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<th>Course No</th>
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<th>Weekly load, hours</th>
<th>CA Marks</th>
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**13.606 Elective II**

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<th>Course No</th>
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<td>13.606.2</td>
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<td>13.606.3</td>
<td>Switched Mode Power Converters (E)</td>
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<td>13.606.4</td>
<td>Finite Element Methods (E)</td>
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<td>13.606.5</td>
<td>Soft Computing (E)</td>
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<td>13.606.6</td>
<td>Software Engineering (E)</td>
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13.601 ADVANCED CONTROL THEORY

Teaching Scheme: 2(L) - 2(T) - 0(P)  
Credits: 4

Course Objective:

- To provide a strong foundation on the advanced control system analysis and design techniques and to expose the students to analysis of the discrete time systems.
- To provide a foundation to the various analysis techniques applied to the nonlinear system, which is necessary during implementation of controllers designed through linear approximation.

Module – I

Module – II

Module – III
Nonlinear systems : Introduction - characteristics of nonlinear systems. Types of non-linearities. Analysis through Linearisation about an operating point. Analysis through harmonic linearisation - Determination of describing function of static nonlinearities (memoryless static nonlinearities only) - application of describing function for stability analysis of autonomous system with single nonlinearity.

Module – IV
Definition of stability- asymptotic stability and instability - Liapunov methods to stability of linear and nonlinear, continuous and discrete time systems.
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:**

*Maximum Total Marks: 100*

- Examination duration: 3 hours

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.

**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:

- Solve linear time invariant systems using state transition matrix.
- Design modern controller to various systems in time domain.
- Analyse stability of digital/sample data systems.
- Solve difference equations using Z-transform method
- Implement the controllers in discrete domain using digital computers
- Analyse the system including the complex nonlinearities at the final stage of implementation of linear controllers.
13.602 INDUCTION MACHINES AND SPECIAL ELECTRICAL MACHINES (E)

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

Course Objectives:

To expose the students to the concepts of induction machines including the constructional details, principle of operation and Performance analysis. It also give the basic concept of principle of operation of special machines.

Module – I


Module – II

Boucherot’s double cage motor - equivalent circuit - approximate current locus - torque-slip curves.

Starting of induction motors - DOL starter - auto transformer starting - star-delta starting - rotor resistance starting. Inter lock and over load protection - comparison of different starting methods. Starting current and starting torque.

Speed control - stator voltage control – V/f control, Cascaded Control - rotor resistance control.


Module – III


Module – IV
Stepper motors-Basic principle - construction –types- comparison – applications.

Reluctance motors- Principle of operation- torque equation -torque slip characteristics applications. Switched reluctance motors.

Brushless DC motor- construction - types -comparison– applications.


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:

- Identify suitable drive depending on speed and torque requirement
- Compute efficiency of induction machines
- Justify and select appropriate starters for induction motors
- Implement various speed control technique as demanded by the industry
- Distinguish and conclude on selection of various motors used in household appliances
- Select the proper induction motor or a special electrical machine for a given application, based on a performance analysis.
13.603 MICROPROCESSORS & APPLICATIONS (E)

Teaching Scheme: 2(L) - 2(T) - 0(P)  
Credits: 4

Course Objectives:
The objective of this course is to provide a strong foundation about the principles, programming and various applications of different microprocessors and commonly used interfacing IC 8255.

Module – I

Module – II
IO and memory interfacing - Interfacing memory – Address decoding – Methods of data transfer – synchronous and asynchronous data transfer, Programmed data transfer – interrupt driven data transfer – interrupt structure of 8085.

Module – III

Module – IV
I/O ports--Programmable peripheral interface PPI 8255- Modes of operation. Interfacing of LEDs, ADC and DAC with 8085 –Interfacing of matrix keyboard and printer with 8086.
Review of 32 bit processors –80386,80486 and 80586 and its built in features. (block diagram or programming not required).

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 students will be able to

- Develop standard assembly language programs using 8085 instruction set.
- Develop simple assembly language programs using 8086
- To interface systems with microprocessors using 8255PPI
- To solve engineering problems using microprocessors.
13.604 NUMERICAL TECHNIQUES & COMPUTER PROGRAMMING (E)

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

Course Objective:

This course will enable the students to acquire the programming skills by learning the fundamental concepts of C programming language and develop programs to solve engineering problems using numerical methods.

Module – I

Introduction, basic data types in C, input/output, operators – expression – unary, binary and ternary operators.
Decision making – if and switch case. Loops – for, while and do while, Break - continue. Structured data types– array, structure and union.

Module – II

Functions - storage classes – recursive functions. Pointers – array Vs pointer – array of pointers, pointer to a structure – implementation of stack and queue using pointers - pointer to a function.
Dynamic allocation of memory, command line arguments. File handling in C – unformatted and formatted files.

Module – III


Module – IV

Programming examples in C for the solution of numerical integration – Trapezoidal and Simpson's 1/3 rule, numerical solution of ordinary and partial differential equations- Euler's method – Rungakutta method.

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.

**Course Outcome:**

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

- Develop application based program in any computer language.
- Apply numerical methods for solving engineering problems using C programming.
- Design programs using different data structures
- Develop C programs using files
13. 605 POWER SYSTEM ANALYSIS AND STABILITY (E)

Teaching Scheme: 2(L) - 2(T) - 0(P)  
Credits: 4

Course Objectives:

This course will enable the students to analyse power systems under normal and abnormal conditions.

Module – I


Modelling of power system components - single line diagram – per unit quantities. Symmetrical components - sequence impedances and sequence networks of generators, transformers and transmission lines.

Introduction to need for power system protection - Methods of analyzing faults in symmetrical and unsymmetrical case - effects of faults - Power system faults - symmetrical faults - short circuit MVA - current limiting reactors - Unsymmetrical faults - single line to ground, line to line, double line to ground faults - consideration of prefault current - problems.

Module – II

Load flow studies - Introduction - types - network model formulation - formation of bus impedance and admittance matrix, Gauss-Siedel, Newton-Raphson (Qualitative analysis only) and Fast Decoupled methods - principle of DC load flow.

Module – III

Economic Operation - Distribution of load between units within a plant - transmission loss as a function of plant generation - distribution of load between plants - Method of computing penalty factors and loss coefficients.

Unit commitment: Introduction — Constraints on unit commitments: Spinning reserve, Thermal unit constraints - Hydro constraints.

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, 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:

- Compute the fault MVA and fault current for different faults on simple power systems
- Conduct load flow analysis manually by Gauss Siedel method
- Solve Economic Dispatch problem for simple systems
- Formulate and solve Unit Commitment problem
- Develop and solve Automatic Generation Control
- Identify different stability issues
Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objective:

- **To provide a strong foundation about the instrumentation systems, selection of the appropriate sensors necessary for the measurement of human variables and to expose the students, to the measurement of bioelectric potentials related to cardiovascular, respiratory nervous and muscular systems.**

- **To provide foundation to the various imaging technologies which help the clinical doctors in the diagnosis, instruments which assists therapy of diseases and patient safety.**

**Module – I**

**Human Physiology systems and transducers:** Problems encountered in measuring living systems. Cardio-vascular, respiratory, nervous and muscular systems of the body. Bioelectric potential - Resting and action potential - Generation, and propagation. Bioelectric potentials associated with physiology systems (ECG, EEG and EMG).

Basic types of electrodes for bio-potential measurement (micro, skin surface and needle electrodes). Transducers for the measurement of Pressure, flow, temperature and respiration rate-(piezo-electric, resistive, capacitive and inductive types).

**Module – II**

**The cardiovascular and Respiratory system measurements:** Heart and cardiovascular system and circulation block diagram, blood pressure and its measurement - Direct and indirect methods. characteristics of blood flow and heart sounds. Measurement of Blood flow. Measurement of Heart rate.

Electrocardiography: ECG lead configurations, Block diagram, ECG recording and ECG waveform.

Respiratory system measurements- Lung volumes and capacities. Spirometer, Measurement of Respiration rate using thermistor, Co₂ method, Using displacement transducer and Impedance pneumography.

**Module – III**

**Nervous system and its measurements:** The anatomy of nervous system, Neuronal communication. Measurements from the nervous system.
Electroencephalography- Lead system, Position of Electrodes, EEG Block diagram, EEG waveforms and features. Brain-Computer interfacing.

Electromyography- block diagram of EMG recorders, EMG waveforms and features. Applications

Elements of intensive care units- Bed side monitors- Block diagram.

**Module – IV**

**Modern imaging systems:** Basic x-ray machines, CAT scanner- Principle of operation, scanning components, Ultrasonic imaging principle, types of Ultrasound imaging, MRI and PET scanning.(Principle only)

**Therapeutic equipments** Cardiac pace makers, de-fibrillators, hemo-dialysis machines, artificial kidney, short wave and Micro wave diathermy machines.

**Patient Safety:** Shock hazards – leakage current – safety and test instruments.

**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:

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

1. Apply science and engineering concepts to solve problems at the various stages of measurement of human variables.

2. Design an instrumentation system, selecting the appropriate sensors to meet desired needs in biomedical instrumentation considering patient safety measures.

3. Plan and conduct experiments as well as analyze and interpret experimental data collected on physical systems and living systems.

4. Illustrate the imaging technologies to help the clinical doctors in the diagnosis and therapy of diseases.

5. Be independent learners who can master new knowledge and technologies and successfully engage in further education and research combining engineering and biomedical sciences.
13.606.2 OPTICAL INSTRUMENTATION (E) (Elective II)

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

Course Objective:

This course introduces fundamental principles of light sourcing and different types of LASERS and applications. It also provides exposure to various optical components and opto-electronic devices and provides a foundation of basic principles, design methodology, and practical considerations needed to design or use optical instruments in engineering practice.

Module – I


Module – II

Opto –Electronic devices and Optical Components: Photo diode, PIN, Photo-Conductors, Solar cells, Phototransistors, Materials used to fabricate LEDs, Response times of LEDs, LED drive circuitry.

Optical Fiber Sensors Active and passive optical fiber sensor, Intensity modulated, displacement type sensors, Multimode active optical fiber sensor (Microbend sensor) Single Mode fiber sensor-Phase Modulates and polarization sensors.

Module – III

Laser Interferometry: Radio-metry, types of interference phenomenon and its Application, Michelson’s Interferometer and its application Fabry-perot interferometer, Refractometer, Rayleigh’s interferometers, Spectrographs and Monochromators, Spectrophotometers, Calorimeters, Speckle pattern instruments: Speckle properties, speckle in single point interferometers and electronic speckle pattern Interferometry.

Module – IV

Holography: The basic principles of Holography, viewing a hologram, volume hologram, multiplex hologram, white light reflection hologram. Measurement of strain, stress, bending moments and vibration by Holography, nondestructive testing, medical and dental research, solid mechanics.
Laser vibrometry: short distance, medium distance and long distance vibrometry.


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:

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

- Get broad theoretical exposure to fundamental concepts of Lasers, different types of Lasers and important optical phenomena.
• Analyze simple optical systems consisting of Opto –Electronic devices and Optical Components and fibre optic sensors.

• Get thorough understanding of Laser Interferometry, different types of interferometers, holography, laser vibrometry and Laser Doppler velocimetry.
13.606.3 SWITCHED MODE POWER CONVERTERS (E) (Elective II)

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

Course Objective:

To expose the student to the various power converters like switched mode DC-DC converters, DC-AC converters and Resonant converters.

Module – I

Linear Power supplies- Introduction to Switched Mode DC-to-DC Converter –
Step-down converters - Continuous Conduction mode – Boundary between continuous and discontinuous conduction – Output voltage ripple
Step-up converters - Continuous Conduction mode – Boundary between continuous and discontinuous conduction – Discontinuous conduction mode
Buck Boost converters - Continuous Conduction mode – Boundary between continuous and discontinuous conduction – Output voltage ripple.

Module – II

Switched Mode DC-to-AC Converter: Introduction to Switched Mode DC-to-AC Converter –

Module – III


Module – IV

References:-


Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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:

Design and analyse various power converters like switched mode DC-DC converters, DC-AC converters and Resonant converters circuits and choose appropriate converter circuit for a specified application.
13.606.4  FINITE ELEMENT METHODS (E) (Elective II)

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

Course Objective:

- To expose the students to the fundamentals Finite Element Analysis.
- To have a thorough understanding of the FEM analysis so that the students can utilize the knowledge for the modeling and analysis of Electrical Engineering systems using some commercial Finite Element Analysis softwares.

Module – I


Module – II


One dimensional FE analysis - discretisation of domain into elements - generalised coordinates approach - derivation of elements equations - assembly of element equations- Boundary conditions.

Module – III


Module – IV

Elements of CAD systems- Preprocessing, modeling, meshing – Material properties – Boundary conditions – setting up solutions – case study (Case study of a Finite Element Analysis of a machine using a standard software).

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:**

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

Solve engineering problems using FEM analysis and also to utilize the knowledge for the modeling and analysis of electrical engineering systems using standard Finite Element Analysis softwares.
13.606.5 SOFT COMPUTING TECHNIQUES (E) (Elective II)

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

Course Objective:

This course is intended to provide the students knowledge of various conventional nonlinear optimization methods, soft computing methods and artificial intelligent techniques and to apply these methods for design, analysis, operation and control of complex electrical systems.

Module – I


Module – II


Module – III

Introduction to classical sets -properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Fuzzy logic control.

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, 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:

- Explain formulation of non-linear optimization problem.
- Choose appropriate optimization techniques for various management/engineering problems.
- Correlate engineering optimization problems with concepts like GA and simulated annealing.
- Explain the ANN structure and its applications in various fields.
- Illustrate fuzzy logic and fuzzy control.
- Design fuzzy controller for real life applications.
• 13.606.6 SOFTWARE ENGINEERING (E) (Elective II)

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

Course Objective:

To assist the student in understanding the basic theory of software engineering, and to apply these basic theoretical principles to a group software development project.

Module – I

Introduction: Introduction to software engineering Software Crisis, Software Processes.

Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM

Software Metrics: Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, and Information Flow Metrics.


Module – II


Module – III

Software Testing: Software process, Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Structural testing: Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards.


Module – IV

Interface Design and CASE: GUI design - advantages - types of user interfaces. Styles of human-computer interaction - Human-Computer interface design - interface design models.
Computer Aided Software Engineering (CASE) tools - Tool integration - object management - Analysis and design tools - programming tools - Integration and testing tools - Maintenance tools.

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:

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

- Define and understand the requirements, analyze, design and develop various software solutions
- To plan, schedule and execute software projects.
- To verify and validate various software products
- To model and implement software solutions
MICROPROCESSOR LAB (E)

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

Course Objective:

This course will enable the students to get practical knowledge to develop and execute programs for microprocessor based applications in electrical and electronics engineering.

List of Experiments:

1. Study of 8085 Microprocessor kit and Instruction set.
2. Data transfer instructions using different addressing modes and block transfer.
3. Arithmetic operations in binary and BCD-addition, subtraction, multiplication and division.
4. Logical instructions- sorting of arrays in ascending and descending order.
5. Binary to BCD conversion and vice versa.
7. Interfacing D/A converter- generation of simple waveforms-triangular wave, ramp etc
8. Interfacing A/D converter
10. Stepper motor control (8085).

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% - Initial work (Algorithm and program)- (30%);
    Implementation/ Execution of program - (30%)
    Results and inference- (20%)
20% - Viva voce
Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

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

1. Develop and execute programs to perform data transfer, arithmetic & logical operations, and code conversions using 8085 microprocessors and basic arithmetic operations using 8086.

2. Generate square wave using 8085 microprocessor and to interface using PPI 8255.

3. Make use of 8085 microprocessor for speed and position control of dc motor and stepper motor
13.608 SOFTWARE LAB (E)

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

Course Objective:
This course will enable the students to get practical knowledge in the development and implementation of C programs for solving engineering problems using numerical methods.

List of Experiments:
1. Simple programs using input output statements
2. Simple programs using decision statements
3. Programs using Control statements
4. Array manipulation
5. Functions Pass by value Pass by reference
6. Recursive functions
7. String manipulation – compare, copy, reverse operations
8. Matrix operations: addition multiplication, determinant and inverse
9. Reading from a file and writing to a file merging and appending of files.
10. Solution of algebraic and transcendental equations: Bisections, Newton-Raphson method- comparison
12. Solution of set of linear equations-Gauss, Gauss-Jordan, Gauss-Siedel- comparison
13. Solution of differential equation – Euler, Runge-Kutta, step size- comparison

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% - Initial work (Algorithm and program)- (30%);  
Implementation/ Execution of program - (30%)
Results and inference- (20%)
20% - Viva voce
Candidate shall submit the certified fair record for endorsement by the external examiner.

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

- Carry out numerical integration and solve linear equations, differential equations and transcendental equations using numerical methods through C programs
- Solve complex electrical engineering problems using C programs.
Course Objective:
This course will enable the students to develop mathematical models for electrical systems and implement controllers and compensators for systems based on system performance.

List of Experiments:
1. Predetermination and verification of frequency response characteristics of Lag and Lead networks.
2. Transfer Function of AC and DC servomotors
3. Step and frequency response of R-L-C circuit
5. Study of P, PI and PID controllers. Response analysis of a typical system with different controllers using process control simulator.
6. Study of performance characteristics and response analysis of a typical temperature/Flow/Level control system.
7. MATLAB: Use of control system Tool box for the Time domain and frequency domain methods of system analysis and design
8. SIMULINK: Simulation and control of real time systems using SIMULINK
9. Compensator design using Bode plot with MATLAB control system Tool box
10. Programmable Logic controller(PLC): To control a simple process using PLC

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:

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

- Develop mathematical models for servomotors and other electrical systems
- Performance analysis of different process control systems
- Performance analysis of different types of controllers
- Use MATLAB and SIMULINK to design and analyze simple systems and compensators.