UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

V SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING
# SCHEME -2013

## V SEMESTER

### ELECTRICAL AND ELECTRONICS ENGINEERING (E)

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Marks</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>13.501</td>
<td>Engineering Mathematics IV (E)</td>
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### 13.506 Elective I

<table>
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<tr>
<th>Course No</th>
<th>Name of subject</th>
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<tbody>
<tr>
<td>13.506.1</td>
<td>Engineering Material Science (E)</td>
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<td>13.506.2</td>
<td>Operations Research (E)</td>
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<td>13.506.3</td>
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<td>13.506.7</td>
<td>Professional Communication (E)</td>
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13.501 ENGINEERING MATHEMATICS - IV (E)
(PROBABILITY, RANDOM PROCESSES and NUMERICAL TECHNIQUES)

Teaching Scheme: 3(L) - 1(T) - 0(P)  Credits: 4

Course Objective:

- To provide a basic understanding of random variables and probability distributions.
- To have a basic idea about Random process-its classification, types and properties and their applications in engineering fields.
- Numerical techniques for solving differential equations are also introduced as a part of this course.

Module – I


Module – II

Numerical integration-Trapezoidal Rule- Simpson’s one third rule.


Numerical Solution of two-dimensional partial differential equation(Laplace equation)-using finite difference method(five point formula).

Module – III

Random Variables -Discrete and continuous random variables -Probability distributions.- Mathematical Expectation and properties.

Special probability distributions-Binomial distribution, Poisson distribution, Poisson approximation to Binomial, Uniform distribution, Exponential Distribution, Normal distribution- mean and variance of the above distributions(derivations except for normal distribution), Simple problems.

Module – IV

Two dimensional random variables-Joint and marginal distributions-Expectations-Conditional probability distributions –independence.

Random processes-Types of random processes-Strict sense stationary process (SSS) and Wide sense stationary (WSS) process-Autocorrelation, autocovariance and their properties(without proof) -Poisson process-mean and variance-simple problems.
**Power spectral density (PSD)** - PSD of real processes and its properties. Relation between autocorrelation and power spectral density.

**References:**


**Internal Continuous Assessment** *(Maximum Marks - 50)*

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- **Examination duration:** 3 hours  
  **Maximum Total Marks:** 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After successful completion of this course, the student will be familiar with the various concepts of Random process which are essential in Electrical and Electronics Engineering and they will be able to use numerical methods to solve problems related to engineering fields.
Course Objectives:

To expose the students to the concepts of synchronous machines (alternators and synchronous motors) including the Constructional details, principle of operation, and Performance analysis.

Module – I


Module – II


Module – III


Module – IV

machine on infinite bus- V Curve and Inverted V Curve – Power flow equation for cylindrical and salient pole machines- power vs power angle diagram – reluctance power –maximum power transfer- stability limit- control of active and reactive power in synchronous machine on infinite busbars- applications of synchronous motors.

References


Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

*Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

After the successful completion of this course, the students will be able to select the proper alternator or synchronous motor for a given application, based on a performance analysis.


13.503 SWITCHGEAR AND PROTECTION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

This course will enable the students to learn the fundamental concepts of Power system components used for protection.

Module – I


Module – II

Protective relays - Introduction - evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection- Classification of Protective relays - Basic Relay Terminology and characteristics- attracted armature, balanced beam, induction disc, thermal relays- over current, earth fault and over voltage relays.

Directional and non- directional relays-Principle and application of directional over current and earth fault relays- Distance relays& their settings – impedance, reactance, mho and off set mho relays, errors and remedies to errors- Differential relays current and voltage comparison - circulating current and opposite voltage differential scheme. Negative sequence relays. Principle of Relay coordination.

Module – III

Protective relays: Block schematic and flow charts of over current relay, impedance relay and directional relay. Principle of numerical protection.

**Module – IV**

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines - field suppression of alternator - Buchholz’s relay - over current and distance protection for feeders - Translay relay.


Over voltages and insulation requirements - Generation of over voltages - Switching surges - Protection against over voltages - Surge diveters - Insulation co-ordination - propagation of surges -Termination in inductance and capacitance - Determination of system voltages produced by travelling waves – Bewley lattice diagram - effects of line loss.

**References:**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours          Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the students will be able to

- Identify and interpret the type of risks faced by power systems
- Choose the appropriate switchgear for protection of any element in power systems
- Choose appropriate protection schemes for the protection of any element in power systems.
13.504 CONTROL SYSTEMS (E)

Teaching Scheme: 2(L) - 2(T) - 0(P)

Credits: 4

Course Objective:

The objective of this course is to provide a strong foundation on the analytical and design techniques on classical control theory and modeling of dynamic systems

Module – I


Module – II

Time domain analysis of control systems: Transient and steady state responses - test signals - time domain specifications - first and second order systems - impulse and step responses of first and second order systems- steady state error analysis - static error coefficient of type 0,1,2 systems - Dynamic error coefficients - PID controllers - Trade-off between steady state and transient behaviour.

Module – III


Compensator design: Realization of compensators – lag, lead and lag-lead - Design of compensator using root locus.

Module – IV

References:


Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Note:** Question paper should be set to check the analytical, design and application skills. Descriptive questions should not exceed 20% of the maximum marks.

Course Outcome:

Upon successful completion of this course, students will be able to:

- Model any physical systems and analyse a given system to assess its performance.
- Design a suitable compensator to meet the required performance specifications.
13.505 ELECTRONIC INSTRUMENTATION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)   Credits: 3

Course Objectives:

To introduce the basic concepts of Process Control System, and to provide sound knowledge in sensors, transducers, data converters, the signal conditioning circuits and the special purpose IC’s used for the process instrumentation system.

Module – I


Review of operational Amplifier circuits - precision rectifier, ZCD, current to voltage converter, phase shifter, Instrumentation amplifier using three Op-Amps, Filters: active filters - frequency response of major active filters - Butterworth low pass, high pass and band pass filter, all pass filter, universal active filters- comparison between Butterworth and Chebyschev filters.

Module – II


Module – III

Display devices - LED, LCD and Electro Phoretic Image Display


Programmable logic controllers: basic structure-operation-Fundamentals of ladder programming.

Module – IV

Data converters - Digital to analog converter - ladder networks - settling time of DAC
Analog to digital converters - successive approximation, dual slope and simultaneous converters, conversion time. Sigma Delta Converters. Resolution, quantization error, gain error and linearity error of ADCs.


References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.
Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

At the end of this course, the students will be able to choose appropriate transducers and design necessary signal conditioning circuits for a given process instrumentation system.
13.506.1 ENGINEERING MATERIALS SCIENCE (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objective:

The objective of this course is to give a good foundation about the science of most of the materials used in the field of electrical engineering and also to give a thorough knowledge of dielectrics and its breakdown, magnetic and conductive properties of materials and their applications.

Module – I

Gaseous dielectrics: Types of collision- Elastic and in-elastic collisions. Ionisation and decay process-ionisation by electron collision, Townsend's first ionization coefficient. photo-ionisation, ionisation by metastables, electron detachment, decay by recombination, decay by attachment-decay by diffusion.

Cathode process: Photo electric emission, electron emission by positive ions and excited atom impact, field emission, Townsend’s second ionization coefficient.

Electric breakdown in gases: Townsend’s criterion for breakdown, the sparking potential, Paschen’s law - effect of space charge, the Streamer mechanism, breakdown voltage characteristics in uniform field, penning effect, surge breakdown voltage, time lag, statistical and formative time lags.

Module – II

Electro-negative gases: Production, properties and application of SF6 gas, high voltage breakdown and arc phenomenon in SF6 and its mixtures with nitrogen. Breakdown in high vacuum, application of vacuum insulation.

Corona discharge: Negative point-plane corona, Trichel pulses, positive point corona.

Liquid dielectrics: Conduction and breakdown in pure liquids and commercial liquids, suspended particle theory, cavitation and bubble theory, thermal breakdown, stressed oil volume theory, treatment and testing of transformer oil, properties of transformer oil and synthetic oil used in transformers.

Module – III

Solid dielectrics: Classification based on temperature, breakdown in solid dielectrics, intrinsic breakdown, electro-mechanical breakdown - breakdown by treeing and tracking. Thermal breakdown, electro-chemical breakdown, cavity breakdown, internal partial
discharges - a b c equivalent circuit, degradation of capacitor insulation by partial discharges. Properties of polyethylene and cross-linking polyethylene and polypropylene films. Properties and applications of paper, rubber, plastic, wood, mica, ceramic and glass as dielectric materials.

**Elementary idea of life of insulation:** Exponential and inverse power law models, constant stress test, accelerated life test methods.

**Module – IV**

**Magnetic materials:** Dia, para, ferro, antiferro and ferri magnetism, magnetic anisotropy, magnetostriction. B-H curve, reversible and irreversible regions, hysteresis loop for soft and hard magnetic materials, annealing, properties of grain oriented silicon steel. Properties and application of iron, alloys of iron, and harden alloys

**Materials for resistors:** Properties of copper, aluminium and its alloys, silver, gold, Nickel, Molybdenum and Tungsten. Non-linear resistors: Thyrite and ZnO.

**Semi-conductor materials:** Classification - properties and applications of silicon, germanium, diamond, graphite, selenium, silicon carbide, gallium arsenide, indium, antimonide, gallium phosphide, cadmium compounds as semi conducting materials, merits of semiconductor materials for use in electrical engineering.

**Superconductivity:** Superconducting elements and compounds, Soft & hard superconductors, applications of superconductivity.

**References:-**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours
Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful completion of this course, the students will be able to select the proper insulating/semiconducting/conducting/superconducting/magnetic material for applications in electrical engineering.
13.506.2 OPERATIONS RESEARCH (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credit: 3

Course Objective:

This course is intended to provide the knowledge of OR tools and to apply the skill in the design, analysis, operation and control of complex electrical systems.

Prerequisite: Concepts of linear programming problems.

Module – I

Module – II
The transportation problem, mathematical formulation, Solution, degeneracy, unbalanced transportation problem. Case studies.

Assignment problem, mathematical formulation, the assignment algorithm, – The Hungarian Method- unbalanced assignment problems .Case studies

Decision theory – decision under risk – expected value of profit or loss, expected variance criterion, decision trees, decisions under uncertainty – the Laplace criterion, the mini-max criterion, minimax regret criterion, Hurwicz criterion.

Module – III
Replacement model, types of replacement problem, problem of choosing between two machines, determination of best replacement age of machine using present worth and discount rate, group replacement. Game theory – definition of a game, pay-off, two person zero sum game, graphical solution, application in marketing, advertisement etc. Inventory problems, the economic lot size system, Newspaper boy problem, purchase, inventory model with price breaks. Case studies.

Module – IV
Network analysis, project scheduling by PERT – CPM, Arrow head representation, calculation of critical path, probability and cost consideration in project scheduling- Case studies. Construction of the time chart-resource leveling, Queuing theory, basic elements of the queuing model problems connecting (m/m/I) and (m/m/k) – Problems – various applications in commercial and engineering fields.
References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the students will be able to design and schedule a process in an optimal way. The students will also be able to take proper decisions to operate a system in the most efficient manner.
13.506.3 SUSTAINABLE DEVELOPMENT  (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)                    Credits: 3

Course Objective:

To introduce the concept of sustainable development, providing a sound basis in the subject, which will help in creating a sustainable society.

Module – I

Understanding Sustainable Development: Definitions and perspectives. Introduction to Sustainable development-Economic growth and progress-Continuing poverty- Environmental threats hitting the rich and poor alike-The business as usual path versus the sustainable development path. The UN framework for sustainable development.


Module – II

The Millenium Development Goals.


Human Rights and Gender Equality: The Ethics of Wealth, Poverty, and Inequality - Major UN Covenants and Declarations – Divided societies – Forces of Widening Inequalities – Gender Inequality and Solutions.

Module – III


Universal Health Coverage: The human right to health – Poverty and disease – Ten Recommended Steps to Health for All in the Poorest Countries

Sustainable Food Supply: Malnutrition – Farm systems, ecology, and food security – How environmental change threatens the food system – How the food system threatens the environment – Towards a sustainable global food supply.

Module – IV

Sustainable Cities: The patterns of urbanization around the world – Factors which make a city sustainable – Smart Infrastructure – Urban Resilience – Planning for Sustainable
Development

**Biodiversity:** Biodiversity – Biodiversity under threat – Oceans and fisheries – Deforestation


**References:-**

**Module I:**


**Module II:**


Module III:


21. One Million Community Health Worker Fact Sheet http://1millionhealthworkers.org/files/2013/01/CHW_FactSheet_Final.pdf


25. Opportunities and Solutions for Sustainable Food Production, UN Sustainable

Module IV:


33. The Economics of Desertification, Land Degradation and Drought: Methodologies and Analysis for Decision-Making, 2nd Scientific Conference on the UNCCD; Executive Summary; Chapter 1: Introduction; Chapter 2: Economic and social impacts of desertification, land degradation and drought; Chapter 5: Implementation of the Rio conventions – a call for synergies to advance the economics of desertification, land degradation and drought; Chapter 6: Using the Economics of desertification, land degradation and drought to inform policies at local, national and international level; Conclusion (26 pages) http://2sc.unccd.int/fileadmin/unccd/upload/documents/Background_documents/Background_Document_web3.


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

Upon successful completion of this course, students will be able to create a society that is sustainable to the environmental changes.
NEW AND RENEWABLE SOURCES OF ENERGY (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objective:

Subject is intended to give an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. Energy conservation methods will also be emphasized.

Module – 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.


Module – II


Module – III

ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitations of TPP.

Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC.

**Module – IV**

**BIOMASS ENERGY:** Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India.

**Small hydro power:** Classification as micro, mini and small hydro projects - Basic concepts and types of turbines - Design and selection considerations.

**EMERGING TECHNOLOGIES:** Fuel Cell, Small Hydro Resources, Hydrogen Energy, alcohol energy, nuclear fusion and power from satellite stations.

**References:-**

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests *(minimum 2)*

30% - Assignments *(minimum 2)* such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

*After the successful competition of this course the students will be able to choose an appropriate alternate energy source for power applications.*
Course Objective:

To provide an understanding and an awareness of the principles and practices of disaster management and the tools available for a disaster manager. Also to introduce the principal disaster management technologies with which a disaster manager should be familiar.

Module – I


Module – II


Module – III

AWARENESS OF RISK REDUCTION: Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness

DEVELOPMENT PLANNING ON DISASTER: Implication of development planning – financial arrangements – areas of improvement – disaster preparedness – community based disaster management – emergency response.

Module – IV

SEISMICITY: Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and Intensity – ground damage – Tsunamis and earthquakes

References:-


4. [http://epdfiles.engr.wisc.edu/dmcweb/AA02 Aim and Scope of Disaster Management. pdf](http://epdfiles.engr.wisc.edu/dmcweb/AA02)

**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

*Students will be able to discuss issues of disaster management in a clear, concise, and easily understandable manner with the general public, mass media outlets, and government officials. Students will also be able to implement, effective means to plan, mitigate, respond, and recover from disasters and emergencies, natural and man-made.*
13.506.6 COMPUTER ORGANISATION (E)

Teaching Scheme: 2(L) - 1(T) - 0(P)  

Credits: 3

Course Objective:

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

Module – I

Basic Operational concepts - Von-Neumann architecture, Bus structure - monobus and multibus structures, memory locations and addresses, Addressing methods. Instruction formats - Instruction sequencing.

Processing unit - fundamental concepts - single bus organization of CPU - multiple bus organization of CPU, memory read and memory write operations - Data transfer using registers. Execution of a complete instruction -sequencing of control signals.

Module – II

Computer Arithmetic - Constructing an arithmetic logic unit - A 32 bit ALU, Basic Operations - Signed and unsigned addition - carry look ahead adder, subtraction, Multiplication algorithm - Booths algorithm, Division algorithm.

Control unit - Hardwired control and micro-programmed control - grouping of control signals – microinstruction with next field address - Pre-fetching of microinstructions - Emulation.

Module – III

Input/output organisation - Accessing input/output devices, Organization of interrupts - vectored interrupts –

Setting of priorities – Interrupt masking - Servicing of multiple input/output devices - Polling and daisy chaining schemes. Direct memory accessing (DMA).

I/O channels (introduction only). I/O interfacing - Interfacing I/O devices to memory, processor and operating systems. Bus standards – IEEE standards – SCSI, PCI, USB.

Module – IV

Main memory unit - Memory organisation - memory cells – static memory-dynamic memories -multiple module memory - Memory interleaving - Cache memory - principles - elements of cache design - mapping function -associate mapping - set associative mapping - fully associative mapping - aging.
Advanced computer architecture - Organisation of multi-user computer system. Principles of RISC machines - Overview of parallel processor, multiprocessor and bit-slice architecture. Pipelining, Overview of data-flow architecture

References:-


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2) 
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc. 
20% - Regularity in the class 

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful completion of this course, the students will be able to do the:

- Implementation of the different types of control and the concept of pipelining.
- Implementation of hierarchical memory system including cache memories.
Course Objective:

To understand how communication works and to manage the assumptions more effectively. To help the students to communicate effectively, appropriately and clearly in all situations.

Module – I

Vocabulary and Functional English: This area attempts at making learners withstand the competition at the transnational technical environment so as to enable them to undertake various professional operations.

1. Vocabulary – a basic word list of one thousand words.
2. Functional grammar, with special focus on common errors in English.
3. Idioms and phrasal verbs.
(Only a brief review of the above topic is required)

Listening, Speaking and Reading:

This area exposes the learners to the standard expressions including stress, rhythm and various aspects of isolated elements and connected speech. The use of diphthongs, elements of spoken expression, varieties of English and accent neutralization

Listening Skills: Listening for general content, Intensive listening, listening for specific information. Sounds, stress, intonation, question tag, listening to lectures, audio/video cassettes, asking and answering questions, note-taking, dialogue-writing.

Speaking Skills: Oral practice: Describing objects/situations/people - Role play (Individual and group activities), Just A Minute (JAM)/Group Discussion.

Reading Comprehension: This area exposes the learners to the techniques deciphering and analyzing longer texts pertaining to various disciplines of study. Types of Reading, Sub skills of Reading, Eye span – fixation, Reading Aloud and Silent Reading, Vertical and Horizontal Reading, Vocalization and sub-vocalization.

Reading Skills: Skimming the text - exposure to a variety of technical articles, essays, graphic representation, and journalistic articles.

Module – II

Written Communication Skills: This area exposes the learners to the basic tenets of writing; the style and format of different tools of written communication. Description (through
Paragraph Writing), Reflection (through Essay Writing), Persuasion (through indented Letter Writing), Skills to express ideas in sentences, use of appropriate vocabulary - sentence construction-paragraphs development-note making, informal letters, essentials of telephonic conversation, invitations, minutes of a meeting, editing a passage and essay writing.

Module – III

Technical communication skills: Technical Report Writing (Informational, Analytical and Special reports), Technical Vocabulary, Technical communication- features, distinction between general and technical communication, language as a tool of communication: levels of communication, interpersonal, organizational, mass communication, the flow of communication: upward, downward and lateral, importance of technical communication, barriers to communication.


Module – IV

A non-detailed study of the autobiography: Wings of Fire-An Autobiography by APJ Abdul Kalam. Students should read the book on their own and selected topics may be discussed in the class

References:-


**Internal Continuous Assessment** *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours            Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

On completing this course, students will be able to listen, understand, read and write English for effective communication and manage their profession.
Course Objective:

This course will enable the students to get practical knowledge in the design and implementation of power electronics circuits.

List of Experiments:

1. Study of Power devices- SCR, TRIAC, Power MOSFET, IGBT, etc.
2. Static VI characteristics of SCR
3. Characteristics of Power MOSFET.
4. Characteristics of IGBT
7. *AC voltage controller using Triac.
8. *Study of PLL IC - Determination of lock in range and capture range.
9. *Ramp Control trigger circuit
12. Pushpull inverter circuit using MOSFET
13. Study of motor control using controlled rectifier
14. Design and testing of step-down and step-up chopper using IC78S40 or equivalent.

*Design of the triggering circuit is part of the experiment

Internal Continuous Assessment (Maximum Marks-50)

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  
Maximum Total Marks: 100

Questions based on the list of experiments prescribed
80% - Circuit and design (30%);
   Performance (30%)
   Results and inference (20%)
20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After successful completion of this course, students will be able to design and implement converter/inverter/chopper circuits for power applications.
13.408 MEASUREMENTS AND INSTRUMENTATION LAB (E)

Teaching Scheme: 0(L) - 0(T) - 4(P)  
Credits: 4

Course Objective:
To expose the students to the testing of various measuring instruments and a variety of process instrumentation systems.

List of Experiments:
1. Design and Testing of Summer, Integrator and Differentiator Circuits
2. Determination of Power and Power factor of a given single phase circuit using dynamometer watt meter and power factor meter
3. Determination of BH characteristics
4. Extension of range of voltmeter and Ammeter using-Wheatstone Bridge and Kelvin’s Double Bridge.
5. Measurement of self inductance, mutual inductance and coupling coefficient
6. Calibration of meters and extension of range using slide-wire potentiometer
8. Calibration of wattmeter using Vernier dial potentiometer
9. Extension of instrument range by using Instrument transformers(CT and PT)
10. Design of Schmitt Trigger (Both symmetrical & Unsymmetrical)
11. Characteristics of Thermistor, RTD, Thermocouple
12. Characteristics of LVDT.
13. Characteristics of strain gauge/ Load cell.

Internal Continuous Assessment (Maximum Marks -50)
40% - Test  
40% - Class work and Record  
20% - Regularity in the class

University Examination Pattern:
Examination duration: 3 hours  
Maximum Total Marks: 100

Questions based on the list of experiments prescribed
80% - Circuit and design (30%); Performance (30%); Results and inference (20%)
20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:
After successful completion of this course, students will be able to select a suitable instrument, with minimum error, for measurement purpose and to choose a proper transducer for instrumentation systems.