3TH SEMESTER

COURSE NAME: Engineering Mathematics – III

COURSE CODE: EC-14301

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 70%-80%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Define the concept of vector in such a way that package contain information about magnitude & direction.

CO2 Convert one type of problem into another which is easier to solve.

CO3 Solve the initial value problems.

CO4 Solve the application to electric circuit, mechanical & heat problems.

Contents

UNIT 1: Fourier Series

Periodic Functions, Euler's formula, Even and Odd function with illustrated examples.

UNIT 2: Laplace Transform

Laplace transform of various standard functions, Properties, Inverse Laplace transform, transform of derivative and integrals, Application to solution of ordinary linear differential equations with constant coefficients, Simultaneous Differential equations.

UNIT 3: Partial Differential Equations and Numerical Methods

Formation of Partial differential equations, First order linear and non linear partial differential equations, classification of linear second order partial differential equations, Important partial differential equations, Wave, Laplace, Diffusion and their solution, Green Function and application ,Numerical solution of Ordinary and Partial differential equations.

UNIT 4: Linear Algebra, Complex Variable and Transformation Techniques

Vector spaces, Subspaces, basis, Dimension, Linear transformation. Analytic function, Line integral, Cauchy integral theorem and formula, Taylor and Laurent Series (without Proof), Residue theorem and Application, Bilinear transformation, Fourier series, Periodic function, Euler's formulae half range expansion. Fourier Transforms (Sine, Cosine).

UNIT 5: Special Functions

Frobenius Method, Legendre and Bessel functions, Bessel functions of first and second kind, Recurrence relations.

Recommended Books and References:

1. C. W. Curits, "Linear Algebra: An Introductory Approach", Springer.
2. A. D. Belegunder, T. R. Chandrupatla, "Optimization Concepts and Application in Engineering", Pearson Education Asia.
3. Ian Sneddon, "Elements of Partial Differential Equations", McGraw-Hill.
4. Rule V. Churchle, James Ward Brown, "Complex Variable and its Applications", Mc Graw Hills.

COURSE NAME: Object Oriented Programming Using C++ and Data Structures

COURSE CODE: EC-14302

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 50%-60%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Explain the importance of OOP using C++, distinguish basic data types, custom input/output operators and illustrate class definition using member functions.

CO2 To familiarize and prepare students to use various concepts like Inheritance, Polymorphism and Memory Management techniques.

CO3 Apply concept of overloading, type conversion and virtual functions.

CO4 Demonstrate templates, use and handle exceptions.

CO5 Explain fundamentals of data structures.

Contents

UNIT 1: Principles of Objected Oriented Programming

Basic concepts of object oriented programming-data types, variables, strings, functions, arrays, structures, standard input/output, classes and objects.

UNIT 2: Pointers and Dynamic Memory Management

Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

UNIT 3: Inheritance and Polymorphism

Types of inheritance, base classes and derived classes, public, private and protected inheritance, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors, virtual functions and polymorphism, dynamic binding, pure virtual functions, abstract base classes.

UNIT 4: Constructors and Destructors

Need for constructors and destructors, copy constructor, constructors and destructors in derived classes, constructors and destructors with static members, virtual destructors, initializer lists, operator overloading and type conversion.

UNIT 5: Exception Handling and Templates

Exception handling, templates and generic programming.

UNIT 6: Introduction to Data Structures

Introduction to data structures, introduction to algorithms complexity.

UNIT 7: Arrays, Stacks & Queues

Concepts; basic operations & their algorithms: transverse, insert, delete, sorting of data in these data structures, prefix, infix, postfix notations.

Recommended Books and References:

1. R. Lafore, "Object Oriented Programming in C++", Waite Group.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill.
3. Ashok N. Kamthane, "Object Oriented Programming with ANSI & Turbo C++", Pearson Education.
4. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.
5. Herbert Schildt, "The Complete Reference to C++ Language", McGraw Hill-Osborne.
6. R. S. Salaria, "Data Structures & Algorithms Using C++", Khanna Book Publishing Co. (P) Ltd.
7. Seymour Lipschutz, "Data Structures", Tata McGraw Hill.

COURSE NAME: Electronics Devices & Circuits - I

COURSE CODE: EC-14303

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 20%-30%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Comprehend the basic processes involved in semiconductors like carrier transport, generation, recombination etc.

CO2 Describe the operating principle of different electronic devices like P-N diodes, LED, LCD, photodiodes etc. along with their V-I characteristics and applications.

CO3 Discuss various configurations of BJTs and other transistors like UJT and phototransistors etc. along with the applications.

CO4 Explain transistor biasing circuits with the use of stabilization and compensation techniques.

CO5 Describe the operation and applications of FETs and MOSFETs.

CO6 Analyze small signal transistors using ‘h’ parameters.

Contents

UNIT 1: Introduction

Energy bands in silicon, intrinsic and extrinsic silicon, carrier transport in silicon: diffusion current, drift current, mobility, and resistivity, generation and recombination of carriers.

UNIT 2: Diode Circuits

Theory of PN junction diode, volt ampere characteristics, band structure of open circuited PN junction, small signal equivalent circuit of diode, temperature dependence of PN diode, rectifiers, filter circuits, special purpose diodes: zener diode as voltage regulator, tunnel diode, LED, LCD and photodiodes.

UNIT 3: Transistor Biasing and Stabilization

PNP & NPN transistor, construction and characteristics in CB, CE and CC modes, transistor as an amplifier, transistor series and shunt regulators, UJT, photo- transistors, operating point, bias stability, various biasing circuits, stabilization against Ico, V_{BE} and beta, bias compensation methods, thermal resistance.

UNIT 4: Field Effect Transistors

Construction and characteristics of junction field effect transistor (JFET), MOSFETs, MOS capacitor, FET parameters, Biasing of FETs, applications of FETs.

UNIT 5: Small Signal Low Frequency Transistor

Determination of h parameters from transistor characteristics, h parameter equivalent circuit of transistor, conversion of h parameter from CB to CE and CC configuration, analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, frequency response of amplifier, effect of an emitter bypass capacitor, coupling capacitor, emitter resistance and shunt capacitors on frequency response of amplifier, analysis of emitter follower using Miller's theorem.

Recommended Books and References:

1. J. Millman, C. C. Halkias, "Electronic Devices & Circuits", Tata McGraw Hill.
2. R. L. Boylestad, "Electronic Devices & Circuits Theory", Prentice Hall India.
3. A. Mottorshead, "Electronic Devices & Circuits", Prentice Hall India.
4. A. Malvino, D. J. Bates, "Electronics Principles", Tata McGraw Hill, 2007.
5. J. Millman, C. C. Halkias, "Integrated Electronics: Analog & Digital Circuits and Systems", Tata McGraw Hill.

COURSE NAME: Electronic Measurement & Instrumentation

COURSE CODE: EC-14304

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 20%-30%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Define generalized instrumentation system and characterize electronic measuring instruments.

CO2 Measure the parameters of signal using different electronic meters and measuring instruments

CO3 Use the bridges for calculations of resistance, inductance and capacitance.

CO4 Generate and analyze various waveforms using different electronic devices.

CO5 Explain the working of various recorders and display devices.

CO6 Describe the working and application of transducers, telemetry system and data acquisition system.

Contents

UNIT 1: Fundamentals: Generalized Instrumentation System

Units and standards, calibration methods, standards of measurements, classification of errors, error analysis, static characteristics- accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effects etc. dynamic characteristics.

UNIT 2: Electronic Meters and Electronic Analog Voltmeter

DC voltmeters-choppers type-DC amplifier, solid state voltmeter, differential voltmeter, peak responding voltmeter, true RMS voltmeter, calibration of DC voltmeters. digital voltmeter introduction, ramp techniques, dual slope, integrating type DVM, successive approximation type DVM, resolution and sensitivity of digital meters, general specification of a DVM. CRO's study

of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope.

UNIT 3: Measuring Instruments

Principle of operation of galvanometer, PMMC, potentiometer, moving iron instruments, resistance measurements using Wheatstone bridge, Kelvin double bridge, Ohm meter, AC bridges: Maxwell bridge, Maxwell wein bridge, Hey's bridge, Schering bridge, Anderson bridge, Campbell bridge.

UNIT 4: **Instrumentation for Generation and Analysis of Waveforms**

Signal generators: fixed and variable AF oscillators, AF sine and square wave generator, function generator: square and pulse generator, sweep generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis.

UNIT 5: Storage and Display Devices

Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorders, digital tape recorders, electronic indicating instruments, seven segment display, fourteen segmental display Nixie tube.

UNIT 6: Transducers and DATA Acquisition Systems

Strain gauge, LVDT, thermocouple, piezoelectric crystal and photoelectric transducers and their applications, data acquisition systems, introduction to telemetry system.

Recommended Books and References:

1. K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", Danpat Rai Publication.
2. D. Cooper, "Electronic Instrumentation and Measurement Techniques", Prentice Hall.
3. H. S. Kalsi, "Electronic Instrumentation", Tata McGraw Hill.
4. D. Buchla, Wayne Melachlan, "Applied Electronics Instrumentation and Measurement", Prentice Hall.
5. B. H Oliver, J. M. Cag, "Electronics Measurement and Instrumentation", McGraw Hill.
6. Carr, "Element of Electronic Instrumentation & Measurment", Pearson Education.
7. Kishore, "Electronic Measurments & Instrumentation", Pearson Education.
8. Terry L. Bartelt, "Process Control Systems and Instrumentation", Cengage Learning.

COURSE NAME: Network Analysis and Synthesis

COURSE CODE: EC-14305

	L	T	P
Internal Marks: 40			
External Marks: 60	**3**	**1**	**-**

Numerical & Design Problems Content: 45%-55%

Note: The Question paper shall have three sections:

Section A shall consist of one question with 10 sub-questions of two (02) marks each. **Section B** shall consist of five questions of five (05) marks each, out of which four questions are required to be attempted by the candidate. **Section C** shall consist of three questions of ten (10) marks each, out of which two questions are required to be attempted by the candidate. Any question of **Section C** may be sub–divided (if required) into two parts of five (05) marks each.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Describe different types of signals used in electrical systems.

CO2 Analyze circuits using various network theorems

CO3 Calculate the transient and steady state response of networks using Laplace transforms

CO4 State realizability conditions for synthesizing two terminal networks.

CO5 Synthesize RL and RC circuits for Foster and Cauer forms.

CO6 Design ladder networks and filters of different types like constant-K and m-derived.

CO7 Analyze basic cut set and tie set matrices for planar networks.

Contents

UNIT 1: Circuit Concepts

Independent and dependent sources, signals and wave forms, periodic and singularity voltages, step, ramp, impulse, doublet, loop currents and loop equations, node voltage and node equations, network theorems, superposition, Thevenin's, Norton's, maximum power transfer, and reciprocity.

UNIT 2: Time and Frequency Domain Analysis

Representation of basic circuits in terms of generalized frequency and their response, Laplace transform of shifted functions, transient and steady response, time domain behaviors from poles and zeros, convolution theorem.

UNIT 3: Network Synthesis

Network functions, impedance and admittance function, transfer functions, relationship between transfer and impulse response, poles and zeros and restrictions, network function for two terminal pair network, sinusoidal network in terms of poles and zeros, real liability condition for impedance synthesis of RL and RC circuits, network synthesis techniques for 2-terminal network, Foster and Cauer forms.

UNIT 4: Filters

Classification of filters, characteristics impedance and propagation constant of pure reactive network, ladder network, T-section, π-section, terminating half section, pass bands and stop bands, design of constant-K, m-derived filters, composite filters.

UNIT 5: Network Topology

Definitions, graph, tree, twigs, basic cut-set and basic tie set matrices for planar network.

Recommended Books and References:

1. J. Bird, "Electrical Circuit Theory and Technology", Newnes.
2. A. Chakraborty, "Circuit Theory", Dhanpat Rai.
3. D. Roy Chaudhury, "Networks and Synthesis", New Age International.
4. M. Nahvi, J. A. Edminister, "Electric Circuits (Schaum's outline series)", Tata McGraw Hill.
5. T. S. K. V. Iyer, "Circuit Theory", Tata McGraw Hill.
6. A. Sudhakar, Shyammohan S. Pali, "Circuits and Networks: Analysis and Synthesis", Tata Mc Graw Hill.
7. M. E. Van Valkenberg, "Network Analysis and Synthesis", PHI Learning.

COURSE NAME: Lab Electronics Devices & Circuits - I

COURSE CODE: EC-14306

	L	T	P
Internal Marks: 30			
External Marks: 20	**-**	**-**	**2**

NOTE: Do all Experiments. Evaluation of the lab work shall be done as per the approved Rubric.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Perform the applications of diodes in rectifiers.

CO2 Observe the filtering operation using different types of filters like T and π filters.

CO3 Use the working principle of zener diode and photodiode in some applications.

CO4 Draw the characteristics of BJT and JFET in different configurations and analyze it.

CO5 Measure the transistor 'h' parameters from output characteristics.

CO6 Design different biasing circuits like fixed bias and potential divider biasing circuits.

Contents

1. To perform the operation of half wave rectifier.
2. To perform full wave & bridge rectifiers and calculate efficiency and ripple factor.
3. To study simple capacitive, T & π filters.
4. To observe the application of Zener diode as voltage regulator.
5. To implement any one application of photodiode.
6. To plot the input and output characteristics of CE configuration.
7. To plot the input and output characteristics of CB configuration.
8. To determine h- parameters of a transistor using output characteristics.
9. To design fixed bias circuit.
10. To design potential divider transistor biasing circuit.
11. To observe the operation of an emitter follower circuit.
12. To plot JFET characteristics in CS configuration.

COURSE NAME: Lab Electronic Measurement & Instrumentation

COURSE CODE: EC-14307

	L	T	P
Internal Marks: 30			
External Marks: 20	**-**	**-**	**2**

NOTE: Do all Experiments. Evaluation of the lab work shall be done as per the approved Rubric.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Measure inductance, resistance, capacitance and various parameters of signal using bridges and electronic meter.

CO2 Calculate the value of Q of a coil using LCR-Q meter

CO3 Determine the frequency & phase angle of signals using C.R.O

CO4 Examine the characteristics and operate various transducers and potentiometer

Contents

1. To be familiar with the working of digital multimeter
2. Measurement of inductance by Maxwell's bridge.
3. Measurement of small resistance by Kelvin's bridge.
4. Measurement of capacitance by Schering Bridge.
5. Measurement of frequency by Wein Bridge.
6. Measurement of medium resistance by Wheat Stone's bridge.
7. Determination of frequency & phase angle using C.R.O.
8. To find the Q of a coil using LCR-Q meter.
9. Study of resonance
10. To determine output characteristic of a LVDT and determine its sensitivity.
11. Study characteristics of temperature transducer like thermocouple, thermistor and RTD with implementation of small project using signal conditioning circuit.
12. To study input- output characteristics of a potentiometer and to use two potentiometers as an error detector.

COURSE NAME: Lab Object Oriented Programming and Data Structures

COURSE CODE: EC-14308

Internal Marks: 30 **L T P**

External Marks: 20 **- - 2**

NOTE: Do all Experiments. Evaluation of the lab work shall be done as per the approved Rubric.

Course Outcomes

On successful completion of this course, the students should be able to:

CO1 Apply the basic concepts of object oriented programming, concepts of classes, constructors and destructors.

CO2 Write programs of initializer list, operator overloading and memory management.

CO3 Use the concept of typecasting and inheritance in programming.

CO4 Apply the concept of polymorphism and exception handling.

CO5 Be exposed to the different data structures.

Contents

Write following programs in C++:

1. Using basic statements like control statements, looping statements, various I/O statements and various data structures.
2. To create classes in C++ for understanding of basic OOPS features.
3. To demonstrate the use of static and const data members.
4. To demonstrate the use of various types of constructors and destructors.
5. To create programs in C++ for understanding initializer list.
6. To demonstrate unary and binary operator overloading.
7. To demonstrate the use of memory management operators.
8. To create programs in C++ to understand various forms of inheritance.
9. To demonstrate the use of virtual keyword.
10. To create programs in C++ to understand exception handling and templates.
11. To implement following operations (using separate functions) on a linear array:
    - Insert a new element at end as well as at a given position
    - Delete an element from a given whose value is given or whose position is given
    - To find the location of a given element
    - To display the elements of the linear array
12. To demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.

13. To demonstrate the use of stack (implemented using linear linked array) in evaluating arithmetic expression in postfix notation.
14. To demonstration the implementation of various operations on a linear queue represented using a linear array.
15. To demonstration the implementation of various operations on a circular queue represented using a linear array.