Nonlinear systems, jump resonance, Sub-harmonic oscillation, Limit cycles, common physical non-linearities, Singular points, phase plane-method, Construction of phase plane trajectories, Isoclines method, Delta method, Computation of time.

UNIT-IV

Stability: Lyapunov's stability criteria, Theorems, Direct method of Lyapunov For linear systems, Non-Linear Systems, Methods of constructing Lyapunov function, Krasovki's Method, Variable gradient method.

UNIT-V

Optimal Control: Formulation of optimal control problem, calculus of variations, Minimization of functionals. Formulation of variational calculus using Hamiltonian method.

Suggested Reading:

1. Gopal.M., *Modern Control System Theory,* Wiley Eastern Limited, 2004
2. Schulz D.G., Melsa J.L., *State Functions of Linear Control Systems,* McGrawHill.

EE 463

OPTIMIZATION METHODS

(Elective-II & Common to EEE & E IE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to Classical Optimization Techniques: Statement of optimization problem, Objective function, Classification of optimization problems.

Classical Optimization Techniques: Single-variable & Multi-variable optimization without constraints. Multi-variable optimization with equality constraints. Lagrange multiplier method, Multi-variable optimization with inequality constraints, kuhn-Tucker conditions.

UNIT-II

Linear Programming: Standard form, Formulation of the LPP, Solution of simultaneous equations by Pivotal condensation, Graphical method, Simplex algorithm, Big M method, Two phase Simplex method, Duality principle, Dual Simplex method.

UNIT-III

Non-Linear Programming: One dimensional Search method: Fibonacci method, Golden Section method.

Direct Search Method: Uni-variate Search and Pattern Search methods, Powell's method.

UNIT-IV

Gradient Method: Steepest Descent, Conjugate Gradient and Quasi-Newton method, Fletcher-Reeves method of Conjugate gradients.

UNIT-V

Dynamic Programming: Multistage design process, Types, Principle of optimality, Computational procedure in Dynamic programming, Examples using Calculus method and Tabular method of solutions.

Suggested Reading:

1. S.S.Rao, *Engineering Optimization Theory and Applications,* New Age International, 3rd Edition, 1998.
2. Jasbir S.Arora, *Introduction to Optimum Design,* McGraw Hill International Edition, 1989.
3. S.D.Sharma, *Operational Research,* Kedarnath Ramnath & Co., 2004.

EC 402

VLSI DESIGN

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction to HDLs, Basic Concepts of Verilog, Data Types, System Tasks and Compiler Directives.

Gate Level Modeling: Gate Types and Gate Delays. Dataflow Modeling: Continuous assignment and Delays. Design of Stimulus Block.

UNIT-II

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks, Generate Blocks. Switch level Modeling.

Tasks, Functions, Procedural Continuous Assignments, Design of Mealy and Moore state models using Verilog.

Logic Synthesis, Synthesis Design flow, Gate level Net list.

UNIT-III

Introduction to MOS Technology, Basic MOS Transistor action: Enhancement and Depletion Modes. Basic electrical properties of MOS, Threshold voltage and Body Effect. Design of MOS inverters with different loads, Basic Logic Gates with CMOS: INVERTER, NAND, NOR, AOI and OAI gates. Transmission gate logic circuits, Bi-CMOS inverter.

UNIT-IV

MOS and CMOS circuit Design Process: MOS Layers, Stick diagrams, Lambda based Design rules and Layout diagrams. Basic Circuit Concepts: Sheet Resistance, Area Capacitance and Delay calculation.

UNIT-V

Combinational Logic: Manchester, Carry select and Carry Skip adders, Crossbar and barrel shifters, Multiplexer.

Sequential Logic: Design of Dynamic Register Element, 3T, 1T Dynamic RAM Cell, 6T Static RAM Cell.

D flip flop using Transmission gates. NOR and NAND based ROM Memory Design.

Suggested Reading:

1. Samir Palnitkar, *"Verilog HDL: A Guide to Digital Design and Synthesis"*, 2/e , Pearson Education, 2008.
2. Michael D. Ciletti, *"Advanced Digital Design with Verilog HDL"*, PHI, 2005.
3. Kamran Eshraghian, Douglas A. Pucknell, and Sholeh Eshraghian, *"Essentials of VLSI circuits and Systems"*, PHI, 2011.
4. John P. Uyemura, *"Introduction to VLSI Circuits and Systems"*, Wiley India Pvt. Ltd., 2011.

LA 454

INTELLECTUAL PROPERTY RIGHTS

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Meaning of Intellectual Property, Nature of I.P., Protection of I.P, Rights, Kinds of Intellectual Property Rights, International Conventions of Intellectual Property Rights, Patent Treaty 1970, GATT 1994, TRIPS & TRIMS. International Organization for Protection of IPR – WTO , WIPO, UNESCO.

UNIT-II

Patents: Meaning of Patent, Commercial significance, obtaining of patent, patentable subject, matter-rights and obligations of patentee, specification, Registration of patents, Compulsory licensing and licenses of rights, Revocation.

UNIT-III

Industrial Designs: Definition of Designs. Registration of Designs. Rights and Duties of Proprietor of Design. Piracy of Registered designs.

UNIT-IV

Trademarks: Meaning of trademark, purpose of protecting trademarks Registered trademark, procedure – passing off. Assignment and licensing of trademarks, Infringement of trademarks.

UNIT-V

Copy Right: Nature, scope of copyright, subject matter of copyright, right conferred by copyright, publication. Broadcasting, telecasting, computer program, database right. Assignment, transmission of copyright, Infringement of copyright.

Suggested Reading :

1. Cornish W.R., *"Intellectual Property – Patents, Copyright, Trademarks and Allied Rights"*, Sweet & Maxwell, 1993.
2. P. Narayanan, *"Intellectual Property Law"*, Eastern Law House, 2/e, 1997.
3. Robin Jacob & Danial Alexander, *"A guide book to Intellectual Property Patents"*, Sweet and Maxwell, 4/e, 1993.
4. Ganguly, *"Intellectual Property: Unleashing the knowledge Economy"*, TMH, 2003.

CE 452

DISASTER MITIGATION AND MANAGEMENT

(Elective-II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction - Natural, human induced and human made disasters -international decade of disaster reduction.

UNIT-II

Natural Disasters - Hydrometereological based disasters - Trophical cyclones, floods, drought and desertification - Zones Geographical based disasters - Earth quake, Tsunammis, Landslides and avalanches.

UNIT-III

Human induced hazards - chemical industrial hazards, major power breakdowns, traffic accidents, etc.

UNIT-IV

Use ofremote sensing and GISI disaster mitigation and management.

UNIT-V

Rich and vulnerability to disaster - mitigation and management options -warning and forecasting.

Suggested Reading :

1. Rajib, S and Krishna Murthy, R. R (2012) *"Disaster Management Global Challenges and Local Solutions"* Universities Press, Hyderabad.
2. Navele, P & Raja, C. K (2009), *Earth and Atmospheric Disasters Management,* Natural and Manmade. B. S. Publications, Hyderabad.
3. Fearn-Banks, K (2011), *Crises computations approach: A case book approach.* Route ledge Publishers, Special Indian Education, New York & London.
4. Battacharya, T. (2012), *Disaster Science and Management.* Tata McGraw hill Company, New Delhi.

EE 471

RENEWABLE ENERGY SOURCES

(Elective-III & Common to EEE & EIE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Statistics on Conventional Energy Sources and Supply in Developing Countries: Definition, Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES, Classification of NCES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of these energy sources.

UNIT-II

Solar Energy: Definition, Energy available from Sun, Solar radiation data, solar energy conversion into heat, Flat plate and Concentrating collectors, Principle of natural and forced convection, Solar Engines: Stirling, Brayton engines, Photo voltaics: p-n junctions. Solar cells, PV systems, Standalone, Grid connected solar power satellite, Calculation of energy through photovoltaic power generation.

UNIT-III

Wind Energy: Energy available from wind, General formula, Lift and drag. Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Windmill rotors, Horizontal axis and Vertical axis rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant.

UNIT-IV

Nature of Geothermal Sources: Definition and classification of resources, Utilization for electricity generation and direct heating, Wellhead power generating units. Basic features: Atmospheric exhaust and condensing, Exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Constructional details of gasifier, Usage of biogas for chullas, various types of chullas for rural energy needs.

UNIT-V

Wave, Tidal and OTEC energy, Difference between tidal and wave power generation. Principles of tidal and wave power generation, OTEC power plants, Operation of small open-cycle experimental facility, Design of 5 MW OTEC pro-commercial plant. Economics of OTEC, Environmental impacts of OTEC, Status of multiple product OTEC systems.

Suggested Reading:

1. Ashok Desai V, *Non-Conventional Energy,* Wiley Eastern Ltd, 1990.
2. Mittal K.M, *Non-Conventional Energy Systems,* Wheeler Publishing Co. Ltd, 1997.
3. Ramesh R, Kurnar K.U, *Renewable Energy Technologies,* Narosa Publishing House, New Delhi, 1997.

EE 472

TRANSDUCERS

(Elective-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Basic Methods of Measurement: A generalized measurement system configuration, Basic characteristics of measuring devices: Accuracy, Precision, Error, Linearity, Hysteresis, Threshold, Repeatability, Reliability and maintainability, Span, Calibration.

UNIT-II

Performance Characteristics of Instrumentation System: Generalized Mathematical model of system, Transfer function representation, Sinusoidal transfer function: Zero. First and Second order instruments, Impulse, Step, Ramp and Frequency responses of above instruments, Specification and testing of Dynamic response.

UNIT-III

Transducer: Definition, Electrical Transducers: Classification. Basic requirement of transducers, Variable resistance transducers, Construction and characteristics of Potentiometers, Application, Electrical Strain gauge: Theory of operation of Resistance Strain gauge, Gauge factor, Types of Electric Strain gauges: Wire gauges. Unbonded and bonded Strain gauges, Foil gauges, Semiconductor Strain gauges. Materials for Strain Gauges, Installation of Strain gauges, Strain measuring circuits, Related problems.

UNIT-IV

Resistive type Temperature Measuring Transducers: Platinum resistance transducer, Thermistor, Thermocouples: Types of thermocouples, Variable inductance and Capacitive transducers, Construction details of different types of inductance transducers:

LVDT, Application, Induction Potentiometers. Types of Variable Capacitive Transducers, Applications.

UNIT-V

Other Transducers: Piezo-Electric transducers, Characteristics, Hall effect sensors, Eddy current sensors, Digital Transducers, Fiber-optic sensors, Electro-optic transducers. Semiconductor sensors.

Suggested Reading:

1. C.S.Rangan. G.R.Sarma and V. S.V.Mani, *Instrumentation Devices & Systems,* Tata McGraw Hill Publications, 1983.
2. D.V.S.Murthy, *Transducers and Instrumentation,* Prentice Hall of India (P) Ltd., 1997.

EE 473

POWER SYSTEM RELIABILITY

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Elements of Probability Theory - Probability Distributions: Random variables, density and distribution functions, Mathematical expectation-Mean and Variance, Binominal distribution, Poisson distribution, Normal distribution, Exponential distribution, Weibull distribution.

UNIT-II

Definition of Reliability: Component reliability, Hazard rate, derivation of the reliability function in terms of the hazarad rate. Causes of failures, types of failures. Bath tub curve, MTTR, MTBF. Reliability logic diagrams for series, parallel, series-parallel, non-series-parallel configurations. Minimal cut-set and decomposition methods

UNIT-III

Discrete Markov Chains: General modeling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation. Absorbing states. Continuous Markov Processes: Modeling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities. Reliability evaluation of repairable systems.

UNIT-IV

Generating System Reliability Analysis: Generation system model – capacity outage probability tables – Recursive relation for capacitive model building – sequential addition method – unit removal – Evaluation of loss of load and energy indices. Frequency and Duration methods – Evaluation of equivalent transitional rates of identical and non-identical units – Evaluation of cumulative probability and cumulative frequency of non-identical generating units – 2-level daily load representation - merging generation and load models

UNIT-V

Distribution System Reliability Analysis: Radial networks –Evaluation of Basic reliability indices, performance indices - load point and system reliability indices – customer oriented, loss and energy oriented indices. Parallel networks- inclusion of bus bar failures, scheduled maintenance – temporary and transient failures – weather effects – common mode failures –Evaluation of various indices.

Suggested Reading:

1. Roy Billinton and Ronald N Allan, *"Reliability Evaluation of Engineering Systems"*, Plenum Press.
2. Roy Billinton and Ronald N. Allan, *Reliability Evaluation of Power Systems* , Plenum Press, New York and London (Second Edition), 1996.
3. J. Endrenyi, John Wiley and Sons, *Reliability Modeling in Electric Power Systems*, 1978. (First Edition).

EE 452

ELECTRONIC INSTRUMENTATION SYSTEMS

(Elective-III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Analog and Digital Measuring Systems: Interfacing Active and Passive Transducers. Amplifiers: Instrumentation amplifiers (Fixed and Programmable gain types and its specifications), Isolation amplifiers (Types and its specifications).

Digital to Analog Converters: R-2R ladder and Inverted ladder DACs. Main DAC specifications. Analog to Digital Converter: R-2R Ladder and Inverted Ladder DACs, Main **DAC Specifications, Analog to Digital Converters:** Parallel (or Flash) ADC successive approximation, ADC Microprocessor compatibility, Dual slope ADC, Principal specifications of an ADC.

UNIT-II

Digital Voltmeters and Multimeters: Simple D.C Voltage attenuator, Current to Voltage converter, Resistance to Voltage Converter, Automatic ranging and Automatic zeroing RMS detector in DMM and RMS and True RMS, Digital Frequency and Time measurements, Frequency Measurements, frequency ratio Time Interval and Pulse width measurements, Scaling and Checking modes. Counting errors, Input signal conditioning, Trigger level, Hysteresis.

UNIT-III

Signal Analysis: Wave Analyzers: Signal analysis and wave Analyzer: Type and Applications. Harmonic Distortion Analyzers: harmonic Distortion, heterodyne harmonic Analyzer or Wave meter, Tuned circuit, Fundamental Suppression. Spectrum Analysis: Block Diagram, Phase locked circuit for the local oscillator, Successive Limiting type of Log IF amplifier.

UNIT-IV

Computer Controlled Test Systems: Testing an Audio amplifier, Radio Receiver instruments used in computer controlled instrumentation, Frequency counter, Synthesized signal generator interfaced with IEEE 488 Bus, Relay switched attenuator, IEEE 488 Electrical Interface.

UNIT-V

Cathode Ray Oscilloscope: Block Diagram, Basic Concepts, Vertical amplifier, Time Base, Trigger Delay line and their role in a CRO, Digital storage Oscilloscope, Magnetic Recorders, Digital Interface for Programmable Instrumentation, Description and Sample examples of Automatic Instrumentation.

Suggested Reading:

1. A.J.Owens, *Digital Instrumentation,* McGraw Hill International Edition, 1995
2. H.S.Kalsi, *Electronic Instrumentation,* Tata McGraw Hill
3. Helfrick and Copper, *Modern Electronic Instrumentation and Measurement Techniques,* Prentice Hall of India,2002
4. Tran Tien Lang, *Electronic Measuring Systems,* John Wiley and Sons, 1987.

CS 413

IMAGE PROCESSING

(Elective - III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to Digital Image Processing: Origins and Applications of Digital Image Processing. Fundamental Steps in Digital Image Processing, Components of Digital Image Processing System. Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization

UNIT-II

Filtering in the Frequency Domain: Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform (DFT) of One Variable, Extension to Function of Two Variables, Image Smoothing and Sharpening using Frequency Domain Filters.

UNIT-III

Filtering Intensity Transformations and Spatial: Histogram Processing, Fundamental of Spatial Filtering, Smoothing and Sharpening Spatial Filters

Image Segmentation: Point, Line and Edge Detection, Thresholding-(Foundation , Basic global thresholding, Otsus method) , Region-Based Segmentation.

UNIT-IV

Image Compression: Fidelity Criteria, Image Compression Models, Image Formats, Containers and Compression Standards

Compression Methods: Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-Length Coding.

UNIT-V

Restoration: Noise Models, Inverse filtering. Least squares Filtering.
Color Image Processing : Color fundamentals, Color models, Pseudocolor Image Processing, Basics of full color image processing.

Suggested Reading:

1. Gonzalez R.C., Woods R.E: *Digital Image Processing,* Pearson Education, Third Edition 2012.
2. William K. Pratt, *"Digital Image Processing"*, John Wiley & Sons Inc. 3rd Edition, 2001.
3. McAndrew, *Introduction to Digital Image Processing* , Cengage Learning 2004.
4. Sonka, Hlavac, Boyle, *Digital Image Processing and Computer Vision,* Cengage learning, 2008.
5. Rosenfeld A. Kak AC: *Digital Picture Processing Vol.I & II Acad,* Press, 2nd Edition, 1982.

CS 415

SOFT COMPUTING

(Elective-III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction: Neural networks, application scope of neural networks, fuzzy logic, genetic algorithm, hybrid systems, Soft computing. Artificial neural networks: Fundamental concepts, Evolution of neural networks, basic model of Artificial neural networks, Important terminology of ANNs, McCulloch-pitts neuron model, Linear separability, Hebb Network Supervised Learning Network: Perceptron networks, adaptive linear neuron (Adaline), Multiple adaptive linear neuron, Back propagation network, Radial basis Function network (Architecture& Training algorithms)

UNIT-II

Associative Memory Networks: Training algorithm for pattern Association, Associative memory network, Hetroassociative memory network (Architecture& Training algorithm), Bidirectional associative memory network Architecture, Discrete Bidirectional associative memory network, Continuous BAM ,Analysis of hamming distance, Energy function and storage capacity, Hopfield networks discrete &continuous. Unsupervised Learning Networks: Fixed weight competitive Nets, Kohonen self organizing network, Learning vector quantization (Architecture& Training algorithm) Adaptive Resonance theory network. Special networks: Simulated Annealing Networks,Boltzmann machine, Gaussian machine

UNIT-III

Fuzzy Logic: Introduction to Classical sets and fuzzy sets, Classical sets,Fuzzy sets: Operations and Properties. Fuzzy Relations: Cardinality, Operations and Properties, Equivalence & tolerance. Membership function: Fuzzification, membership value assignment: Inference, rank ordering, angular fuzzy sets

UNIT-IV

Defuzzification: Lamda Cuts for fuzzy sets and relations, defuzzification methods Fuzzy arithmetic and fuzzy measures: Fuzzy arithmetic, extension principle, fuzzy measures, measures of fuzziness, fuzzy integral Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy propositions formation of rules
,decomposition of compound rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference system, fuzzy expert systems

UNIT-V

Fuzzy decision making: Individual, multiperson, multi objective, multi attribute, Fuzzy Bayesian decision making, Fuzzy logic control system: control system design, architecture &operation of FLCsystem,FLC system models,Aplication of FLC system.

Genetic Algorithim: Introduction,basic operators& terminology, Traditional algorithm vs genetic algorithm, simple GA, general genetic algorithm, schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming , applications of genetic algorithm

Suggested Reading:

1. S. N. Sivanandam & S.N.Deepa, *"Principles of Soft Computing"*, Wiley India, 2008.
2. Limin Fu, *"Neural Networks in Computer Intelligence"*, McGraw Hill, 1995.
3. Timoty J. Ross, *"Fuzzy Logic with Engineering Applications"*, McGraw Hill, 1997.

ME 472

INDUSTRIAL ADMINISTRATION & FINANCIAL MANAGEMENT

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Industrial Organisation: Types of various business organizations. Organisation structures and their relative merits and demerits. Functions of management.

Plant location and layouts: Factors affecting the location of plant and layout. Types of layouts and their merits and demerits.

UNIT-II

Work study, Definitions, objectives of method study and time study. Steps in conducting method study. Symbols and charts used in method study. Principles of motion economy. Calculation of standard time by time study and work sampling. Performance rating factor. Types of ratings. Jobs evaluation and performance appraisal. Wages, incentives, bonus, wage payment plans.

UNIT-III

Inspection and quality control: Types and objectives of inspection S.Q.C., its principles. Quality control by chart and sampling plans. Quality circles, introduction to ISO.

Production planning and control: Types of manufacture. Types of production. Principles of PPC and its function. Production control charts.

UNIT-IV

Optimisation: Introduction to linear programming and graphical solutions. Assignment problems.

Project Management: Introduction to CPM and PERT. Determination of critical path..

Material Management: Classification of materials. Materials planning. Duties of purchase manager. Determination of economic ordering quantities. Types of materials purchase.

Unit-V

Cost accounting: Elements of cost. Various costs. Types of overheads. Break even analysis and its applications. Depreciation. Methods of calculating depreciation fund. Nature of Financial management. Time value of money. Techniques of capital budgeting and methods.

Cost of capital. Financial leverage.

Suggested Reading:

1. Pandey I.M. *"Elements of Financial Management"*, Vikas Publ. House, New Delhi, 1994.
2. KhannaO.P., *"Industrial Engineering and Management"*, Dhanapat Rai & Sons.
3. Everrete E. Adama & Ronald J. Ebert, *"Production & Operations Management"*, Prentice Hall of India, 5th Edition, 2005.
4. S.N. Chary, *"Production and Operations Management"*, Tata McGraw Hill, 3rd Edition, 2006.
5. Paneer Selvam, *"Production and Operations Management"*, Pearson Education, 2007.

EE 481

DIGITAL SIGNAL PROCESSING LAB

(Common to EEE & EIE)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

1. Waveform generation –Square, Triangular and Trapezoidal.
2. Verification of Convolution Theorem-comparison of Circular and Linear Convolutions.
3. Computation of DFT, IDFT using Direct and FFT methods.
4. Verfication of Sampling Theorem
5. Design of Butterworth and Chebyshev of LP & HP filters.
6. Design of LPF using rectangular and Hamming, Kaiser Windows.
7. 16 bit Addition, Integer and fractional multiplication on 2407 DSP trainer kit.
8. Generation of sine wave and square wave using DSP trainer kit.
9. Response of Low pass and High pass filters using DSP trainer kit.
10. Linear convolution using DSP trainer kit.
11. PWM Generation on DSP trainer kit.
12. Key pad interfacing with DSP.
13. LED interfacing with DSP.
14. Stepper Motor Control using DSP.
15. DC Motor 4-quadrant speed control using DSP.
16. Three phase IM speed control using DSP.
17. Brushless DC Motor Control.

At least ten experiments should be completed in the semester

EE 482

PROJECT

Instruction	6 Periods per week
Duration of University Examination	Viva - Voce
University Examination	Grade*
Sessional	50 Marks

'Solving the Real Life Problem' should be the focus of U.G. Project. Faculty members should prepare the Project brief well in advance, which should be made available to the students at the Departmental library. The Project may be classified as hardware, software, modeling and simulation. It should involve one or many elements of techniques such as analysis, design, synthesis etc.

The Department will appoint a Project co-coordinator who will coordinate the following:

- Grouping of students(a maximum of three in a group)
- Allotment of Projects and Project guides
- Project monitoring at regular intervals

All Project allotments are to be completed by 4th week of IV year 1st Semester so that students get sufficient time for completion of the Project.

All Projects will be monitored at least twice in a semester through students presentation. Sessional marks should be based on the grades/ marks, awarded by a monitoring committee of faculty members and marks given by the supervisor.

Efforts should be made that some of the Projects are carried out in Industries with the help of Industry co-coordinators. Problems can also be invited from the Industries to be worked out through U.G. Project.

Common norms will be established for final documentation of the Project report by the respective Department.

**Excellent / Very Good / Good / Satisfactory / Unsatisfactory.*

Note : Three periods of contact load will be assigned to each Project guide.

EE 483

SEMINAR

Instruction	3	Periods per week
Duration of University Examination	3	Hours
Sessional	25	Marks

Oral presentation is an important aspect of Engineering education. The objective of the Seminar is to prepare the student for systematic & independent study of state of the art of topics in broad area of his/her specialization.

Topics of Seminar may be chosen by the students with the advice from faculty members. Students are to be exposed to following aspects of Seminar presentations

1. Literature survey
2. Organization of material
3. Preparation of OHP Slides / PC presentation
4. Technical writing

Each student is required to

1. Submit one page synopsis of the Seminar talk for display on notice board
2. Give a 20 minutes presentation through OHP, PC, Slide projector, followed by 10 Minutes of discussion
3. Submit a report on the Seminar topic with list of references and slides used.

Seminars are to be scheduled from 3 week to the last week of the Semester and any change in the schedule should be discouraged.

The sessional marks will be awarded to the students by at least two faculty members on the basis of an oral and a written presentation as well as involvement in the discussions.