NARAYANA ENGINEERING COLLEGE::GUDUR
AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Structure for B. tech ECE w. e. f   AY: 2021-22

SEMESTER I

Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
		L	T	P	Total		Int. Marks	Ext. Marks	Total marks
BS	Algebra and Calculus	3	1	0	4	4	40	60	100
BS	Applied Physics	3	0	0	3	3	40	60	100
ES	Problem Solving and Programming	3	0	0	3	3	40	60	100
ES	Basic Electrical Engineering	3	0	0	3	3	40	60	100
BS	Applied Physics Lab	0	0	3	3	1.5	40	60	100
HS	Oral Communication Skills Lab	0	0	2	2	1	40	60	100
ES	Basic Electrical Engineering Lab	0	0	2	2	1	40	60	100
ES	Engineering and IT Workshop	0	0	3	3	1.5	40	60	100
ES	Problem Solving and Programming Lab	0	0	3	3	1.5	40	60	100
MC	Mandatory course I	Induction Program							
	Counselling/Mentoring	0	0	1	1	0	--	--	--
	Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
	Activity Point Programme	During the Semester					20 Points		
	Total	12	1	16	29	19.5	360	540	900

NARAYANA ENGINEERING COLLEGE:GUDUR
21MA1001   **ALGEBRA AND CALCULUS**   **R-21**

Semester	Hours / Week			Totalhrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
I	**3**	**1**	**0**	**64**	**4**	**40**	**60**	**100**

Pre-requisite: Intermediate Mathematics

Course Objectives:
1. To familiarize the students with the theory of matrices and quadratic forms.
2. To analyze second order ordinary differential equations.
3. To explain the series expansions using mean value theorems and the concepts of multivariable calculus.
4. To summarize the procedure to solve the partial differential equations.
5. To explain the student with mathematical tools needed in evaluating multiple integrals and its applications.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Make use the concepts of Matrices **to solve various Engineering problems.**   **(BL-3)**

CO 2 Identify different types of higher order differential equations and their applications **in solving engineering problems.**   **(BL-3)**

CO 3 Apply Mean value theorems, Multi variable calculus **to solve engineering problems.**   **(BL-3)**

CO 4 Apply a range of techniques **for solutions of first order Linear and non-Linear Partial Differential Equations (PDE).**
     (BL-3)

CO 5 Apply the techniques of multiple integrals **for the area and volume of the region bounded by curves**.
(BL-3)

CO-PO Mapping															
	PO													PSO	
CO	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	
CO1	3	3													
CO2	3	3													
CO3	3	3													
CO4	3	3													
CO5	3	3													
1- Low, 2-Medium, 3- High															

<center>**COURSE CONTENT**</center>

MODULE – 1   **Matrices**   **Hours: 16h(12L+4T)**

Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non-homogeneous linear equations. Eigen values and Eigenvectors and their properties (without proof), Cayley-Hamilton theorem (without proof), finding inverse and powers of a matrix byCayley-Hamilton theorem, Diagonalization.

<center>At the end of the Module 1, student will be able to:</center>

1. Solving system of linear equations.   (BL-3)
2. Determine the rank, eigen values and eigenvectors.   (BL-3)
3. Find the inverse and powers of a square matrix by Cayley-Hamilton Theorem.   (BL-1)

MODULE -2   **Higher Order Ordinary Differential Equations with Constant Coefficients**

<div align="right">**Hours:14h(11L+3T)**</div>

Definitions, homogenous and non-homogenous, Complimentary function, general solution,particular integral, method of variation of parameters. applications to L-C-R Circuits

<center>At the end of the Module 2, students will be able to:</center>

1. Identify the essential characteristics of linear differential equations with constant coefficients. (BL-3)
2. Solve the linear differential equations with constant coefficients by appropriate method.   (BL-3)
3. Classify and interpret the solutions of linear differential equations.   (BL-2)
4. Solve the higher order differential equation by analyzing physical situations.   (BL-3)

MODULE-3   **Mean Value Theorems and Multivariable Calculus**   **Hours: 12h (9L+3T)**

Taylor's and Maclaurin's theorems with remainders (without proof), related problems, Partial differentiation, Chain rule, Total derivative, Jacobians, maxima and minima of functions of two variables, method of Lagrange's multipliers.

<center>At the end of the Module 3, students will be able to:</center>

1. Translate the given function as series of Taylor's and Maclaurin's with remainders.   (BL-2)
2. Find the maximum and minimum values of the function for two variables.   (BL-1)
3. Apply Jacobian concept to deal with problems in change of variables.   (BL-3)

MODULE-4   **Partial Differential Equations**   **Hours: 10h (7L+3T)**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, Solutions of first order linear partial differential equations using Lagrange's method, Solutions of first order non-linear partial differential equations- Standard forms-I, II, III and IV, Method of separation of variables.

<center>At the end of the Module 4, students will be able to:</center>

1. Identify the basic properties of partial differential equations.   (BL-3)
2. Outline partial differential equations.   (BL-2)
3. Solve the applications of PDE by using the method of separation of variables.   (BL-3)
4. Apply the PDE techniques in various engineering fields.   (BL-3)

MODULE-5   **Multiple Integrals**   **Hours: 12h(9L+3T)**

Double integrals, change of order of integration, change of variables. Evaluation of Triple integrals, change of variables between Cartesian, Cylindrical and Spherical polar coordinates. Finding areas and volumes using double and triple integrals.

<center>At the end of the Module 5, students will be able to:</center>

1. Find the area bounded by a region using double integration.   (BL-1)
2. Solve triple integrals.   (BL-3)
3. Make Use of multiple integral techniques in engineering problems.   (BL-3)

NARAYANA ENGINEERING COLLEGE:GUDUR

21PH1001   **APPLIED PHYSICS**   **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
I	**3**	**0**	**0**	**60**	**3**	**40**	**60**	**100**

Pre-requisite: Mathematics Knowledge, Basics concepts of Physics

Course Objectives:

1. To understand optical phenomenon i.e. interference and diffraction related to their engineering applications.
2. To explain the concepts and difference between classical free electron theory and quantum theory.
3. To impart knowledge in basic concepts of free electron theory of metals and semiconductors.
4. To illustrate the concepts of superconductor and nanomaterials in functioning of electronic devices.
5. To familiarize the types of laser/optical fibres and their applications in communication engineering devices

Course Outcomes: After successful completion of the course, the student will be able to: BL

CO 1	Explain the conecpts of interference, diffraction using Huygen's wave theory	2
CO 2	Comprehend the conecpts of matter waves, wave functions and their interpretation for understanding the matter at atomic scale	1
CO 3	Summarize the importance of free electron theories in determining the properties of metals and semiconductors	1
CO 4	Understand the concepts of superconductor and nanomaterials to familarize their applications in relevant fields	2
CO 5	Realize the importance of the lasers and optical fibres in engineering and medical applications	2

Total hours: 64h (48L+16T)

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Book(s):

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, 2019 Narosa Publishing house
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education,2017
3. H. K. Das, Er. RajnishVerma, Higher Engineering Mathematics, S. Chand,2014
4. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press,9th edition 2020.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2												
CO2	3	2												
CO3	3	2											1	
CO4	3					1							1	
CO5	3	1				1							1	
1: Low, 2-Medium, 3- High														

MODULE – 1   **WAVE OPTICS**   **10 HOURS**

Interference-Principle of Superposition, Interference of light, Conditions for sustained Interference, derivation of conditions for constructive and destructive interference of reflected light from a thin film, Newton's Rings-experimental arrangement, Determination of Wavelength; engineering applications of Interference

Diffraction-distinction between interference and diffraction, differences between Fresnel & Fraunhoffer diffractions, Fraunhoffer Diffraction at single slit(derivation, energy distribution curve) , Fraunhoffer Diffraction at a Double slit (derivation, energy distribution curve),Theory of Diffraction Grating, Engineering applications of diffraction
At the end of the Module 1, students will be able to:
1. **Explain** the need of coherent sources and the conditions for sustained interference (L2)
2. **Identify** engineering applications of interference including homodyne and heterodyne detection (L3)
3. **Analyze** the differences between interference and diffraction with applications (L4)

MODULE -2   **INTRODUCTION TO QUANTUM MECHANICS**   **9 HOURS**

Matter waves –de-Broglie hypothesis- properties, G.P.Thomson experiment, Phase and group velocities—Expression for group velocity; Heisenberg's uncertainty principle; Schrodinger's time dependent and independent wave equations – Physical significance of wave function-important characteristics of wave function, Eigen values and Eigen functions of a particle confined to one dimensional infinite square well (potential well).
At the end of the Module 2, students will be able to:
1. **Explain** Quantum Mechanics to understand wave particle dualism (L2)

2. **Necessity** of quantum mechanics to explore the behavior of sub atomic particles (L3)

3. **Evaluate** the Eigen values and Eigen functions of a particle (L2)

MODULE-3   FREE ELECTRON THEORY OF METALS & SEMICONDUCTORS
                                                                                    10 HOURS
Classical free electron theory-assumptions, expression for electrical conductivity, merits and demerits; Quantum free electron theory of metals-expression for electrical conductivity; Fermi-Dirac distribution, Mathiesson rule, causes of electrical resistance in metals, Bloch's theorem (Qualitative), Kronig - Penny Model (Qualitative), Classification of solids into conductors, semiconductors and insulators based on energy band gap.

Semiconductors- Introduction – Intrinsic and Extrinsic semiconductors– Density of charge carriers, Electrical conductivity, Fermi level of intrinsic semiconductors ; Hall effect – Hall coefficient – Applications of Hall effect.
At the end of the Module 3, students will be able to:
1. **Demonstrate** the success of quantum free electron theory over classical free electron theory (L2)
2. **Examine** the probability of occupancy of an electron in an energy state at different temperatures (L3)
3. **Outline** the properties of n-type and p-type semiconductors and charge carriers (L2)
4. **Identify** the type of semiconductor using Hall effect (L2)

MODULE-4   SUPERCONDUCTORS AND NANOMATERIALS

10 HOURS

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – Applications of superconductors.

Nanomaterials– Significance of nanoscale , Properties of nanomaterials: Physical, mechanical, Magnetic, Optical ; Synthesis of nanomaterials: Top-down-Ball Milling, Bottom-up –Chemical vapour deposition ;Applications of Nano materials.

At the end of the Module 4, students will be able to:

1. **Explain** how electrical resistivity of solids changes with temperature (L2)
2. **Classify** superconductors based on Meissner's effect (L2)
3. **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)
4. **Identify** the nano size dependent properties of nanomaterials (L2)
5. **Illustrate** the methods for the synthesis (L2)
6. **Apply** the basic properties of nanomaterials in various Engineering branches (L3).

MODULE-5   LASERS & OPTICAL FIBERS

9 HOURS

Lasers: Introduction, properties of lasers: monochromaticity, coherence, directionality, brightness; Spontaneous & stimulated emission of radiation, Einstein coefficients, Population inversion, Pumping methods, Types of lasers: Nd- YAG Laser, He–Ne Laser, Semiconductor laser; Applications.

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of optical fibers based on materials, modes and refractive index profile-Applications: fiber optic communication system and sensors.

At the end of the Module 5, students will be able to:

1. **Understand** the basic concepts of LASER light Sources (L2)
2. **Apply** the concepts to learn the types of lasers (L3)
3. **Identify** the Engineering applications of lasers (L2)
4. **Explain** the working principle of optical fibers (L2)
5. **Classify** optical fibers based on refractive index profile and mode of propagation (L2)

Total hours:48 hours

Text Book(s):

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012.
3. S.O.Pillai, "Solid State Physics", 8th edition, New Age International Publishers, 2018.

Reference Book(s):

1. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
2. N. Subrahmanyam, BrijLal, A Textbook of Optics, S. Chand, New Delhi, 2015
3. Kittel, C. Introduction to Solid State Physics‖. Wiley, 2005.
4. K. Thyagarajan, Engineering Physics, McGraw-Hill Education (India) Pvt. Ltd, 2016.
5. Ajoy Ghatak, Optics, 5th Edition, McGraw Hill, 2012
6. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
7. William T. Silfvast, "Laser Fundamentals" 2nd edition, Cambridge University Press, 2004.
8. T. Pradeep, "A Text Book of Nanoscience and Nanotechnology", Tata Mc Graw Hill, 2003

21ES1001   **PROBLEM SOLVING & PROGRAMMING**   **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
I	3	0	0	48	3	40	60	100

Pre-requisite: Mathematics Knowledge, Analytical and Logical skills

Course Objectives:

- To understand various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn the syntax and semantics of a C Programming language.
- To learn structured programming approach for problem solving.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Identify methods to solve a problem through computer programming. **(BL - 3)**
CO 2   Understand the use of operators and input/output. **(BL - 2)**
CO 3   Understand the difference and the usage of various control statements and Functions**(BL -2)**
CO 4   Apply the Arrays and Pointers for solving problems. **(BL - 3)**
CO 5   Explain User-Defined Data Types and Files. **(BL - 2)**

CO-PO Mapping														
	PO												**PSO**	
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3											1	
CO2	1	2	1										1	
CO3	1	2	1		2								2	2
CO4	2	2	3	2	1							2	3	2
CO5	3	3	2	2								1	2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   Fundamentals of Computers and Programming   10 HOURS

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming,Programming languages, Compiler, Interpreter, Algorithms, Flowcharts, How to Develop a Program.

 Basics of C: Introduction**,** Character Set, Structure of a C Program, A Simple C Program, Variables, Data Types and Sizes, Declaration, Identifiers, Keywords, Constants, Assignment, and Initialization.

At the end of the Module 1, students will be able to:

1. Solve problems using language independent notations. **(BL - 3)**
2. Understand the compilers and interpreters. **(BL - 2)**
3. Understand Basic Structured of Programming in C. **(BL - 2)**
4. Develop algorithms and flowcharts for problems.**(BL - 3)**
5. Understand various Tokens in C language.**(BL - 2)**

MODULE -2   Operators and Input and Output   9 HOURS
Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Conditional Operator, Comma operator, sizeof operator, Expressions, L values and R values, Expression Evaluation- Precedence and Associativity, Type Conversion.
Input and Output: Basic Screen and Keyboard I/O in C, Formatted Input and Output, Unformatted Input and Output Functions.

<div align="center">At the end of the Module 2, students will be able to:</div>

1. Illustrate the working of expressions.**(BL - 2)**
2. Understand the precedence and Associativity rules of operators. **(BL - 2)**
3. Understand the rules of type conversion. **(BL - 2)**
4. Explain the Formatted and Unformatted I/O functions. **(BL - 2)**

MODULE-3   Control Statements and Functions   10 HOURS
Control Statements: Selection Statements - if, Nested if, if-else, Nested if-else, else-if ladder, switch Looping Statements - while, do-while, for, Nested loops, Unconditional Statements - goto, break, Continue, return.
Functions: Introduction, Using Functions, Passing Arguments to a Function, Working with Function, Scope and Extent, Recursion, The C Preprocessor, Storage classes

<div align="center">At the end of the Module 3, students will be able to:</div>

1. Understand Selection Statements. **(BL - 2)**
2. Understand Looping and Unconditional Statements. **(BL - 2)**
3. Understand the basic concept of functions. **(BL - 2)**
4. Understand concepts of Recursion, Preprocessor and storage classes. **(BL - 2)**

MODULE-4   Arrays and Pointers   10 HOURS
Arrays and Strings: Introduction, One-Dimensional Array, Multidimensional Arrays, Passing Arrays to Function, Strings - Declaration, Initialization, Printing Strings, String Input, Character Manipulation, String Manipulation, Arrays of Strings.
Pointers: Fundamentals, Pointer Declarations, Operations on pointers, Passing Pointers to a Function, Pointers and Arrays, Arrays of Pointers, Pointer to Pointer, Pointer to Functions, Command line arguments, Dynamic Memory Management.

<div align="center">At the end of the Module 4, students will be able to:</div>

1. Understand the concept of Arrays. **(BL - 2)**
2. Understand the concept of pointers. **(BL - 2)**
3. Explain Dynamic Memory Management. **(BL -2)**

MODULE-5   User-Defined Data Types and Files   9 HOURS
Structures and Unions: Basics of Structures, Nesting of Structures, Arrays of Structures, Structures and Pointers, Structures and Functions, Self-Referential Structures, Unions, Bit-fields, Enumerations, typedef.
Files: Introduction, Using Data Files in C, Working with Text Files, Random Accesses to Files.
At the end of the Module 5, students will be able to:

1. Explain user defined data types like structures and unions. **(BL - 2)**
2. Understand the concept of Self-Referential Structures. **(BL - 2)**
3. Understand the working of files. **(BL - 2)**

Total hours:48 HOURS

Text Book(s):
1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill

Reference Books :
1. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
2. Computer Fundamentals by Anita Goel, 2010, Pearson Publication
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.
4. Programming in C, 3/e : A Practical Approach by Ajay Mittal, Pearson Publication
5. C: The Complete Reference by SCHILDT and HERBERT, McGraw Hill, 4th Edition, 2020
6. Problem Solving with C by SOMASHEKARA, M. T., GURU, D. S., MANJUNATHA, K. S., PHI Learning, 2nd Edition, 2018

21ES1502   **BASIC ELECTRICAL ENGINEERING**   **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
I	3	0	0	48	3	40	60	100

Pre-requisite: Fundamental of mathematics and physics

Course Objectives:
1. To analyze AC and DC circuits with different types of circuits..
2. Analyze EMF and Torque Equations of DC Machines.
3. To understand the Applications of Transformers and AC Machines.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Analyze DC and AC circuits with different sources .(BL-4)
CO 2   Apply the concept of network theorems in solving DC and AC circuits .(BL-3)
CO 3   Discuss the operation and construction of DC machine.(BL-2)
CO 4   Describe the operation and construction of single and three phase transformer.(BL-2)
CO 5   Explain the operation and construction of AC Machines.(BL-2)

7. C How to Program,Paul Deitel, Deitel & Harvey Deitel, 6th Edition, Pearson Education
8. Programming in C and Data Structures, Jeri R. Hanly, Elliot B. Koffman, Ashok Kamthane andA.Ananda Rao, Pearson Education, 1st Edition, 2010.
9. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition Education / PHI,2009
10. Programming in ANSI in C, E Balaguruswamy, Tata McGraw Hill, 8thEdition, 2019
11. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing, 2017
12. Let us C, Yashavant P. Kanetkar, BBP Publications, Delhi, 16th Edition, 2017

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3										2	3
CO2	3	3	3	2									3	3
CO3	3	3	3	2									3	3
CO4	2	2	3	2										
CO5	3	3	3	2										

COURSE CONTENT

MODULE – 1   INTRODUCTION TO CIRCUITS   10hrs

Introduction to Voltage, Current, Power, Direct Current (DC), Alternating Current (AC), Electrical circuit elements (R, L and C) – Voltage and Current sources – KCL & KVL – Analysis of simple (Series and Parallel) circuits with DC Excitation. Average and RMS values – Phasor representation – Real Power, Reactive Power, Apparent Power, Analysis of Single phase AC circuits consisting of R, L, C, RL, RC, RLC circuits(series circuits only).

At the end of Module 1, students will be able to:
1. Analysis of Series and Parallel circuits with DC Excitation(BL-2)
2. Understand the Voltage, Current, Power, Direct Current (DC), Alternating Current.(BL-2)

3. Explain the Electrical circuit elements (R, L and C).(BL-2)
4. Explain the Single phase AC circuits.(BL-2)

MODULE -2   NETWORK THEOREMS   10hrs

Superposition theorem, Compensation theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Reciprocity theorem; Application of network theorems in solving DC and AC circuits.

At the end of the Module 2, students will be able to:
1. Understand the Application of network theorems in solving DC circuits. (BL-2)
2. Understand the Application of network theorems in solving AC circuits. (BL-2)
3. Explain various theorems. (BL-2)

MODULE -3   DC MACHINES   08hrs

Principle of operation of DC Generator - EMF Equation – Types of Generators – Magnetization and Load Characteristics – Applications – Principle of operation of DC Motor – Torque Equation – Types of Motors – Brake Test on DC Shunt Motor - Characteristics – Applications.

At the end of the Module 3, students will be able to:
1. Explain the Types of Generators. (BL-2)
2. Understand the Characteristics and Applications of DC Machines. (BL-2)
3. Explain the Torque Equation and Types of Motors. (BL-3)

MODULE -4   TRANSFORMERS   10hrs

Principle of operation of Single phase Transformer – Types – EMF Equation – O.C and S.C. Tests of transformers, Voltage regulation and efficiency of transformers- Applications.

At the end of the Module 4, students will be able to:
1. Explain the types of Transformer. (BL-2)
2. Explain the Applications of Transformer. (BL-2)
3. Understand the single phase and three phase transformer at consumer premises.   (BL-2)

MODULE-5   AC MACHINES   10hrs

Principle of operation of Alternator – Characteristics- applications – Principle of operation of single phase and three phase Induction Motors – Brake Test - Characteristics – Applications.

At the end of the Module 5, students will be able to:
1. Understand the concept of different type of AC machines. (BL-2)
2. Understand the Characteristics and Applications of AC Machines. (BL-3)
3. Explain the Principle of operation of three phase Induction Motor. (BL-2)

Total hours: 48hours

Text Book(s):
1. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th Edition, New Delhi, 2015.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press..

Reference Book(s):
1.S.Sivanagaraju, G.Kishor & C.Srinivasa Rao, "Electrical Circuit Analysis", Cengage Learning, 1st Edition, 2010.

21PH1501	Applied Physics lab	R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	2	36	1	40	60	100

Course Objectives:

1. To provide student to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field. To prepare students for performing requirement analysis and design of variety of applications.
2. To enable the students to understand the concepts of interference and diffraction and their applications.
3. To educate students to recognize the applications of laser in finding the wavelength, slit width and its role in diffraction studies
4. To make the students to understand the important parameters of optical fibres and metals

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Learn important concepts of physics through involvement in the experiments by applying theoretical knowledge.

CO 2 Understand the concepts of interference and diffraction and their applications.

CO 3 Recognize the applications of laser in finding the wavelength, slit width and its role in diffraction studies

CO 4 Understand the important parameters of optical fibres and metals

2. A . Chakrabarti : Circuit Theory (Analysis and Synthesis), Dhanpat Rai &Co

3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013

4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004

5. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1												
CO2	2	1												
CO3	2	1				1								
CO4	2	1				1								
1: Low, 2-Medium, 3- High														

COURSE CONTENT

Task -1 Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

The objective :To determine

a) sign of the charge carriers,

b) charge carrier concentration,

c) mobility of the charge carriers of a given semiconductor   CO1

Task - 2 To determine the resistivity of semiconductor by Four probe method

Objective: To determine the resistivity of semiconductor by Four probe method   CO 1

Task -3 Determine the energy gap of a given semiconductor diode.

Objective:To plot characteristics between reverse saturation current and 10^3 /T and find out the approximate value of Energy Band Gap in PN junction diode   CO 1

TASK -4 Measurement of radius of curvature of a lens by Newton's rings method.

Objective:To determine the wavelength of sodium light by Newton's Ring method

The key idea behind Newtons ring experiment is the thin film formation between a plane-convex lens and a glass plate. Due to this thin film of air a path difference occurs in the waves which reflect from the lower surface of the lens and the top surface of the glass plate. As a result of it, they superimpose and develop the interference pattern.   CO 2

TASK -5. Determine the thickness of the wire using wedge shape method

Objective: To calculate the thickness of a thin wire by forming interference fringes using an air wedge arrangement.

The key idea behind this experiment is the formation of thin wedge shaped film between two plane glass plates. Due to this thin film of air, a path difference occurs between waves reflected from top and bottom surface of the film. On superimposition of these waves an interference pattern containing a number of straight line fringes will be produced   CO 2

TASK-6 Determination of wavelength by plane diffraction grating normal incidence method

Objectives: 1.To understand the types of diffraction

To familiarize with the principle of diffraction in plane transmission grating

To know the procedure for standardization of the grating

To determine the wavelengths of prominent spectral lines of mercury spectrum.

An arrangement, which is equivalents in its action to a large number of parallel slits of same width separated by equal opaque spaces is called diffraction grating. It is constructed by ruling fine equidistant parallel lines on an optically plane glass plate with the help of a sharp diamond pointCO 2

TASK -7 Dispersive power of a diffraction grating

objective: To determine Dispersive power of a diffraction grating

When white light passes through a grating, different wavelengths undergo different angles of diffraction. Hence white light split up into different colours and diffraction spectra of different orders will be produced. The angular dispersion or dispersive power of a grating is defined as the rate of change of angle of diffraction with the change of wavelength in a particular order of the spectrum CO2

TASK -8 Determination of wavelength of LASER light using diffraction grating
Objectives :1. To determine the concept of diffraction
2. To determine the wavelength of the given Laser source.   CO 3

TASK -9 . Laser: Diffraction at a single slit
Objective:Determination of width of a given single slit using laser diffraction method
Laser beam has high monochromaticity,coherence and directionality. Hence it forms a clear
diffraction pattern and we can measure width of a single slit accurately.   CO 3

TASK -10 To determine the numerical aperture and acceptance angle of a given optical fibre
Objective: To determine the numerical aperture and acceptance angle of a given optical fiber.
In optical fibres light travel by multiple total internal reflections. Numerical aperture represents light
gathering powerof optical fibre. Acceptance angle represents maximum limiting angle at one end of
optical fibre for the liglht ray to travel by multiple total internal reflections through the core region of
thefibre.
1. Optical fibers may be used for accurate sensing of physical parameters and fields like pressure,
temperature and liquid level.
2. For military applications like fiber optic hydrophones for submarine and underwater sea application
and gyroscopes for applications in ships, missiles and aircrafts.   CO4

Additional Experiments:
TASK -11 Laser: Diffraction at a double slit
Objective:Determination of width of a given double slit using laser diffraction method.
With this experiment we can demonstrate diffraction nature of lasers and measure width of a double
slit accurately.   CO 3

TASK -12: Determination of Fermi energy of a metal.
Objective: To determine Fermi energy of a metal.
Fermi energy represents highest energy level occupied by the electron at 0 K in a metal.   CO4

Text Book(s):
1. C. L. Arora, "Practical Physics", S. Chand & Co., New Delhi, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering Students", S M Enterprises,
2nd Edition, 2014.

Reference Book(s):
1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers,
   2017.
2. C.H. Bernard and C.D. Epp, John Wiley and Sons, "Laboratory Experiments in College Physics"
   Inc, New York, 1995.
3. Dr.Ruby Das, C.S.Robinson, Rajesh Kumar and Prasanth Kumar "A text book of Engineering
   Physics Practical", 1st edition, Sahu University Science Press, 2010.
4. Jayaraman, "Engineering Physics Laboratory Manual", 1st edition, Pearson Education, 2014.

21EN1502

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	2	48	1	40	60	100

CO – 1: To understand the communication concepts and to develop the students' competence in communication at an advanced level

CO – 2: To participate in Team activities that leads to the development of collaborative work skills

CO- 3: To develop strategies appropriately to improve Listening skills and Spoken Skills

CO – 4: To provide the knowledge on Presentation Skills , Group Discussion, Interview Skills and Resume Writing

CO-5: To improve skills to write resume, cover letter and Technical report

TASK – 1
Class Room : Introduction – Objectives & Characteristics of Technical Communication – Importance and need for Technical communication.
Practice-1 : Ice - Breaking Activity, Introducing Oneself and Others – Greetings – Taking Leave

TASK – 2
Class Room : Verbal & Non Verbal Communication - Interpersonal Communication in/with Groups – Barriers to effective Communication – Public Speaking Skills - Poster Presentation
Practice-2 : Role Plays – Just a Minute (JAM) – Conversation Practice
Practice-3 : Oral Description of Pictures, Photographs, Products, and Process – Poster Presentation

TASK – 3
Class Room : Listening Skills - Types of Listening Skills- Active listening and anticipating the speaker
Practice-4 : Listening for Specific & General Details- Listening Comprehension

TASK – 4
Class Room : Reading Skills: Skimming, Scanning, Intensive & Extensive reading **–** Debate : How to Debate, Tips for Debate, Debate Practice, Explanation of Debate Techniques, Debate Videos Presentation
Practice-5 : Debate (Planned & Extempore)
Practice-6: Reading comprehension- Skimming, Scanning, Intensive & Extensive reading

TASK – 5
Class Room : Scientific and Technical writing; Formal and Informal writing – Abstract Writing – Technical Report Writing– Resume Writing: Cover Letter, Resume Preparation
Practice-7 : Technical Report Writing
Practice-8 : Resume Writing

TASK – 6
Class Room : Presentation Skills Presentation techniques-tips of how to be an effective presenter-Preparation — how to deal with fear and anxiety - Voice, pace and gesture — how to speak, stand and

move. Getting live feedback — how to interact with the audience
Practice-9 : Technical Report Writing
Practice-10 : Resume Writing

TASK – 7
Class Room : Group Discussion: What is Group Discussion, Types of Group Discussion, Tips and Techniques for Effective Group Discussion, Group Discussion Videos Presentation – Interview Skills : Interview strategies, Interview questions, Successful Interview presentations

Practice-11 : Group Discussion (Planning & Extempore)
Practice-12 : Mock Interviews

Text Book(s):
1. Technical Communication: Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press.

Reference Books:
1. Effective Technical Communication by M. Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd. 2005.
2. English Language Communication: A Reader cum Lab Manual byAnuradha Publications, Chennai, 2006. 4. Dr. ShaliniVerma, "Body Language- Your Success Mantra", S. Chand, 2006.
3. Business Communication today by Bovee, Till and Schatzman, Pearson

NARAYANA ENGINEERING COLLEGE:GUDUR

21ES1502   **BASIC ELECTRICAL ENGINEERING LAB**   **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
I	**0**	**0**	**2**	**32**	**1**	**40**	**60**	**100**

Pre-requisite: Basic knowledge of Electrical circuits and Machines

Course Objectives:
  1. To Verify the KCL, KVL and Network Theorems
2. To conduct testing on DC and AC Machines. .

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Solve the given electrical circuit using basic Kirchhoff's laws and network theorems (BL-3)

CO 2   Analyze the simple DC circuits using Pspice (BL-3)

CO 3   Determine the performance characteristics of DC Machines. (BL-3)

CO 4   Determine the performance of single phase transformer & three phase Induction motor (BL-3)

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1										2	3
CO2	2	2	2										2	3
CO3	3	2	2										2	3
CO4	3	3	2										2	3
1: Low, 2-Medium, 3- High														

(Table title: CO-PO Mapping)

COURSE CONTENT

PART-A

Task 1 - Verification of Kirchhoff laws.
  Objectives:
   a) To Verify the KCL
 b) To Verify the KVL   CO 1

Task-2 Verification of Thevenin's and Norton's theorems
Objective: a) To Verify the Thevenin's and Norton's Theorem   CO 1

Task-3 Verification of Superposition Theorem
Objective: a) To Verify the Superposition Theorem   CO 1

Task-4 Verification of Maximum Power Transfer Theorem
  Objective: To verify the Maximum power transfer theorem   CO 1

Task 5 Verification of Reciprocity and Millman's Theorems
Objective:
To verify the reciprocity and Millman's Theorems   CO 1

TASK-6 Verification of Compensation Theorem
Objective: To verify the compensation theorem   CO 1

Task 7 - Brake Test on DC shunt Motor.

Objectives: To determine the performance characteristics,
a) Efficiency Vs Output
b) Line current Vs Output
c) Speed Vs Output
d) Torque Vs Output   CO 3

Task 8 - Magnetization characteristics of DC shunt generator. Determination of   critical field resistance and critical speed
  Objectives:
  a) Predetermine the OCC at different speeds
  b) Determine the critical field resistance
  c) Obtain critical speed for a given shunt field resistance   CO 3

Task 9- O.C. & S.C. Tests on Single Phase Transformer.
  Objectives: Predetermination of the following
  a) Efficiency at different load conditions and different power factors
  b) Regulation at different load conditions and different power factors
 c) Output vs. Efficiency curves   CO 4

Task 10 - Brake Test on Three Phase Induction Motor.
  Objectives: To determine the performance characteristics,
   a) Efficiency Vs Output
   b) Line current Vs Output
   c) Speed Vs Output
   d) Torque Vs Output   CO 4
Task 11 - Simulation of DC Circuit using mesh analysis
Objectives: To simulate a simple DC circuits using PSpice   CO 2

Task 12 - Simulation of DC Circuit using nodal analysis
Objectives: To simulate a simple DC circuits using PSpice   CO 2

  Text Book(s):
  1. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th Edition, New Delhi, 2015.
  2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press..
  Reference Book(s):
  1.S.Sivanagaraju, G.Kishor & C.Srinivasa Rao, "Electrical Circuit Analysis", Cengage Learning, 1st Edition, 2010.
  2. A . Chakrabarti : Circuit Theory (Analysis and Synthesis), Dhanpat Rai &Co
  3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013
  4. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004
  5. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.

21ES1505   **ENGINEERING & ITWORK SHOP**   **R21**

PART – A ENGINEERING WORK SHOP

Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	4	64	2	40	60	100

Pre-requisite: Basic mathematics and electronic devices.

Course Objectives:

1. To know basic workshop processes and adopt safety practices while working with various tools and equipments
2. To identify, select and use various marking, measuring, holding, striking and cutting tools & equipments.
3. To know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
4. To gain knowledge about the usage of tools like Word processors, Spreadsheets, Presentations
5. To learn about Networking of computers and use Internet facility for Browsing and Searching

Course Outcomes: After successful completion of the course, the student will be able to:

CO1   **Understand** the safety aspects in using the tools and equipments.(BL-2)

CO2   **Apply** tools for making models in respective trades of engineering workshop.(BL-3)

CO3   **Apply** basic electrical engineering knowledge to makes imple housewiring circuits And check their functionality.(BL-3)

CO4   **Understand** to disassemble and assemble a Personal Computer and prepare the Computer ready to use(BL-2)

CO5   **Apply** knowledge to Interconnect two or more computers for information sharing (BL-3)

COURSE CONTENT (TRADES FOR PRACTICE)

Trade -1 Carpentry (6 H)

Familiaritywithdifferenttypesofwoodsandtoolsusedinwoodworkingandmakefollowingjointsfromoutof 300x40x25 mms of two od stock.

  a) Half–Lapjoint.

  b) Mortise and Tenonjoint

Trade-2 Fitting (6 H)

  i.]Familiarity with different types of tools used in fitting and do the fitting exercises out of 80 x 50 x 5 mm M.S. stock

   a) V-fit b) Dovetail fit

Trade - 3 Sheet Metal Work (6 H)

  Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from out of 22 or 20 guage G.I. sheet

Trade - 4 Electrical House Wiring (6 H)

  Familiarities with different types of basic electrical circuits and make the following electrical connections

  a) Two lamps in series

  b) Two way switch

  c) Tube light

d) Two lamps in parallel with 3 pin plug and switches

Trade 5 - Welding

   Familiarity with different types of tools used in welding and do the following welding exercises
1. Single V butt joint
2. Lap joint

Text Book(s):
   1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjar Roy S.K. "Elements of WorkshopTechnology"Vol-I2008&Vol-II2010MediaPromoters&Publishers Pvt.Limited,Mumbai.
   2. KalpakjianS.andStevenS.Schmid,"Manufacturing   Engineering   and   Technology" 4thEdition, Pearson Education IndiaEdition,2002.
   3. P. Kannaiah&K. L. Narayana "Workshop manual" 2ndEd., Scitech publications Pvt.Ltd.,Hyderabad,2008.

PART-B   IT WORKSHOP LAB
Course Objectives:
   1. To provide Technical training on Productivity tools like Word processors, Spreadsheets, Presentations.
   2. To make the students know about the internal parts of a computer, assembling, installing the operating system.
   3. To teach connecting two or more computers.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Understand functionalities of a computer and operating system.   (BL-2)

CO 2   Practice Word processors, Presentation and Spreadsheet tool.   (BL-2)

CO 3   Connect computer using wired and wireless connections.   (BL-2)

CO-PO Mapping														
	PO												**PSO**	
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1													
CO2	1													
CO3	1													
1: Low, 2-Medium, 3- High														

<center>COURSE CONTENT   CO</center>

Task-1 Learn about Computer (4H)
Identify the internal parts of a computer and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

<div align="right">CO1</div>

Task -2 Assembling a Computer (4H)
Disassemble and assemble the PC back to working condition. Troubleshoot the computer and identify working and non-working parts. Identify the problem correctly by various methods available (eg: beeps). Record the process of assembling and trouble-shooting a computer.   CO 1

Task-3 Install Operating system (2H)   CO 1

Install Linux, any other operating system (including proprietary software) and make the system dual boot or multi boot. Record the entire installation process.

TASK-4 Operating system features (2H)   CO 1

Record various features that are supported by the operating system(s) installed. Submit a report on it. Access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Install new application software and record the installation process.

TASK-5 Word Processor (6H)   CO 2

Create documents using the word processor tool. Tasks to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Submit a report of the word processor considered.

Create documents using the word processor tool. Mail Merge in word processor for creating appointment orders for 10 employee records in excel.

TASK-6 Spreadsheet (4H)   CO 2

To create, open, save the spreadsheet and format them as per the requirement. Some of the tasks to be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells, working with pivot tables and charts. Submit a report of the Spreadsheet application considered.

TASK-7 Presentations (6H)   CO 2

To create, open, save and run the presentations, Select the style for slides, format the slides with different fonts, colors, create charts and tables, insert and delete text, graphics and animations, bulleting and numbering, hyperlink, set the time for slide show, Record slide show. Submit a report of the Presentation tool considered.

TASK-8 Wired network & Wireless network (4H)   CO 3

Select a LAN cable, Identify the wires in the cable, Define the purpose of each wire, Study the RJ45 connecter, Use crimping tool to fix the cable to the connecter, Test the cable using LAN tester, Connect two or more computers using cross and straight cables, Configure the computers, share the data between the computers.

Additional Experiments:

TASK -1 IoT   CO 3

Raspberry Pi Study the architecture of Raspberry pi, configure software, Install SD card, Connect the cables, Install Raspbian (or any other) operating system, Configure Wi-Fi, Remotely connect to your Raspberry Pi.

TASK -2 OUTLOOK, MACROS   CO 3

Practice the following tasks and submit report
  A. Configure outlook and access mails.
Create Macros in word and spreadsheet tools

Text Book(s):

1. B.Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance",2nd edition, Tata McGraw-Hill, 2002

2. "MOS study guide for word, Excel, Powerpoint& Outlook Exams", Joan Lambert, Joyce Cox,

PHI.
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.

Reference Book(s):
1. Rusen, "Networking your computers and devices", PHI
2. Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH.

21ES1501　　　　**Problem Solving and Programming Lab**　　　　R21

Semester	Hours / Week			Totalhrs	Credit		Max Marks	
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
I	0	0	3	48	1.5	40	60	100

Pre-requisite: Mathematics Knowledge, Analytical & Logical Skills

Course Objectives:

1. To work with the compound data types

2. To explore dynamic memory allocation concepts

3. To design the flowchart and algorithm for real world problems

4. To write C programs for real world problems using simple and compound data types

5. To employee good programming style, standards and practices during program development

Course Outcomes: After successful completion of the course, Student will be able to:

CO 1　　Translate algorithms into programs (In C language) (BL - 2)

CO 2　　Code and debug programs in C program language using various constructs.(BL - 3)

CO 3　　Solve the problems and implement algorithms in C. (BL - 3)

CO 4　　Make use of different data types to handle the real time data (BL - 3)

CO-PO Mapping														
	PO												**PSO**	
CO	**PO1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	1	2											1	
CO2	2	2	2										2	1
CO3	2	2	3	1	2								2	2
CO4	2	2	3	1	1								2	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT

TASK-1　(3H)

 1. Practice DOS and LINUX Commands necessary for execution of C Programs.

 2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.

 3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the Programming environment.　　　　　　　　　　　　　　　　　　　　CO 1

TASK-2　(3H)

1. Practice programs: Finding the sum of three numbers, exchange of two numbers, largest of two numbers, to find the size of data types, Programs on precedence and Associativity of operators, sample programs on various library functions.　　　　CO 1

TASK-3 (6H)

 1. Write a program to find the roots of a Quadratic equation.

 2. Write a C program to calculate the factorial of a given positive integer.

 Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 & 1.

 Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program

to generate the first n terms of the sequence.   CO1

  TASK-4 (6H)
   1. Write a C program to find the sum of individual digits of a positive integer.
   2. Write a program to reverse the digits of a number.
   3. Write a program to generate the series of prime numbers in the given range.
  4.   Write a program to check for number palindrome.   CO 2
TASK-5 (6H)
   1. Write a C program for the following that use both recursive & non-recursive functions:
       a. To calculate the factorial of a given positive integer.
       b. To find the greatest common divisor of two given integers.
       c. To generate Fibonacci series.
 Illustrate the use of auto, static, register and external variables.   CO 2
TASK-6 (3H)
   1. Write a program to find the sum of positive and negative numbers in a given set
      of numbers.
   2. Write C code to reverse the elements of the array. For example, [1,2,3,4,5] should become
      [5,4,3,2,1]
 Write a program to find the maximum of a set of numbers.   CO 3
TASK-7 (6H)
                     1. Write a C program that use pointers to find Addition of Two Matrices
       2. Write a C program that use functions to find Multiplication of Two Matrices   CO 3
TASK-8 (3H)
   1. Write a program to accept a line of characters and print the number of vowels,
      Consonants, blank spaces, digits and special characters.
   2. Write a C program to check whether a given string is a palindrome or not, without using any
      built-in functions.   CO 3
TASK-9 (6H)
       1. Write a C program to find the length of a given string using pointers.
       2. Write a C program to add two distances in feet and inches using structure
       3. Write a C program to read and print an employee's detail using structure
       4. Write a C program to read and print book information using union   CO 4
TASK-10 (6H)
   1. Write a program to split a "file" into two files, say file1 and file2. Write lines into the 'file'
      from standard input. Read the contents from 'file' and write odd numbered lines into file1
      and even numbered lines into file2.
 Write a program to merge two files.   CO 4
ADDITIONAL TASKS
       1.   Write a program to find the Abundant Number
       2.   Write a program to insert the element in a given position

Text Book(s):
   1. "How to Solve it by Computer", R.G. Dromey, 2014, Pearson.
   2. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education, 1st Edition, 2010.
Reference Book(s):
   1. "The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, 2nd Edition,

Pearson.

2. "Let us C", Yeswant Kanetkar, BPB publications

3. "Pointers in C", Yeswant Kanetkar, BPB publications, 16th Edition, 2017

4. Computer Science, A Structured Programming Approach Using C by Behrouz Forouzan & Richard F. Gilberg, 3rd Edition, Cengage Learning

5. C Programming A Problem-Solving Approach, Behrouz A. Forouzan & E.V. Prasad,

6. F. Gilberg, 3rd Edition, Cengage Learning

7. Programming with C Rema Theraja, Oxford, 2018

8. Programming in C, 3rd Edition, 2015, Ashok N. Kamthane, Pearson Education

9. Programming in C, 3/e : A Practical Approach by Ajay Mittal, Pearson Publication

10. Problem Solving with C by SOMASHEKARA, M. T., GURU, D. S., MANJUNATHA, K. S., PHI Learning, 2nd Edition, 2018

11. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press, 2001

12. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill

SEMESTER-II

Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
		L	T	P	Total		Int. Marks	Ext. Marks	Total marks
BS	Chemistry	3	0	0	3	3	40	60	100
BS	Vector Calculus and Transforms	3	1	0	4	4	40	60	100
ES	Python Programming and Data Science	3	0	0	3	3	40	60	100
HS	English	2	0	0	2	2	40	60	100
BS	Chemistry Lab	0	0	3	3	1.5	40	60	100
HS	English Language Lab	0	0	3	3	1.5	40	60	100
ES	Engineering Graphics	0	1	4	5	3	40	60	100
ES	Python Programming and Data Science Lab	0	0	3	3	1.5	40	60	100
	Counselling/Mentoring	0	0	1	1	0	--	--	--
	Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
	Activity Point Programme	During the Semester					20 Points		
	Total	11	2	16	29	19.5	320	480	800

NARAYANA ENGINEERING COLLEGE:GUDUR

21CH1001	CHEMISTRY			R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Basic concepts in chemistry, Advanced engineering materials, chemistry in day to day life, Fossil fuels

Course Objectives:

1. To impart technological aspects of modern chemistry and its applications.
2. Understand the chemistry behind electrochemical energy systems.
3. To train the students on the principles and applications of polymers.
4. To acquire knowledge of engineering materials and fuels.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 **Understand** the **fundamental concepts of chemistry to predict the structure and bonding of material**s.**(BL-2)**

CO 2 **Discuss** various kinds of **electro chemical cells.(BL-3)**

CO 3 **Compare** the **materials of various energy storage devices and emerging technologies.(BL-3)**

CO 4 **Demonstrate** the **mechanism and applications of different polymers in electronic devices.(BL-3)**

CO 5 **Explain calorific values, refining of petroleum and cracking of oils.(BL-2)**

CO-PO Mapping														
	PO												PSO	
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3													
CO2	3													
CO3	3						3							
CO4	3						3							
CO5	3						3							
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1 **Structure and Bonding Models** **10 Hrs**

Structure and Bonding Models: Dual nature of matter- De Broglie's equation, Schrodinger wave equation, Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules− energy level diagrams of O_2 and CO, etc. π-molecular orbital's of butadiene and benzene, calculation of bond order and magnetic properties, Crystal field theory – salient features – splitting in octahedral and tetrahedral complex.

At the end of the Module 1, student will be able to:

1. **Understand** the fundamental concepts of chemistry to predict the structure, properties and

bonding of Engineering materials.**(BL-2)**
    2. **Explain** the calculation of bond order of O2 and Co molecules.**(BL-2)**
    3. **Discuss** the magnetic behavior and colour of coordination compounds.**(BL-2)**

MODULE -2   **Electro Chemistry**   **10 Hrs**

Electro chemistry: Electrode potential, EMF of an electrochemical cell, Nernst equation, electrodes – concepts, reference electrodes (standard hydrogen, Calomel electrode, and glass electrode), potentiometry- potentiometric titrations (red ox titrations), concept of conductivity, conductometric titrations (acid- base titrations). PV Cell and its applications.

At the end of the Module 2, students will be able to:
    1. **Demonstrate** competency in the basic concepts of electrochemical cells. **(BL-3)**
    2. **Explai**n the significance of electrode potentials. **(BL-2)**
    3. **List** the different types of electrodes. **(BL-1)**
    4. **Differentiate** between Potentiometric and conductometric titrations. **(BL-2)**
   5. **Illustrate** the construction of PV cell. **(BL-3)**

MODULE-3   **Battery Technology**   **09 Hrs**

Battery Technology: Introduction, classification of batteries, Important applications of batteries, Modern batteries- zinc-air, lithium cells,Li- MnO_2 cell, Ni-Cd cell, lead acid storage cell. Fuel cells- Introduction – classification, hydrogen - oxygen fuel cell, methanol - oxygen fuel cell, SOFC - Merits and demerits of fuel cell.

At the end of the Module 3, students will be able to:

    1. **Classify** batteries into different types. **(BL-3)**
    2. **Explain** the concept involved in the construction of batteries. **(BL-2)**
    3.**Identify** the significance of batteries.**(BL-1)**
    4. **Compare** the merits of different fuel cells. **(BL-2)**

MODULE-4   **Polymer Chemistry**   **10 Hrs**

Polymer Chemistry: Introduction to polymers, polymerization, types of polymerization, mechanism of polymer formation. Plastics - Thermoplastics and Thermosetting, Preparation, properties and applications of –PVC,PTFE, Bakelite, Urea- formaldehyde resin, Nylons. Natural Rubber, processing, vulcanization.

Elastomers–Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – poly

acetylene, poly aniline, mechanism of conduction and applications.

At the end of the Module 4, students will be able to:
    1. **Identify** different types of polymers. **(BL-1)**
    2. **Distinguish** between thermoplastic and thermo setting resins. **(BL-2)**
    3. **Explain** the preparation, properties and applications of some plastic materials. **(BL-2)**
    4. **Apply** the knowledge of advanced polymers, conducting polymers for different
      Applications. **(BL-3)**

MODULE-5   **Fuel Technology**   **09 Hrs**

Fuel Technology: Introduction, Types of fuels, characteristics of good fuel, units, calorific value, HCV
&LCV, Solid fuels, Analysis of coal-proximate and ultimate. Liquid Fuels: refining of petroleum, synthetic petrol preparation by Fischer- tropsch Process,Gaseous fuels;Natural gas,water gas,producer gas and coal gas.
At the end of the Module 5, students will be able to:

1. Differentiate petroleum, petrol, synthetic petrol and have knowledge how they are produced.
  (BL-2)
2. Select suitable fuels for IC engines. **(BL-1)**
 3. Explain calorific values, octane number, refining of petroleum and cracking of oils. **(BL2)**

Total hours:48 Hours
Text Book(s):
 1. P. C. Jain & Monika Jain*, Engineering Chemistry*, Dhanpat Ray Publishing Company
    (P) Ltd, New Delhi, 16th edition, 2013.
 2. K. N. Jayaveera, G. V. Subba Reddy and C. Ramachandraiah, *Engineering Chemistry,* McGraw
    Hill Publishers, New Delhi.
 3. Energy scenario beyond2100,by S.Muthu Krishna Iyer.

 Reference Book(s):
 1. J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5th edition 2010.
 2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition, 2007.
 3. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University
Press,
 10th edition, 2010.

NARAYANA ENGINEERING COLLEGE:GUDUR

21MA1004   VECTOR CALCULUS & TRANSFORMS   **R-21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
II	3	1	0	64	4	40	60	100

Pre-requisite: inter mathematics

Course Objectives: This course aims to providing the knowledge for the student about on
1. To enlighten the learners in the concept of vector differentiation and integration.
2. To illustrate the physical interpretation of gradient, divergence and curl
3. To understand the concepts of Laplace transforms and its properties.
4. To apply the concepts of Laplace, transform to solve the ordinary differential equations.
5. To understand the concepts of Fourier series and apply its applications in engineering.
6. To understand the concepts of Fourier transforms and apply its applications in engineering.

Course Outcomes: After successful completion of the course, the student will able to:

CO 1   Interpretate the different operators such as gradient, curl and divergence to find out point function   (L-3)

CO 2   evaluate area and volumes by Apply the fundamental theorems   (L-5)

CO 3   Apply Laplace and Inverse Laplace transforms techniques to solve the differential equations and its application   (L-3)

CO 4   Develop the Fourier Series to the given periodic functions   (L-3)

CO 5   Apply the concepts of Fourier transforms to Find impulse   (L-3)

CO-PO Mapping														
	PO												**PSO**	
CO	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3												
CO2	3	3												
CO3	3	3												
CO4	3	3												
CO5	3	3												
1- Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   **Vector Differentiation**   **Hours: 2h(9L+3T)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions Gradient, del applied to vector point functions-Divergence and Curl, vector identities (without proof)

At the end of the Module 1, students will be able to:
1. Apply del to Scalar and vector point functions   (L-3)
2. Illustrate the physical interpretation of Gradient, Divergence and Curl   (L-2)
3. Apply del to scalar and vector point functions.   (L-3)
4. Illustrate the physical interpretation of gradient, divergence and curl. (L-2)
5. Calculate directional derivatives and gradients   (L-1)

MODULE -2   **Vector Integration**   **Hours: 12h(9L+3T)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

At the end of the Module 2, students will be able to:

1. Find the work done in moving a particle along the path over a force field   (L-1)
2. Evaluate the rates of fluid flow along and across curves   (L-5)
3. Evaluation of surface areas integrals by applying Green`s theorems.   (L-5)
4. Evaluation of volume integrals by applying Gauss theorems   (L-5)
5. Evaluation of line integrals by applying Stokes theorems.   (L-5)

MODULE-3   **Laplace and Invers Laplace Transforms**   **Hours: 6h(12L+4T)**

Definition-Laplace transform of standard functions-existence of Laplace Transform Inverse transform – First shifting Theorem, transforms of derivatives and integrals – Unit step function Second shifting theorem – Dirac's delta function – Convolution theorem Laplace transform of Periodic function. Differentiation and integration of transform solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

At the end of the Module 3, students will be able to:

1. Understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.   (L-3)
2. Find the Laplace transforms of general functions using its properties.   (L-2)
3. Understand Laplace transforms of special functions (Unit step function, Unit Impulse & Periodic.   (L-3)
4. Apply Laplace transforms to solve Differential Equations.   (L-3)

MODULE-4   **Fourier Series**   **Hours: 12h(9L+3T)**

Determination of Fourier coefficients (Euler's)–Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions Fourier series in an arbitrary interval–Half-range Fourier sine and cosine expansions.

At the end of the Module 4, students will be able to:

1. Understand Fourier series expansion of the given function.   (L-3)
2. Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the given function.   (L-3)
3. Expand the given function in Fourier series given in Half range interval.   (L-3)
4. Apply Fourier series to establish Identities among Euler coefficients.   (L-3)

MODULE-5   **Fourier Transform**   **Hours: 12h(9L+3T)**

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform–Fourier sin and cosine transforms Properties–Inverse transforms– Finite Fourier transform and Inverse Finite Fourier transform.

At the end of the Module 5, students will be able to:

1. Understand the concepts of Fourier transforms.   (L-2)
2. Apply the properties of Fourier transforms to various engineering problems.   (L-3)
3. Apply the concepts of Fourier transforms to Find impulse.   (L-3)
4. Make use of the Fourier transforms and its inverse in practical applications of electronics engineering.   (L-3)

21ES1005 **PYTHON PROGRAMMING AND DATA SCIENCE** **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
II	3	0	0	48	3	40	60	100

Pre-requisite: Basics of programming Language.

Course Objectives:
1. To learn about Python programming language syntax, semantics, and the runtime environment
2. To be familiarized with general computer programming concepts like conditional execution, loops & functions
3. To learn about mutable and immutable types.
4. To learn about the data science related functions in NUMPY.
5. To solve data science problems using PANDAS.

Course Outcomes: After successful completion of the course, Student will be able to
CO 1 Demonstrate various **operators, data types and decision structures** in python. (BL - 3)
CO 2 Solve problems using **Functions and data structures** in Python (BL - 3)
CO 3 Implement the concept of **Files and Modules** (BL - 3)
CO 4 Implement Data Science queries using **NUMPY** module (BL - 3)
CO 5 Solve data manipulation task using **PANDAS** module (BL - 3)

Total hours:64
Text Book(s):
1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers.
2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publication.
3. Ramana B.V., "Higher Engineering Mathematics", McGraw Hill Publishers.

Reference Book(s):
1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley.
2. Veerarajan T., "Engineering Mathematics",Tata McGraw-Hill.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.

CO-PO Mapping														
	PO												**PSO**	
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1											1	
CO2	2	2											2	
CO3	2	1											2	
CO4	2	2											1	
CO5	2	2											1	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   I/O and Decision Structures   10H

Input and Output: Introduction to Python and installation, Input and Output, Comments, Variables, Operators. Type conversions, Expressions, Data types.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures. Looping: while loop, for loop, Nested Loops.

At the end of the Module 1, students will be able to:
1. **Describe** python expressions, data types (BL-2)
2. **Perform** various Arithmetic calculations using Operators in Python(BL-3)
3. **Demonstrate** the usage of looping structures in python Language.(BL-3)

MODULE -2   Functions and Data structures   10H

Functions: Definition, Function Arguments, Anonymous Function, Scope of the variable and namespacing, Recursion, Map, Filter and Reduce Functions

Strings, **Lists, Tuples and Dictionaries**: String Methods and Operations, Lists: Operations and Methods, Tuples: Operations and Methods, Dictionaries: Operations and Methods.

At the end of the Module 2, students will be able to:
1. **Implement Functions** to solve problems.(BL-3)
2. **Describe** various **String** handling functions in python(BL-2)
3. **Describe** the various **Lists, Tuples and Dictionaries** in python(BL-2)

MODULE-3   Files and Modules   10H

Files: Text Files, File Operations, File Functions, Copying the Files, Two Files Merging into Single File.

Modules: Modules, Standard Modules, Packages.

At the end of the Module 3, students will be able to:

Describe the concepts of Files (BL-2).

Describe the importance of Modules and packages (BL-2).

MODULE-4   Introduction to Numpy   9H

Introduction to Numpy: Fixed-Type Arrays in Python, Creating Arrays from Lists, Creating Arrays from Scratch Numpy Standard Data Types, The Basics of Numpy Arrays, Numpy Array Attributes.

Array Indexing: Accessing Single Elements, Array Slicing: Accessing Subarrays, Reshaping of Arrays, Array Concatenation and Splitting. Computation on Numpy Arrays: Universal Functions.

At the end of the Module 4, students will be able to:
1. Describe the concept of **Numpy** Module(BL-2)
2. Solve numerical problems related to data science using **Numpy Arrays.(BL-3)**
3. Apply **Universal Functions** for Data Science problems(BL-3)

MODULE-5   Data Manipulation with Pandas   9H

Data Manipulation with Pandas: Installing and Using Pandas, Introducing Pandas Objects, Pandas Series Object, Pandas DataFrame Object, Pandas Index Object, Data Indexing and Selection Data Selection in Series.

Data Selection in DataFrame Operating on Data in Pandas Ufuncs: Index Preservation UFuncs: Index Alignment, Operations Between DataFrame and Series, Handling Missing Data, Trade-Offs in Missing Data Conventions, Missing Data in Pandas, Operating on Null Values.

At the end of the Module 5, students will be able to:
1. Describe the concept of **Data Manipulation** (BL-2).
2. Describe the concept of **Pandas** for Data Science(BL-2)
3. Apply Ufunctions in pandas to generate **DataFrame** (BL-3)
4. Implement Pandas Module to handle **Missing Data**(BL-3)

Total hours: **48 HOURS**

Text Books:
1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2. Python Data Science Hand Book, Jake Vanderplas, First Edition, Oreilly

Reference Book(s):
1. Introduction to Python Programming, Gowrishankar. S, Veena A, CRC Press.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
3. Python for Data Analysis-Wes McKinney, 2nd-Edition, Oreilly.
4. Python Programming: A Modern Approach, Vamsi Kurama, Pearson. Braun W. J., Murdoch D. J., A First Course in Statistical Programming with R, Cambridge University Press, 2007

NARAYANA ENGINEERING COLLEGE:GUDUR

21EN1001			ENGLISH				R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	2	0	0	32	2	40	60	100

CO 1 : Acquire in depth knowledge on formulating appropriate sentences with grammatical accuracy and vocabulary building. (B.L:2)

CO 2 : Understand the factors that influence in use of grammar and effective strategies for professional written communication (B.L:2)

CO 3 : Explain the use of Grammar to improve effective writing Note making & Paraphrasing. (B.L:2)

CO 4 : Understand the Grammar to write dialogues and reviews effectively. (B.L:2)

CO 5 : Develop the skills and sub skills of reading and use strategies for reading effectively and provide knowledge on the structure and format of technical writing. (B.L:3)

Module 1

Grammar : Parts of Speech - Kinds of Sentences – Sentence structures: Identifying the sentences, Sentence Pattern, Sentence Improvement and Construction, Sentence Completion, Sentence Arrangement, Joining sentences, Para jumbles.

Vocabulary : Concept of word formation – Synonyms & Antonyms – Homonyms Homophones – Prefixes & suffixes – Commonly confused Words – One word substitutes – Idioms & Phrasal Verbs.

Module 2

Grammar & Vocabulary : Cohesive devices - linkers, sign posts and transition signals - Articles – Prepositions – Gerund - Verbs: Auxiliary verbs (Primary & Modal) – Tenses – Subject Verb agreement.

Writing : Principles of writing: clarity, simplicity, brevity, single focus, organization of thoughts - sequencing the ideas – Punctuation - Question formation (Wh- questions, Yes or No questions, Tag questions) - Letters (Formal & Informal) and Emails : Structure / template of common formal letters and emails: inquiry /complaint / placing an order.

Module 3

Grammar : Active and Passive Voice - Direct & Indirect Speech – Comparison of Adjectives – Cause and effect – Verb noun Collocations & Adjective - Noun Collocations.

Writing : Note Making – Summarizing - Paragraph Writing – Paraphrasing : Techniques of paraphrasing - Replacement of words and phrases, change of sentence structures.

Module 4

Grammar : Misplaced modifiers - If Clauses - Simple, Compound, Complex Sentences -Spotting Errors.

Writing : Dialogue writing (Formal & Informal) - compare and contrast paragraphs- Writing of Reviews: Book / Play / Movie.

Module 5

Reading Skills : Types of reading: Skimming, Scanning, Intensive & Extensive Reading – Reading Comprehension - Scramble Sentences - Complete the passage using contextual clues Identifying Main Ideas using Scanning - Technique Identifying Specific Ideas using Skimming Technique - Studying

the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing : Describing – Report Writing: definition - purpose – types – structure - formal and informal reports - stages in developing report- proposal, progress and final reports –examples.

Text Books:

1. Contemporary English Grammar –Structures and Composition by David Green, MacMillan India, 2014.
2. Effective Technical Communication by Ashraf, M Rizvi,Tata McGraw-Hill, 2006.

Reference Books:

1. English Conversation Practice by Grant Taylor, Tata McGraw Hill,2009.
2. Practical English Usage by Michael Swan, OUP, 4th Edition.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press,2009.
4. English Vocabulary in Use Advanced by Michael McCarthy, Felicity O'Dell, Cambridge University Press,2008.
5. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

21CH1501   **CHEMISTRY LAB**   **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
II	**0**	**0**	**3**		**1.5**	**40**	**60**	**100**

Pre-requisite: Nil

Course Objectives: The objective of the laboratory sessions is to enable the learners to get hands-on experience on the principles discussed in theory sessions and to understand the applications of these concepts in engineering.

Course Outcomes: After successful completion of the course, the student will be able to:

 CO 1   **Determine** the cell constant and conductance of solutions

 CO 2   Perform quantitative analysis using instrumental methods

 CO 3   Utilize the fundamental laboratory techniques for analyses such as titrations, separation purification and Spectroscopy

 CO 4 Analyze and gain experimental skill.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3													
CO2	3													
CO3	3													
CO4	3													
1: Low, 2-Medium, 3- High														

COURSE CONTENT

Task-1: Estimation of Ferrous Ion by using Potassium Dichromate
Objective:
 1. Determine the percentage of ferrous iron in an unknown sample by redox titration with potassium dichromate solution.
2. The student will pre-treat the sample to obtain the iron in the reduced (+2 oxidation) state**.**
3.The student will use a solution of primary standard as the titrant   CO 3

Task-2: Conductometric titration of Weak acid vs. Strong base
Objective:
1.Perform a conduct metric titration of Weak acid with a strong base,
2. Determine the equivalence point of the titration by plotting titration curve using conductance values and amount of the base added during titration,
3. State the advantages conduct metric titrations.   CO 2

Task-3 : Conductometric titration of strong acid vs. strong base
Objective:
1.Perform a conductometric titration of strong acid with a strong base,
2. Determine the equivalence point of the titration by plotting titration curve using conductance values and amount of the base added during titration,

3. State the advantages conduct metric titrations.   CO2

Task-4 : Determination of cell constant and conductance of solutions
Objective:
 1. To determine conductivity of the given water sample. by using conductivity meter
2. To understand the specific conductance.   CO 1

Task-5 : Potentiometry - Determination of red-ox potentials and emfs
Objective:
1. Determine the concentration of an unknown iron(II) solution. By using potentiometer
2. Perform a red-ox titration of ammonium iron (II) sulphate using potassium dichromate as oxidizing agent,
3. Determine the equivalence point of the redox titration by plotting titration curve using potential change values and amount of oxidizing agent added during titration   CO 3

Task-6 : Determination of Strength of an acid in Pb-Acid battery
Objective: 1. To determine the half –reactions involved in spontaneous oxidation –reduction reactions.
2. Explain the function of the lead storage and dry cell batteries …electrolysis involving two lead strips immersed in sulfuric acid.   CO 4

Task-7 : Preparation of a Bakelite
Objective: To prepare phenol formaldehyde resin. (Bakelite)
1. Understand the differences between linear and cross linked polymers.
 2. Compare and contrast the recycling properties of linear and cross linked polymers.
 3. Compare the combustion properties of various types of material.
 4. Define the following terms: polymer, monomer, repeat unit, cross linking, biopolymer   CO 4

Task-8: Determination of percentage Moisture content in a coal sample
Objective: 1. To provide practical knowledge for developing experimental skill in using desicator
          to estimate moisture content in coal
2. Understand percentage of moisture in Coal sample.   CO4

Task-9: Determination of percentage of Iron in Cement sample by colorimetry
Objective: 1.To use spectroscopy to relate the absorbance of a colored solution to its concentration.
2. To prepare a Beer's Law Plot to determine the concentration of an unknown.   CO 2
Task-10: Estimation of Copper by complexo metric method

Objective:
 1. Determine the percentage of Copper in an unknown sample by Complex metric titration with EDTA solution.
2. The student will pre-treat the sample to obtain the Copper in the reduced state**.**
3.The student will use a solution of primary standard as the titrant   CO 3

Additional Experiments:
Task-11 : Determination of hardness of ground water sample
Objective: 1. Determine the total hardness (total calcium and magnesium ion concentration).

2. Learn how to titrate with EDTA solution.

3.Determine permanent hardness and the temporary hardness   CO1

Task-12: pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base

Objective: 1. To perform a pH metric titration of an acidic solution of known molarity.

2. To graph the volume of base added vs. the pH and to determine the equivalence point

3. To calculate the morality of the basic solution   CO 2

Text Book(s):

1.A Textbook of Quantitative Analysis, Arthur J. Vogel.

2. Jain & Jain. Engineering Chemistry: Dhanapathrai Publications., 2015.

3.S.S.Dara, Experiments and Calculations in Engineering Chemistry: S-Chand Publications, Revised Edition, 2008.

Reference Book(s):

1. S.K. Bhasin and Sudha Rani, "Laboratory Manual on Engineering Chemistry", DhanpaRai Publishing Company, New Delhi, 2nd edition.

2. Sunitha Rattan, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2nd edition.

21EN1501	ENGLISH LANGUAGE LAB	R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	3		1.5	40	60	100

CO-1: To expose the students to develop knowledge and awareness of English speech sounds, word accent, intonation and rhythm

CO-2: To sensitize the students to the nuances of English speech sounds, word accent, intonation and thythm

CO-3: To develop strategies appropriately to improve Listening skills and Spoken Skills

CO-4: To improve the descriptive strategies and presentation styles

CO-5: To distinguish main ideas and specific details and make use of contextual clues to infer meanings of unfamiliar words from context.

CO-6: To improve the skills to exhibit the main ideas in the poster

TASK – 1

Introduction to Phonetics: Introduction to Sounds of Speech – Vowels – Consonants.

Practice-1: Listening Sounds of Speech – Vowels – Consonants with a focus on pronunciation
Practice-2: Highlighting the sounds of Vowels and Consonants

TASK – 2

Syllabification: Word Stress, Rules of word stress

Practice-3 : Practice on Intonation and Stress

TASK – 3

Listening Skills : Types of Listening Skills- Active listening and anticipating the speaker

Practice-4 : Listening for Specific & General Details

Practice-5 : Listening Comprehension

TASK – 4

Defining & Describing: Objects, Places and Events - Video Speech Writing- Review (Oral) (Books / Movies / Products..etc.,)

Practice-6 : Describing: Objects and Places

Practice-7 : Describing: Events and Process

Practice-8 : Review (Oral) : Books / Movies / Products..etc.,

Practice-9: Video Speech Writing

TASK – 5

Reading Comprehension- Information Transfer.

Practice-10 : Reading practice for practice of Pronunciation – understanding;

Practice-11 : writing paragraph- graphs, flow charts, diagrams - Information Transfer

TASK – 6

Giving and Asking Directions - Poster Presentation

Practice-12 : Giving and Asking Directions

 Reference Books:
1. A Textbook of English Phonetics for Indian Students 2nd Ed .Balasubramanian (Macmillian),2012
2. SkillfulLevel2Reading&WritingStudent'sBookPack(B1)MacmillanEducational.
3. English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009.CUP
4. Rizvi,Ashraf.M.,EffectiveTechnicalCommunication,McGrawHill,NewDelhi.2005
5. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi.2011.
 Software :
1. Walden ELCS&AECS Lab
2. English In Mind (EIM) all level by Cambridge University
3. Cambridge Pronunciation Dictionary by Cambridge University
4. Oxford Advanced Learners Dictionary, Oxford University

21ES1503			ENGINEERING GRAPHICS				R21

Semester	Hours / Week			Totalhrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	1	4	80	3	40	60	100

Pre-Requisite: Basic Mathematics (Geometry)

Course Objectives:
1. To impart skills on using drawing instruments
2. To convey exact and complete information of any physical object.
3. To Construct Engineering Curves.
4. To Learn and practice basic AutoCAD commands.
5. To Instruct the utility of drafting & modelling packages in orthographic and isometricdrawings

Course Outcomes: At the end of the course, student will be able to:

CO 1	Define the qualities of precision and accuracy in engineering drawing. (BL-1)
CO 2	Draw engineering curves with different methods(BL-3).
CO 3	Develop the orthographic projection of points and straight lines(BL-3)
CO 4	Construct the planes and simple solids.(BL-3).
CO 5	Understand and practice basic AUTOCAD commands (BL-2)

COURSE CONTENT

Part-A Manual Drawing

TASK– 1	**Introduction and Conic sections**	10 Hours

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance; various instruments used, drawing sheet sizes and title block, lettering, BIS conventions, types of lines and dimensioning methods.

Geometrical constructions: simple constructions, construction of Pentagon, Hexagon by general Method only.

Conic Sections:. Types of conics: Ellipse, Parabola and Hyperbola (Eccentricity method only),

TASK–-2	**Orthographic Projections**	10 Hours

Objectives and Principle of projection, Methods of projections, Comparison between first angle and third angle projection.

Projections of points: Projection of points placed in different quadrants.

Projection of straight lines: Fundamental concepts**,** Line parallel, perpendicular and inclined toone and two reference planes placed in first quadrant only.

TASK–3	**Projections of Solids**	15 Hours

Projections of planes: Projection of planes (Triangle, Square, Pentagon, Circle) parallel, Perpendicular and inclined to one and two reference planes placed in first quadrant only.

Types of solids ; Polyhedra, Solids of revolution,

Projections of regular solids (Prisms, Pyramids, Cylinders and Cone),with its axis

Perpendicular to one plane and parallel to other plane, Axis inclined to one plane and parallel to other plane.

TASK–4   **Isometric and Orthographic views**
10Hours
Isometric Projections: Principles, Isometric scale, Isometric views, Conventions, Isometric views of lines, planes, simple solids (Cube, Cylinder, and Cone), and Conversion of Isometric views to Orthographic views.
Part B Computer Aided Drafting
TASK–5   **Introduction to AutoCAD**   17 Hours
Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions. Dimensioning principles and conventional representations.

TASK–6   **Orthographic and Isometric Projections**   18 Hours
Transformation of Isometric Projections into orthographic projections such as simple solids such ascylinder, cone, square prism, pentagonal pyramid
Draw 3D model of mechanical components such as Stepped block, Bush bearing,
Total hours:80 hours

Text Book(s):
  1. Bhatt N.D. "Elementary Engineering Drawing", Charotar Publishers,   2014.
  2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
  3. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech
        Publishers,Chennai,2012.
  4. Engineering Drawing by Dr AVS Sridhar Kumar, Dr. Krishnaiah, T P Vara Prasad.
                          ,Spectrum education, Sun techno Publications, 2019

Reference Book(s):
  1. Engineering Drawing and Graphic Technology -International Edition,
      Thomas E.French, Charles J. Vierck, Robert J. Foster, McGraw-Hill, 2014
  2. Venugopal.K "Engineering Drawing and Graphics", New Age International (P)Ltd., New Delhi,2010

NARAYANA ENGINEERING COLLEGE:GUDUR

21ES1508	Python Programming and Data Science Lab						R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
II	**0**	**0**	**2**	**32**	**1**	**40**	**60**	**100**

Pre-requisite: Programming Knowledge

Course Objectives:
1. To gain knowledge on python program basics
2. To prepare students for building programs using control statements
3. To prepare students for solving the problems involving functions and files.
4. To gain knowledge Python Numpy module to solve complex mathematical problems involving matrices.
   . To gain Knowledge of data cleaning using Pandas.

Course Outcomes: After successful completion of the course, the student will be able to:

CO1	Understanding and use of python- Basic Concepts**(BL -2)**
CO2	Solve the problems using python Iterative Statements**(BL -3)**
CO3	Understand the concepts of files, modules**(BL -2)**
CO4	Solve the Numerical problems that involve Matrices **(BL -3)**
CO5	Provide solutions for data cleaning tasks**(BL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	1	2										1	
CO2	2	3	2	2									2	1
CO3	2	2	3	2	2								3	2
CO4	2	2	2	1	1								3	2
1-Low, 2-Medium, 3- High														

COURSE CONTENT

Task-1 - Python Basics (4 H)
1. Running instructions in Interactive interpreter and a Python Script
2. Write a program to purposefully raise Indentation Error and Correct it
3. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
4. Write a program to convert a Binary number to Decimal number and verify if it is a Perfect number.   CO 1

Task-2 - Conditional Statements (2 H)
1. Write a program to determine if a given string is a Palindrome or not
2. Write a program for Fibonacci sequence is generated by adding the previous two terms by starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89,   CO 1

TASK-3 - Functions (2 H)
1. Write a function that draws a Pyramid with # symbols

```
        #
      # # #
    # # # # #
  # # # # # # #
```

2. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions. CO 2

TASK-4 -Strings (4H)

   1. Write a program to use split and join methods in the string and trace a birthday with Dictionary data structure.

Write a program using map, filter and reduce functions   CO 2

TASK-5 - Lists   (2H)

   1. Write program which performs the following operations on lists. Don't use built-in functions

          a) Updating elements of a list

          b) Concatenation of list's

          c) Check for member in the list

          d) Insert into the list

          e) Sum the elements of the list

          f) Push and pop element of list

          g) Sorting of list

          h) Finding biggest and smallest elements in the list

          i) Finding common elements in the list   CO 2

TASK-6 - Files   (4H)

   1. Write a program to read the file content and count the number of vowels, consonants, digits and special characters in a given file.
   2. Write a program to perform the following operations in Files:
     a. Copy from one file to another file

     Merge two files   CO3

TASK-7 –- Introduction to Numpy (4 H)

   1. Write a NumPy program to compute the outer product of two given vectors.

     Write a Numpy program to compute the determinant of a given square array.   CO 4

TASK-8 - Introduction to Numpy (2H)

   1. Write a Numpy program to calculate the difference between the maximum and the minimum values of a given array along the second axis.

Expected Output:

Original array:

[[0 1 2 3 4 5]

[6 7 8 9 10 11]]

Difference between the maximum and the minimum values of the said array:[5 5]   CO 4

TASK-9 - Introduction to Pandas (4 H)

   1. Write a Pandas program to convert a Panda module Series to Python list and it's type.

Write a Pandas program to display most frequent value in a given series and replace everything else as 'Other' in the series   CO 5

TASK-10 - Introduction to Pandas (4 H)

   1. Write a Pandas program to identify the column(s) of a given DataFrame which have at least one missing value.

Write a Pandas program to replace NaNs with a single constant value in specified columns in a DataFrame.   CO 5

ADDITIONAL EXPERIMENTS

TASK – 11 – Lists, Strings, Tuples
1. Write a python programs on lists
2. Write a python program on strings
3. Write a python program on tuples   CO2

TASK – 12 – Pandas
1. Write a Pandas program to interpolate the missing values using the Linear Interpolation method in a given DataFrame.

Write a Pandas program to import excel data (coalpublic2013.xlsx) into a Pandas DataFrame.   CO5

Text Book(s):
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017
2. Learning Python, Mark Lutz, Orielly, 5th Edition, 2013

Reference Book(s):
1. Think Python, Allen Downey, Green Tea Press, 2nd Edition
2. Core Python Programming, W.Chun, Pearson, 2nd Edition, 2007
3. Fundamentals of Python, Kenneth A. Lambert, Cengage Learning, 1st Edition, 2015
4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019
5. Allen B. Downey, "Think Python", 2ndEdition, SPD/O'Reilly, 2016
6. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
7. Michael Dawson, ―Python Programming for absolute beginners, 3rd Edition, CENGAGE Learning Publications, 2018.
8. Taming Python by Programming, Jeeva Jose,Khanna Publishing House, 1st Edition, 2018
9. Introduction to Computing and Problem Solving with Python, J. Jose, Khanna Publications, 1st Edition, 2019.
10. Guido Van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

SEMESTER III

Category	Course Title	L	T	P	Total	Credits	Int. Marks	Ext. Marks	Total Marks
		Contact Periods per week					**Scheme of Examination Max. Marks**		
BS	Complex Analysis and Numerical Methods	3	0	0	3	3	40	60	100
ES	Data Structures and Algorithms	3	0	0	3	3	40	60	100
ES	Electronic Devices and Circuits	3	0	0	3	3	40	60	100
PC	Signals and Systems	3	0	0	3	3	40	60	100
PC	Digital Logic Design	2	0	0	2	2	40	60	100
PC	Network Analysis	3	0	0	3	3	40	60	100
ES	Electronic Devices and Circuits Lab	0	0	2	2	1	40	60	100
ES	Data Structures and Algorithms Lab	0	0	3	3	1.5	40	60	100
SC	Career Competency Development I	0	0	2	2	1	40	60	100
SC	Value Added Course/ Certificate Course I	0	0	0	0	1	40	60	100
MC	Mandatory Course II	2	0	0	2	0	00	00	00
	Counselling/Mentoring	0	0	1	1	0	--	--	--
	Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
	Activity Point Programme	During the Semester					20 Points		
	Total	19	0	10	29	21.5	400	600	1000

21MA1005   COMPLEX ANALYSIS & NUMERICAL METHODS   R-21

Semester

III	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
20MA1005	3	0	0	48	3	40	60	100

Pre-requisite: inter mathematics

Course Objectives: This course aims to providing the knowledge for the student about on

1. Special functions and
2. Complex Variables Differentiation & Integration.
3. Various numerical methods for solving an algebraic and transcendental equations,
4. To interpolating the values through the polynomials,
5. To evaluation of integral values through the numerical methods
6. To solve ordinary differential equations through the numerical methods.

Course Outcomes: After successful completion of the course, the student will able to:

CO 1	Apply the techniques of special functions in various engineering problems	(L-3)
CO 2	Evaluate derivatives of complex functions.	(L-5)
CO 3	Evaluate improper integrals of complex functions using Residue theorem.	(L-5)
CO 4	solve algebraic and transcendental equations and interpolate the trend value	(L-3)
CO 5	To Solve ordinary differential equations by using numerical methods	(L-3)

CO-PO Mapping														
	PO												**PSO**	
CO	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3												
CO2	3	3	2											
CO3	3	3												
CO4	3	3	2											
CO5	3	3												
1- Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   Special Functions   Hours:10

Introduction to special functions, Beta function- Definition of beta function and its properties (with proof), Other forms of Beta function (with proof), Gamma function- Definition of Gamma function and its properties (with proof), Relation between Beta and Gamma functions (with proof)

  At the end of the Module 1, students will be able to:

1.Understand Beta and Gamma functions and its relations.	(L-3)
2.Explain the applications and the usefulness of these special functions.	(L-2)
3.Use Beta & Gamma functions to evaluate different types of integral problems	(L-1)
4.Apply the techniques of special functions in various engineering problems.	(L-3)

MODULE -2   Complex variables – Differentiation   Hours:10

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate-construction of analytic function by Milne -Thomson method.

At the end of the Module 2, students will be able to:
1. Understand functions of Complex variable and its properties.   (L-3)
2. Evaluate derivatives of complex functions.   (L-5)
3. Understand the analyticity of complex functions.   (L-3)

MODULE-3   Complex Variables – Integration   Hours:8

Line integral-Contour integration, Cauchy's integral theorem (without proof), Cauchy's Integral formula (without proof), zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi-circle with f(z) not having poles on real axis).

At the end of the Module 3, students will be able to:

Understand the integration of complex functions.   (L-3)

Apply Cauchy's integral theorem and Cauchy's integral formula.   (L-3)

Understand singularities of complex functions.   (L-3)

Evaluate improper integrals of complex functions using Residue theorem.   (L-5)

MODULE-4   Solution of Algebraic, Transcendental Equations & Interpolation
**   Hours:10**

Introduction-Bisection method, Regula-falsi method, Newton Raphson method, Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae.

At the end of the Module 4, students will be able to:
1. Solve an algebraic or transcendental equation using an appropriate numerical method.   (L-3)
2. Understand the use of different operators in   interpolation.   (L-2)
3. Find interpolating polynomials using Newton's forward and backward formulae.   (L-2)
4. Understand the theoretical and practical aspects of the use of numerical methods. (L-2)

MODULE-5   Numerical integration & Solution of ordinary differential equations
**   Hours:10**

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method- Runge-Kutta Method.

At the end of the Module 5, students will be able to:

Apply numerical differentiation and integration techniques to various engineering problems. (L-3)

Understand the techniques of Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule and its applications   (L-2)

Work out numerical differentiation whenever and wherever routine methods are not   (L-1)

Apply Runge-kutta method in engineering problems   (L-3)

Total hours:48

Text Book(s):
1. B.S. Grewal, "Higher Engineering Mathematics", 44th edition ,Khanna Publishers,2017.

2 Ramana B.V., "Higher Engineering Mathematics", McGraw Hill Publishers,2017..
3. S.S. SASTRY, Introductory Methods of Numerical Analysis, 5/e, PHI learning private limited, 2012.

Reference Book(s):

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley.
2. Veerarajan T., "Engineering Mathematics", Tata McGraw-Hill.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.

NARAYANA ENGINEERING COLLEGE:GUDUR

21ES1009	DATA STRUCTURES AND ALGORITHMS	R21

Course Code	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1   **Introduction to Data Structures**   **9H**

Introduction: Overview of Data Structures, Implementation of Data Structures, Algorithm Specifications, Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off, Arrays.
Searching: Introduction, Basic Terminology, Linear Search and Binary Search Techniques and their complexities.

MODULE – 2   **Stacks and Queues**   **9H**

Stacks: Introduction, Representation of a Stack, Stack Operations, Applications of Stacks. **Queues:** Introduction, Representation of a Queue, Queue Operations, Various Queue Structures: Circular Queue, Double Ended Queue, Priority Queue, Applications of Queues.

MODULE – 3   **Linked Lists and Sorting**   **10H**

Introduction, Singly linked lists, Doubly Linked Lists, Circular Linked Lists, Linked Stacks and Queues, Applications of Linked Lists. **Sorting:** Introduction, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort

MODULE – 4   **Trees**   **10H**

Introduction, Basic Terminologies, Definition and concepts, Representation of Binary Tree, operations on a Binary Tree, Binary Search Tree, Height balanced Binary Tree, B Trees.

MODULE – 5   **Graphs & Hashing**   **10H**

Graphs: Introduction, Graph Terminologies, Representation of Graphs, Graph Operations, Shortest Paths, Topological Sorting, Minimum Spanning Trees – Kruskal's and Prim's algorithms. Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Total hours:48 hours

TEXTBOOK:

1. D. Samanta, **Classic Data Structures**, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.

2. Ellis Horowitz and Sartaj Sahni, **Fundamentals of Data Structures in C**, 2nd Edition, Universities Press, 2008.

REFERENCES:

1. Data Structures A Pseudo code Approach with C, Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

2. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu, Radhika Raju Palagiri, Pearson, 2010.

3. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, Careermonk Publications, 2016

4. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2014

5. Data Structures, RS Salaria, Khanna Publishing House, 3rd Edition, 2017

6. Data Structures through C, Yashwant Kanetkar, BPB Publications, 3rd Edition, 2019

7. Expert Data Structures with C, RB Patel, Khanna Publications, 2019

NARAYANA ENGINEERING COLLEGE:GUDUR							
21ES1010 ELECTRONIC DEVICES AND CIRCUITS							**R21**
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**	
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
III	**3**	**0**	**0**	**48**	**3**	**40**	**60**	**100**

Pre-requisite: Semiconductor Physics.

Course Objectives:

1. To study the operation and characteristics of PN junction diode and special semiconductor devices..
2. To familiarize the design and analysis of rectifiers with filters.
3. To describe the characteristics of BJT and its configurations.
4. To analyze the biasing circuits of BJT.

. To study the characteristics of MOSFET.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   **Illustrate** the **V-I characteristics of P-N junction Diode and special semiconductor devices**. (BL-2)

CO 2   **Demonstrate** the **performance of rectifiers with and without filters**. (BL-2)

CO 3   **Compare** the **operating characteristics of BJT** (BL-3)

CO 4   **Analyze** the **BJT biasing techniques**. (BL-4)

CO 5   **Interpret** the **characteristics of MOSFET**. (BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1											3	
CO2	3	2	3										3	
CO3	3	2											3	
CO4	3	3	2										2	
CO5	3	1	1										3	
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   SEMICONDUCTOR DIODE&SPECIAL SEMICONDUCTOR DEVICES

10 Hrs

Semiconductor Diode: Principle and Structure of PN junction diode, Open circuited PN junction diode, Energy band diagram of PN diode, Diode current Equation, Volt-Ampere Characteristics, Temperature dependence of Volt-Ampere Characteristics, Diode capacitance.

Special Semiconductor Devices: Principle of operation and Characteristics of Varactor diode, Tunnel Diode, Photo diode, LED, SCR

At the end of the Module 1, student will be able to:

1.Define PN junction diode (BL-1)

2. Explain the operation of PN junction diode for both forward and reverse bias. (BL-2)

3. Derive the expression for transition and diffusion capacitance (BL-2)

4. Explain V-I Characteristics of various special diodes. (BL-2)

MODULE -2   RECTIFIERS & FILTERS   10 Hrs

Diode applications: P-N junction diode as a rectifier - Half Wave Rectifier, Full Wave Rectifier,

Bridge Rectifier, rectifier parameters, Harmonic components in Rectifier Circuits. Clippers and Clampers (Qualitative Treatment only)

Filters: Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters, bleeder resistor.

At the end of the Module 2, students will be able to:
1. Explain the operation of a bridge rectifier. (BL-2)
2. Analyze the performance of rectifiers with and without filters. (BL-4)
3. Design half wave and full wave rectifier circuits. (BL-4)
4. Differentiate various rectifier circuits in terms of their parameter metrics.(BL-2)
5. Explain the importance of bleeder resistor (BL-2)

MODULE-3   BIPOLAR JUNCTION TRANSISTOR   9 Hrs

Bipolar junction Transistor : Construction, Principle of Operation, transistor current components , transistor configurations, Transistor h-parameter model, calculation of h-parameters from characteristics, transistor as a switch, transistor as an amplifier.

At the end of the Module 3, students will be able to:
1. Discuss the current components and their relationships in BJT (BL-2)
2. Explain principle, operation and applications of BJT (BL-2)
3. Describe input and output Characteristics of BJT (BL-2)
4. Differentiate BJT configurations (CB,CC,CE) (BL-2)

MODULE-4   TRANSISTOR BIASING   10 Hrs

Transistor Biasing: Need for biasing, operating point, load line analysis, Stabilization against variations in I_{CO}, V_{BE} and β, biasing and stabilization techniques: fixed bias, collector to base bias, voltage divider bias, bias compensation techniques, thermal runaway, heat sink and thermal stability.

At the end of the Module 4, students will be able to:
1. Explain principle, operation and applications of MOSFET (BL-2)
2. Describe the operation and characteristics of Depletion MOSFET. (BL-2)
3. Explain the operation and characteristics of Enhancement MOSFET. (BL-2)
4. Differentiate enhancement and depletion mode MOSFET. (BL-2)

MODULE-5   METAL OXIDE SEMICONDUCTOR FIELD-EFFECT TRANSISTOR   9Hrs

MOSFET: Construction of depletion mode and enhancement mode of NMOS and PMOS, Drain characteristics of MOSFET, Transfer Characteristics of MOSFET, MOSFET as a Switch, CMOS Inverter and it's Characteristics.

At the end of the Module 5, students will be able to:
 1.Define biasing and stabilization (BL-1)
 2.Explain the importance of thermal stability (BL-2)
 3.Analyze the stabilization techniques.(BL-4)
 4. Differentiate compensation techniques. (BL-2)

Total hours:48 Hours

Text Book(s):
1. 1. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2. L. Boylestad and Louis Nashelsky (2006), Electronic Devices and Circuits, 9th Edition, Pearson/Prentice Hall
3. Electronic Devices and Circuits by Lal Kishore, BS Publications.

Reference Book(s):
1. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
2. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj (2008), Electronic Devices and Circuits, 2nd edition, Tata McGraw Hill, New Delhi.

21EC2003				Signals and Systems				R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite:

‣ knowledge on Integration, Differentiations and Transforms

Course Objectives:

- To understand the mathematical description and representation of continuous and discrete-time signals and systems.
- To study the frequency representation of periodic signals.
- To characterize signals and systems using frequency domain methods.
- To study sampling theorem and to convert continuous-time signals to discrete-time signals with different techniques and vice-versa.

‣ To analyze continuous and discrete-time signals and systems using Laplace & Z- Transform mathematical tool.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Understand the mathematical description and representation of continuous and discrete-time signals and systems.**(BL-2)**

CO 2 Solve the problems based on the concepts of Fourier series and properties.**(BL-3)**

CO 3 Analyze the frequency spectra of various continuous and discrete-time signals using Fourier transform methods**. (BL-4)**

CO 4 Apply sampling theorem to convert continuous-time signals into discrete-time signals with different techniques and reconstruct back**. (BL-3)**

CO 5 Apply Laplace & Z-Transform as mathematical tool to continuous and discrete-time signals and systems.**(BL-3)**

3. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

CO-PO Mapping														
	PO												PSO	
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1		1							1	1	
CO2	2	2	2	1	1							1	2	
CO3	2	2	2	2	1							1	2	
CO4	2	2	2									1	1	
CO5	2	2	2	2	1							1	2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1 INTRODUCTION TO SIGNALS AND SYSTEMS   9 Hrs

 SIGNALS AND SYSTEMS: Basic definitions and classification of Signals**,** Basic operations on signals, Classification of Continuous-Time and Discrete-Time Systems, Basic System Properties,

Linear Time-Invariant Systems - Discrete-Time LTI Systems, Convolution Sum, Continuous-Time LTI Systems Convolution Integral, Properties of Linear Time-Invariant Systems.

At the end of the Module 1, students will be able to:

1. Understand classifications of the signals and systems. **(BL-2)**
2. Explain continuous and discrete time signals. **(BL-2)**
3. Understand the concept of convolution. **(BL-2)**

MODULE -2   FOURIER SERIES   8 Hrs

Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Properties of CT Fourier Series, Trigonometric Fourier Series and Exponential Fourier Series with examples, Complex Fourier spectrum, Fourier series representation of a periodic signals.

At the end of the Module 2, students will be able to:

1. Apply Fourier series for the periodic signals. **(BL-3)**
2. Solve problems by using Fourier series properties. **(BL-3)**
3. Sketch the complex Fourier spectrum. **(BL-3)**

MODULE-3   FOURIER TRANSFORMS   10 Hrs

Deriving Fourier Transform from Fourier series, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of CT Fourier Transform, Systems characterized by Linear constant coefficient differential equations. The Magnitude-Phase Representation of the Fourier Transform, The Magnitude-Phase Representation of the Frequency Response of LTI Systems**.** Definition, Computation and properties of DTFT for different types of signals and systems.

At the end of the Module 3, students will be able to:

1. Analyze the periodic and aperiodic signals by applying Fourier transforms. **(BL-4)**
2. Interpret the Magnitude-Phase Representation of F.T & LTI Systems. **(BL-2)**
3. Analyze the spectral characteristics of signals using Fourier transform. **(BL-4)**

MODULE-4   SAMPLING   7 Hrs

Representation of a Continuous Time Signal by its Samples - Sampling Theorem, Reconstruction of a Signal from its Samples Using Interpolation, types of sampling-natural sampling, flat- top sampling and impulse sampling, Effect of under sampling -Aliasing.

At the end of the Module 4, students will be able to:

1. Illustrate the representation of a Continuous Time Signal by sampling. **(BL-2)**
2. Understand the reconstruction of a sampled signal using Interpolation. **(BL-2)**
3. Solve problems for nyquist interval and nyquist rate. **(BL-3)**

MODULE-5   LAPLACE TRANSFORMS & Z-TRANSFORMS   14 Hrs

Definition, Region of Convergence, Properties, Inverse Laplace Transform, Relationship between Fourier and Laplace Transforms, Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform .

Definition**,** Region of Convergence, Properties of the z-Transform, Inverse z-Transform, Relation between Fourier and Z Transforms, Common z- Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms**.**

At the end of the Module 4, students will be able to:

1. Understand the properties of Laplace transform. **(BL-2)**
2. Analyze the discrete-time signals and systems using Z - transforms. **(BL-04)**
3. Interpret the relationship between Fourier and Z - Transforms. **(BL-02)**
4. Find the stability of the systems using ROC. **(BL-01)**

Total hours:48 Hours

Text Book(s):

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2ndEdition, PHI, 2009.

21EC2001   DIGITAL LOGIC DESIGN   R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge on number system and algebra.

Course Objectives:
1. To study the basic concepts of number systems and binary codes.
2. To minimize Boolean expressions using map and Q-M method.
3. To design combinational and sequential circuits.
4. To familiarize Registers &counters using Flip-Flops.
5. To understand the concept of memory organization

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Use number systems, binary codes and Boolean algebra to implement digital circuits **(BL-3)**

CO 2   **Apply** minimization techniques on Boolean expressions. **(BL-3)**

CO 3   **Design** combinational circuits using logic gates. **(BL-3)**

CO 4   **Analyze** synchronous sequential circuits. **(BL-4)**

CO 5   **Classify** the memories and programmable logic devices. **(BL-2)**

2. Simon Haykin and Van Veen, "Signals & Systems", 2ndEdition, Wiley, 2005.

3. Signals and Systems, J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, TMH

Reference Book(s):

 1. Simon Haykin and B. Van Veen, Signals & Systems, John Wiley, 2nd Edition, 2010.

2. A. Anand Kumar, Signals & Systems, PHI, 2011.

3. B.P. Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2nd Edition, 2013.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1	1									1	
CO2	1	2	1										1	
CO3	2	2	2	1	1							1	1	1
CO4	1	2	2	1	1							1	2	1
CO5	1		1									2	1	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   NUMBER SYSTEMS & BOOLEAN ALGEBRA   10 h

Number Systems: Introduction, Number Systems, Number base conversions, 1's and 2's Complements, BCD code, Excess -3 codes, Gray code, ASCII code, Error Detection and Correction Codes. Boolean Algebra: Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, Logic gates, implementation of Boolean functions using logic gates

At the end of the Module 1, students will be able to:
1. List number systems. (BL-1)
2. Illustrate different code conversions. (BL-2)
3. List Theorem's and properties of Boolean algebra (BL-1)
4. Explain the functionality of logic gates(BL-2)

MODULE -2   SIMPLIFICATION OF BOOLEAN FUNCTIONS   10 h
Introduction, Karnaugh map simplification, Don't care conditions, Prime Implicants, Quine-McCluskey method Simplification, NAND & NOR Implementations, Two Level Implementations.
At the end of the Module 2, students will be able to:
1. Apply basic laws and De Morgan's theorems to simplify Boolean expressions(BL-3)
2. Explain map and Q-M method to minimize Boolean expressions. (BL-2)
3. Implement Boolean expression using universal gates. (BL-3)
4. Implement Boolean expression using two level methods. (BL-3)

MODULE-3   COMBINATIONAL CIRCUITS   9 h
Introduction, Design Procedure, Adders, Sub tractor, Binary Adder-Sub tractor, BCD Adder, Binary Multiplier, Magnitude Comparator, Multiplexers, De-multiplexers, Decoders, Encoders and Code Converters.
At the end of the Module 3, students will be able to:
1. Design combinational logic circuits. (BL-3)
2. Implement Boolean expression using multiplexer. (BL-3)
3. Implement higher order MUX using lower order MUX.(BL-3)
4. Design code converters using gates. (BL-3)

MODULE-4   SEQUENTIAL CIRCUITS   10 h
Introduction, Latches, Flip-flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-Flop conversions, Design of Synchronous Sequential Circuits: State Equations, State Table, State reduction, State assignment, State diagram , Mealy and Moore machine models, Registers, Shift Registers, Counters: Synchronous counters, Asynchronous counters & other counters.
At the end of the Module 4, students will be able to:
1. Describe behavior of latches & flip flops. (BL-2)
2. Analyze the flip-flop conversions(BL-3)
3. Analyze synchronous sequential circuits. (BL-3)
4. Explain the design procedure of sequential circuits(BL-2)
5. Design synchronous sequential circuits using state reduction & assignment process. (BL-3)

MODULE-5   MEMORY &PROGRAMMABLE LOGIC DEVICES   9 h
Introduction, Random Access Memory, Types of RAM, Memory decoding, Read Only Memory, Types of ROM, Flash memory, Programmable Logic Devices (PLDs): Basic concepts, Programmable Read Only Memory (PROM), Programmable Array Logic (PAL) and Programmable Logic Array(PLA).
At the end of the Module 6, students will be able to:
1. Explain PROM, PAL and PLA. (BL-2)
2. Compare digital logic families. (BL-2)
3. Illustrate the characteristics of digital IC's . (BL-2)
Total hours: 48 hours

Text Book(s):
1. M. Morris Mano, M.D. Ciletti, "Digital Design", 5th edition, Pearson, 2018.
2 John F Wakely Digital Design Principles And Practices, Pearson Publication , Fourth edition
3 Anil K. Maini, "Digital Electronics: Principles, Devices and Applications", Willey, 2007
Reference Book(s):
1. Anand Kumar, Switching Theory and Logic Design, PHI,2008

| **21EC2002** | **NETWORK ANALYSIS** | | | | | | **R21** |

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	45	3	40	60	100

Pre-requisite: Fundamental of Basic Electrical circuits

Course Objectives:

To understand frequency response in electrical circuits

The capability to analyze the Low and High Pass filter.

Evaluate the behaviour of networks for transient analysis of first order and second order.

Analyze and synthesize networks using Laplace transforms.

Different types of two-port network analysis using network parameters, with different types of connections.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Describe the Series resonance ,parallel resonance and analyze the locus diagramsof R,L,C(BL-2)

CO 2 Analyze the DC transients of R,L,C (BL-4)

CO 3 Analyze the AC transients of R,L,C (BL-4)

CO 4 Derive Two port network parameters of Electrical circuits(BL-3)

CO 5 Analyze the Filters and Network functions(BL-4)

2. John. M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education (India Private Limited), 2012.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									1	1
CO2	3	2	2	2									1	1
CO3	3	2	2	2									1	1
CO4	3	3	2	2									1	1
CO5	3	3	2	2									1	1

COURSE CONTENT

MODULE – 1 RESONANCE 9hrs

Introduction, Definition of quality factor **Q** of inductor and capacitor, Series resonance, Bandwidth of the series resonant circuits, Parallel resonance (or anti-resonance), Locus diagram for Series R-L, R-C, R-L-C and Parallel Combination with Variation of Parameters.

At the end of the Module 1, students will be able to:

1. Explain the series and parallel resonance.(BL-2)
2. Understand the effect of resonance on series and parallel resonance circuits.(BL-2)
3. Understand the concept of locus diagrams. (BL-2)

MODULE -2   DC TRANSIENT ANALYSIS   9hrs

Transient Response of R-L, R-C, R-L-C Series and Parallel Circuits for D.C Excitation-Initial
Conditions-Solution Method Using Differential Equations and Laplace Transforms, Response of R-L
& R-C Networks to Pulse Excitation.
At the end of the Module 3, students will be able to:
        Explain the transient phenomenon in DC excitations. (BL-2)
        Explain Application of Laplace transform for solution of D.C transient circuits. (BL-2)
Compare the classical method and Laplace transform approach in sinusoidal excitations. (BL-2)

MODULE -3   AC TRANSIENT ANALYSIS   9hrs
Transient Response of R-L, R-C, R-L-C Series and Parallel Circuits for Sinusoidal Excitations-Initial
Conditions-Solution Method Using Differential Equations and Laplace Transforms.
At the end of the Module 4, students will be able to:
    Explain the transient phenomenon in AC excitations. (BL-2)
    Understand AC transient analysis in electrical circuits to know the power system stability.
    (BL-2)
    Develop knowledge on R-L, R-C and R-L-C circuit analysis in A.C. (BL-3)

MODULE -4   TWO PORT NETWORKS   9Hrs
Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and
their Relations, Reciprocity and Symmetry conditions, Concept of Transformed Network, Two Port
Network Parameters Using Transformed Variables.
At the end of the Module 5, students will be able to:
        Understand the concept of two port network theory. (BL-2)
        Verify the Reciprocity and Symmetry conditions for the given two port network. (BL-1)
        Understand the concept of Transformed Network (BL-2)

MODULE-5   FILTERS & NETWORK FUNCTIONS   9HRS
Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters
design – Attenuators – Network functions for one port and two port networks, pole-zeros of network
functions and network stability
At the end of the Module 6, students will be able to:
1. Explain the types of filters. (BL-2)
2. Explain the parameters for the design of various filters. (BL-2)
3. Explain the poles and zeros of a given transfer function. (BL-2)
Total hours:45 hours

Text Book(s):
1. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", TMH, 5th
Edition, New Delhi, 2015.
2. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015
Reference Book(s):
1. S.Sivanagaraju, G.Kishor & C.Srinivasa Rao, "Electrical Circuit Analysis", Cengage Learning, 1st
Edition, 2010.
2. A. Chakrabarti : Circuit Theory (Analysis and Synthesis), Dhanpat Rai &Co
3. Joseph A. Edminister and Mahmood Nahvi, "Electric Circuits Schaum"s Outline Series", 6th
Edition, Tata McGraw-Hill, 2014, New Delhi.

21ES1514	ELECTRONIC DEVICES AND CIRCUITS LAB					R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
III	0	0	2	36	1	40	60	100

Pre-requisite: Basic knowledge on semiconductor physics.

Course Objectives:

1. To Gain Knowledge on basic electronic devices.
2. To Observe the characteristics of various electronic devices.
3. To prepare students for designing various biasing circuits

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Demonstrate the basic characteristics and applications of basic electronic devices. **(BL-02)**

CO 2 Draw the characteristics of electronic devices by plotting graphs**(BL-02)**

CO 3 Analyze the Characteristics of UJT, BJT, FET, and SCR **(BL-04).**

CO 4 Design FET based amplifier circuits/BJT based amplifiers for the given specifications**.(BL-03)**

CO-PO Mapping														
	PO												**PSO**	
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2													
CO2	2													
CO3	2	2		1									1	
CO4	2	2	2										1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT

Task-1: PN Junction Diode

 Objective: To Verify the Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs.   CO1

Task-2: ZENER DIODE

Objective: To design a Zener diode based voltage regulator against variations of supply and load.

Task-3: Half Wave Rectifier

Objective: To design a half wave rectifier for the given specifications with and without filters and verify experimentally and draw suitable graphs.   CO 3

Task-4: FULL WAVE RECTIFIER

Objective: To design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. And draw suitable graphs   CO 3

Task-5: COMMON EMITTER CONFIGURATION

Objective: To Verify the input and output characteristics of BJT in Common Emitter configuration experimentally and find the required h – parameters from the graphs   CO 3

Task-6:Common Emitter Configuration

 Objective: To Verify the input and output characteristics of BJT Common Emitter

configuration experimentally and find h – parameters from the graph   CO3

Task-7: Common Collector configuration
 Objective: To Verify the input and output characteristics of BJT Common Collector
configuration experimentally and find h – parameters from the graph   CO3

Task-8: MOSFET Characteristics
 Objective: To Study and draw the Volt Ampere characteristics of MOSFET   CO 4

Task-9: MOSFET As Switch
 Objective: To Study the Switching characteristics.   CO 4

Task-10:LED Characteristics   CO4
 Objective: To Study the characteristics of LED

Additional Experiments
Task-11: VOLTAGE- DIVIDER BIAS CIRCUIT USING BJT.
Objective: To Design and analyse the voltage- divider bias/self bias circuit using BJT   CO 1

Task-12: CLIPPERS AND CLAMPER CIRCUITS
Objective: To Verify clipping and clamper circuits using PN junction diode and draw the suitable
graphs   CO 1

Text Book(s):
   1. Fundamentals of Electronic Devices and Circuits Lab Manual By David Bell
   2. Electronics Lab Manual By Navas K. A
   3. Fundamentals of Electronic Circuit Design, Getting Started: MultiSim Textbook Edition
      byDavid J. Comer, Donald T. Comer.

Reference Book(s):
   1. A Guide to Circuit Simulation and Analysis Using PSPICE by Paul W. Tuinenga
   2. Ben G. Streetman, Sanjay Banerjee , Solid State Electronic Devices, Pearson Prentice Hall,
      2006.
   3. Robert T. Paynter, "Introductory Electronic Devices and Circuits", Pearson Education, 7th
      Edition
   4. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 5th
      Edition.

Course Code				Hours / Week	Total hrs	Credit		Max Marks	
SEMESTER	L	T	P			C	CIE	SEE	TOTAL
III	0	0	3	48		1.5	40	60	100

COURSE CONTENT

TASK-1   **3H**

1. Write a Program to Implement the following Searching Algorithms:

a)Linear Search   b) Binary Search

TASK– 2   **6H**

  1. Implement the following using arrays:

      A. Write a Program to Implement Stack Operations

      B. Write a Program to convert a given infix expression into its Postfix using stack.

   2.Write a Program to evaluate the Postfix Expression using stack

TASK-3   **3H**

1. Write a Program to Implement Queue Operations using Arrays

  2.Write a Program to Implement Circular Queue Operations using Arrays

TASK-4   **6H**

1. Write a Program to implement the operations of Singly Linked List

2.Write a Program to implement the operations of Doubly Linked List

TASK-5   **6H**

  1. Write a Program to implement stack operations using linked list

2.Write a Program to implement the operations of Circular Singly Linked List

TASK-6   **3H**

  1.Write a Program to Sort the set of elements:

a) Insertion Sort   b) Quick Sort

TASK-7   **3H**

1. Write a Program to Sort the set of elements:

a)Merge Sort   b) Heap Sort

TASK-8   **6H**

1. Write a Program to implement the following on trees

     a) Insertion and deletion operations

     b) Traversals

2.Write a Program to implement Binary Search Tree Operations.

TASK-9   **6H**

1. Write a Program to implement the following Graph Traversal Algorithms:

a) Depth first traversal b) Breadth first traversal

TASK-10   **6H**
1. Write a Program to implement the following Minimum Spanning Tree Algorithms:

a) Kruskal's Algorithm   b) Prim's Algorithm
   Additional Experiments:
   1. Write Program to Implement Fibonacci Search

   2. Write a Program to Implement Double Ended Queue Operations by using Array

    3.Write a Program to Implement Tree traversal Techniques
   4.Write a Program to Implement Radix Sort

                                                                    48 hours

   TEXTBOOK:
   1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.

   2. Horowitz Sahni and Anderson-Freed ―Fundamentals of Data Structures in C. 2nd Edition, Universities Press, 2008.

   REFERENCES:
   1. Richard F. Gilberg& B. A. Forouzan ―Data Structures A Pseudocode Approcah with C, Second Edition, CENGAGE Learning.

   2. Ananda Rao,Data Structures and Algorithms Using C++,Akepogu, Radhika Raju Palagiri, Pearson, 2010.

   3. Mark Allen Weiss, Data structure and Algorithm Analysis in C. Addison Wesley Publication. 2006.

SEMESTER IV

Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
		L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
PC	Electronic Circuit Analysis and Design	3	0	0	3	3	40	60	100
PC	Control Systems	3	0	0	3	3	40	60	100
PC	Electromagnetic Theory and Transmission Lines	3	0	0	3	3	40	60	100
PC	Probability theory and Stochastic processes	3	0	0	3	3	40	60	100
OE	Open Elective I	3	0	0	3	3	40	60	100
PC	Electronic Circuit Analysis and Design Lab	0	0	3	3	1.5	40	60	100
PC	Networks and control systems lab	0	0	2	2	1.5	40	60	100
PC	MATLAB and Simulink Lab	0	0	2	2	1.5	40	60	100
SC	Industry Oriented Course I	0	0	0	0	1	100	--	100
SC	Career Competency Development II	0	0	2	2	1	40	60	100
	Counselling/Mentoring	0	0	1	1	0	--	--	--
	Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
	Activity Point Programme	During the Semester					20 Points		
	Total	15	0	12	27	21.5	460	540	1000

21EC2006 ELECTRONIC CIRCUIT ANALYSIS AND DESIGN   R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
IV	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge on concepts of electronic devices.

Course Objectives:

To study the effect of negative feedback on amplifier characteristics.

To design RC & LC oscillator circuits.

To analyze amplifier frequency response at low and high frequencies.

To study coupling schemes and multi stage amplifiers.

To analyze the large signal amplifiers and tuned amplifiers.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Analyze small signal amplifiers at low frequencies and high frequencies.(BL-4)

CO 2   Understand the concept of different negative feedback amplifiers. (BL-2)

CO 3   Understand the working principle of RC & LC oscillators. (BL-2)

CO 4   Analyze various configurations of multistage amplifiers. (BL-4)

CO 5   Learn operation of Power amplifiers and Tuned amplifiers.(BL-2)

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1		1							1	2	
CO2	2	2	1		1							1	2	
CO3	2	2	2	1	1							1	2	
CO4	2	2	2	1	1							1	2	
CO5	2	2	2		1							1	2	
1: Low, 2-Medium, 3- High														

Table header: **CO-PO Mapping**

COURSE CONTENT

MODULE – 1 SMALL SIGNAL LOW FREQUENCY & HIGH FREQUENCY ANALYSIS 10 Hrs

Low Frequency Analysis:

Transistor hybrid model, determination of h-parameters, conversion of h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis.

High Frequency Analysis:

Hybrid- π Common Emitter transistor model, Hybrid π conductance's, Hybrid π capacitances, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, Current gain with resistive load.

At the end of the Module 1, students will be able to:

1. Define Transistor hybrid model.(BL-1)
2. Compare different transistor amplifiers. (BL-2)
3. Explain the effect of coupling and emitter bypass capacitors. (BL-2)

4. Explain the gain bandwidth product of amplifiers.(BL-2)
5. Analyze the Emitter follower frequency response at high frequencies.(BL-4)
6. Analyze the hybrid π CE transistor model. (BL-4)

MODULE -2 FEEDBACK AMPLIFIERS   10 Hrs

Feedback concept, types of feedback, classification, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Determination of input & output impedance of different feedback amplifier, Method of Analysis of Feedback Amplifiers.

At the end of the Module 2, students will be able to:
1. Define negative and positive feedback in amplifiers.(BL-1)
2. Explain the effect of negative feedback on amplifier characteristics.(BL-2)
3. Compare different feedback topologies. (BL-2)

MODULE-3 OSCILLATORS   9 Hrs

Oscillator principle, condition for oscillations, types of oscillators, Generalized analysis of LC Oscillators, Hartley oscillator & Colpitt's oscillator using BJT and FET with relevant analysis, Crystal oscillators, RC-phase shift oscillator & Wein bridge oscillator using BJT with relevant analysis, Frequency & amplitude stability of oscillators.

At the end of the Module 3, students will be able to:
1. Explain condition for oscillations and types of oscillators.(BL-2)
2. Illustrate the operation of RC oscillators.(BL-2)
3. Explain the operation of LC oscillators.(BL-2)
4. Demonstrate the frequency and amplitude stability of oscillators(BL-2)

MODULE-4 MULTISTAGE AMPLIFIERS   10 Hrs

Classification of amplifiers, Methods of coupling, Generalized analysis of Cascaded amplifier, Analysis of two stage RC coupled amplifier with frequency response, Cascode amplifier, Emitter follower, Darlington pair amplifier, Differential amplifier using BJT.

At the end of the Module 4, students will be able to:
Explain the concept of cascading and coupling schemes(BL-2)
Analyze two stage RC coupled amplifier (BL-4)
Summarize the darlington amplifier parameters.(BL-2)
Explain differential amplifier with BJT. (BL-2)

MODULE-5 POWER AMPLIFIERS & TUNED AMPLIFIERS   9 Hrs

Power Amplifiers: Classification, Class A Power Amplifier, Distortion, Second harmonic Distortion, Class B Amplifier, Push- pull amplifier, Complementary Symmetry Class AB Amplifier, Class C Amplifier, Thermal stability and Heat sink.

Tuned Amplifiers: Tuned Circuit, Q-Factor, Single tuned capacitive coupled amplifier, Effect of Cascading Single tuned amplifiers on Band width, Stability.

At the end of the Module 5, students will be able to:
1. List types of power amplifiers & compare the voltage and power amplifier.(BL-2)
2. Discuss heat sinks, thermal stability and distortions.(BL-1)
3. Explain the concept of tuned circuits. (BL-02)
4. Compare different tuned amplifiers. (BL-02)
5. Derive the expression for gain and bandwidth of a single tuned amplifier. (BL-02)

Total hours: 48 Hours

Text Book(s):

1. J. Millman and C.C. Halkias, "Integrated Electronics", McGraw-Hill, 1972.

2. Donald A. Neaman, "Electronic Circuit Analysis and Design", McGraw Hill.

3. Electronic Circuit Analysis 4th Edition – by K. Lal Kishore , BS Publications.

Reference Book(s):

1. Robert T. Paynter, "Introductory Electronic Devices and Circuits", Pearson Education, 7th Edition

2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory" Pearson/Prentice Hall, 9th Edition, 2006.

3. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 5th Edition.

4. Salivahanan, N.Suressh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill, Second Edition

21EC2004 **CONTROL SYSTEMS** **R21**

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
IV	3	0	0	48	3	40	60	100

Pre-requisite: Basics concepts of Electrical Circuits & Basics of Laplace transform

Course Objectives:

1. To understand the merits and demerits of open and closed loop control systems
2. To understand the step response of second order control systems
3. To plot Root locus for the given system transfer function
4. To understand the stability analysis from Bode plot, polar plots
   To understand the merits of state space analysis over time domain analysis

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Solve the transfer function for the given electrical or mechanical systems. **(BL=3)**

CO 2 Explain the control system behaviour in time domain for step signal with various damping's. **(BL=2)**

CO 3 Analyze the stability of given system by using Routh's stability criteria and Root locus plot. **(BL=4)**

CO 4 Analyze the stability of given system by means of Bode plot, polar plot & Nyquist plot **(BL=4)**

CO 5 Analyze controllability & observability for the given state model. **(BL=4)**

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2											2	3
CO2	3	2		2	2								2	3
CO3	3	1			2								2	2
CO4	2	3	2										2	3
CO5	1	1											3	3
1- Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1 INTRODUCTION TO CONTROL SYSTEMS 9 hrs

Examples & Classification of control systems, merits and demerits of Open Loop and closed loop control systems, Effects of positive and negative feedback

Mathematical modelling and transfer function of Electrical and Mechanical systems, Analogous systems.

Control System Components: DC Servo motor, AC Servo motor , Synchro Transmitter & Receiver (2h)

Block diagrams: Block diagram representation of control systems, Block Diagram Reduction Rules .(4h)

Signal flow graph: Definitions, Reduction using Mason's gain formula.(3h)

At the end of the Module 1, students will be able to:

1.Identify the difference between open loop and closed loop systems **(BL=3)**

2.Understand the effect of feedback on system performance **(BL=2)**

3. Apply the block diagram reduction to simplify the given system **(BL=3)**

MODULE-2   TIME RESPONCE ANALYSIS   10hrs

Standard test signals, Time response of first order and second order un damped, under damped, critically damped and over damped systems, Time domain specifications. (6h)

Error Analysis: Steady state Error**,** static error coefficient of type 0,1, 2 systems (3h)

At the end of the Module 3, students will be able to:

4. Understand the importance of basic test signals . **(BL=2)**
5. Understand the Time response of second order system with different dampings . **(BL=2)**

MODULE-3   STABILITY ANALYSIS   10 hrs

Stability: The concept of stability, Routh's stability criterion, limitations of Routh's stability.(4h)

Root locus plot: The root locus concept, construction of root loci, effects of adding poles and zeros to G(s)H(s) on the root loci. (5h)

At the end of the Module 4, students will be able to:

      Understand various stability issues **(BL=2)**

      Apply Routh's stability criteria to given system for stability assessment **(BL=3)**

      construct the Root locus plot for the given system **(BL=3)**

MODULE-4   FREQUENCY RESPONSE ANALYSIS   10 hrs

Introduction, Frequency domain specifications, Bode plot, polar plot, Transfer function from the Bode Diagram, Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots. (8h)

Compensation Techniques: Lag, Lead, Lag-Lead Compensators.(3h)

At the end of the Module 5, students will be able to:

1. Understand various frequency domain specifications. **(BL=2)**
2. Explain the Bode plot for the given system.   **(BL=2)**

      Find the stability of given system from Bode plot and polar plot. **(BL=1)**

MODULE-5   STATE SPACE ANLYSIS   9 hrs

Introduction: Concepts of state, state variables and state model, derivation of state models from differential equations, Diagonalization. (5h)

Solution of state equation: Solving the Time invariant state Equations, State Transition Matrix and it's Properties. (2h)

The concepts of controllability and observability. (2h)

At the end of the Module 6, students will be able to:

      Understand the importance of state space analysis **(BL=2)**

      Find the state model for the given transfer function through various techniques. **(BL=1)**

      Examine the controllability and observability of the given state model. **(BL=1)**

Total hours:48 hours

Text Book(s):

1."Control Systems Engineering, I. J. Nagrath and M. Gopal, New Age International Publishers, 5th edition, 2007, Reprint 2012.

2. Control Systems by A. Anand Kumar, PHI Learning pvt. Ltd., second edition

Reference Book(s):

1. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons PTE Ltd, 2013
2. Modern Control Engineering, Katsuhiko Ogata, PEARSON, 1st Impression 2015.
3. Automatic Control Systems, Farid Golnaraghi and Benjamin. C. Kuo, WILEY, 9th Edition, 2010.
4. N C Jagan, "Control Systems", BS Publications, 1st Edition, 2007.
5. S Palani, "Control Systems Engineering", Tata McGraw-Hill Publications, 1st Edition, 2001.
6. N K Sinha, "Control Systems", New Age International Publishers, 1st Edition, 2002.

NARAYANA ENGINEERING COLLEGE:GUDUR

21EC2005   ELECTROMAGNETIC WAVES AND TRANSMISSION LINES   R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
IV	3	0	0	48	3	40	60	100

Pre-requisite: Vector Calculus, Knowledge of Integration and differentiation.

Course Objectives:

1. To study different coordinate systems, Physical significance of Divergence, Curl and Gradient.
2. To acquire knowledge on electric and magnetic fields in both static and dynamic domains.
3. To understand wave concept with the help of Maxwell's equations.
4. To Analyze reflection and refraction of EM waves and Electromagnetic wave propagation in different media.
5. To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.

Course Outcomes: After successful completion of the course, the student will able to :

CO 1   Apply the Coulomb's law and Gauss law for different charge distributions.**(BL-3)**

CO 2   Apply Biot-Savart's Law and Ampere's Circuit law to static current distributions.**(BL-03)**

CO 3   Apply Maxwell's equations for time varying electromagnetic fields **(BL-3)**

CO 4   Interpret the wave propagation through different mediums. **(BL-2)**

CO 5   Understand the concept of transmission lines & their applications. **(BL-2)**

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1								1	3	
CO2	3	2	1	1								1	3	
CO3	3	2	1	1								1	2	
CO4	1	1		2								1	3	2
CO5	2	1		2								1	2	2
1- Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1   Electrostatics   13 Hrs

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Electric dipole, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

At the end of the Module 1, students will be able to:

   Summarize basic laws of static electric field. (BL-2)

   Derive the Maxwell's equations for electrostatic fields. (BL-3)

   Define currents of conductors and dielectrics (BL-1)

Illustrate Poisson's and Laplace's Equations (BL-2)

MODULE -2   Magneto statics   9 Hrs

Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic torque and moment, Magnetic dipole, Inductances and Magnetic Energy, Illustrative Problems.

  At the end of the Module 2, students will be able to:

        Summarize basic laws of static magnetic field. (BL-2)

        Derive the Maxwell's equations for magnetic fields. (BL-3)

        Solve problems applying laws of magneto statics. (BL-3)

MODULE-3   Maxwell's Equations for Time Varying Fields   6 Hrs

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

  At the end of the Module 3, students will be able to:

         Derive Maxwell's equations for time varying electromagnetic fields. (BL-3)

        Apply the boundary conditions of EM fields at the interface of different media.(BL-3)

        Solve problems on time varying maxwell's equations of electromagnetic fields. (BL-3)

MODULE-4   EM Wave Characteristics   12 Hrs

Wave Equations ,Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

  At the end of the Module 4, students will be able to:

        Derive wave equations for different media. (BL-3)

        Explain concept of polarization of electromagnetic waves. (BL-2)

        Explain principles of reflections and refraction for different incidences. (BL-2)

        Explain concept of power flow using Pointing vector. (BL-2)

MODULE-5   Transmission Lines   8 Hrs

Introduction, Transmission line parameters (Primary and Secondary), Transmission line equations, Input impedance, Standing wave ratio & power, Smith chart & its applications, Applications of transmission lines of various lengths, Micro-strip transmission lines – input impedance, Illustrative Problems.

  At the end of the Module 6, students will be able to:

    1.Study the principles of transmission lines and concept of smith chart.(BL-2)

    2.Derive the input impedance of transmission line.(BL-3)

    3. Calculate the line parameters through problem solving.(BL-3)

    4.Study the applications of different lengths of transmission lines.(BL-2)

Total Hours: 48 Hours

 Text Book(s):

 1. Matthew N.O. Sadiku, S.V.Kulkami, "Elements of Electromagnetics", Oxford Univ. Press, 6th ed., 2015.

 2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th ed., 2006.

NARAYANA ENGINEERING COLLEGE:GUDUR

21EC2007   PROBABILITY AND STOCHASTIC PROCESSES   R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
IV	3	0	0	48	3	40	60	100

Pre-requisite:

- Set theory
- Integrations, differentiations, partial differentiations formulas
- Terms involved in Electronics & Communications

Course Objectives:

1. To understand the basic probability concepts and to find the probability.
2. To acquire skills in handling situations involving more than one random variable and functions of random variables.
3. To analyze the concept of statistical averages.
4. To understand types of random processes, Auto-correlation, Cross Correlation and power spectral density and cross power spectral density
5. To understand the principles of random process relate to system concepts

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Apply the concepts on appropriate sample space to find probabilities (**BL-3)**

CO 2   Calculate statistical averages from probability density functions (pdfs) and probability distribution functions **(BL-3)**

CO 3   Apply the different operations to multiple random variables **(BL-3)**

CO 4   Analyze power spectral density and cross power density spectrum of a random process. **(BL-4)**

CO 5   Analyze the response of a system using principles of random process. **(BL-4)**

Reference Book(s):

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000

2. John D. Krauss, "Electromagnetics", 4th Edition,McGraw- Hill publication1999.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	2			2	1							2	1	
CO2	2	2		1	1							2	1	
CO3	2	2		1	1							2	1	
CO4	2	2		2	2							2	1	
CO5	2	2		2	2							2	1	
1: Low, 2-Medium, 3- High														

<div align="center">COURSE CONTENT</div>

MODULE – 1   **PROBABILITY**   **9 Hrs**

Probability introduced through Sets and Relative Frequency; Probability space& Axioms; Mathematical Model of Experiments, Joint probability, Conditional probability, Total probability and Baye's theorem

At the end of the Module 1, students will be able to:
1. Understand the fundamental concepts of probability (BL-2)
2. Find the probability for real time examples (BL-1)
3. Find total probability (BL-1)

MODULE -2   DISCRETE& CONTINUOUS RANDOM VARIABLES   9 Hrs

Probability mass function, probability distribution function, example random variables and distributions and density functions; Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random Variables; Central limit theorem (without+ proof)

At the end of the Module 2, students will be able to:
1. Understand probability distribution and density functions (BL-2)
2. Outline the importance of the central limit theorem (BL-2)
3. Solve the moments to the sum of random variables (BL-3)

MODULE-3   OPERATIONS ON MULTIPLE RANDOM VARIABLES   9 Hrs

Expected value of a function of random variables, joint moments about the origin, joint central moments Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables. Markov, Chebyshev and Chernoff bounds.

At the end of the Module 3, students will be able to:
> Understand the moments for multiple random variables. (BL-2)
> Understand the concepts of linear transformation of Gaussian random variables. (BL-2)
> Apply the different operations to multiple random variables. (BL-3)

MODULE-4   RANDOM PROCESSES: TEMPORAL CHARACTERISTICS & SPECTRAL CHARACTERISTICS   12 Hrs

The random process concept, classification of processes, concept of stationary and statistical independence. Correlation function.Power spectrum Properties, Relationship between power spectrum and autocorrelation function, properties of power spectral density, relation between cross – power density spectrum and cross correlation, properties of cross power spectral density; problems.

At the end of the Module 4, students will be able to:
1. Define continuous and discrete-time random processes. (BL-1)
2. Explain various Stationary Processes. (BL-2)
3. Understand the concepts of power spectral density & cross power spectral density (BL-2)
4. Apply PSD & CPSD properties on random process. (BL-3)

Apply CPSD properties on random process. (BL-3)

MODULE-5   RANDOM SIGNAL RESPONSE OF LINEAR SYSTEMS   9 Hrs

System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

Noise Definitions: White Noise, Ideal low passfiltered white noise, RC filtered white noise.

At the end of the Module 6, students will be able to:

Relate the theory of stochastic processes to analyze linear systems. (BL-2)

Understand the concepts of low pass and band pass noise models for random processes. (BL-2)

Apply the statistical characteristics to response of linear systems. (BL-3)

Analyse the output characteristics of a system when input is an WSS process. (BL-4)

Total hours: 48 Hours

Text Book(s):

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th edition, 2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, 4th edition, 2002**.**

Reference Book(s):

1. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", Pearson Education, 3rd edition.
2. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd edition, 1999.
3. Keiser, Gerd, "probability theory and stochastic processes", TMH publications, 4th edition.

| 21EC25001 | ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB | | | | R21 |

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	0	0	2	42	1	40	60	100

Pre-requisite: Basic knowledge on amplifiers and oscillators.

Course Objectives:

1. Analyze amplifiers for frequency response

2. Analyze feedback circuits, amplifier circuits and oscillator circuits

3. Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Measure various parameters of analog circuits and compare experimental results in the laboratory with theoretical analysis. **(BL-3)**

CO 2   Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers.**(BL-4)**

CO 3   Design analog electronic circuits using discrete components **(BL-3)**

CO 4   Design RC and LC oscillators, Feedback amplifier for specified gain and multistage amplifiers for Low, Mid and high frequencies. **(BL-3)**

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1				1						1				
CO2	2	2			2					1	1			1
CO3	2	2	2	1	2					1	1	1	1	1
CO4			2		2					1	1	1	1	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT

Task-1 : COMMON EMITTER AMPLIFIER

Objective: Design voltage divider based Common Emitter amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response.CO1

Task-2: RC COUPLED AMPLIFIER

Objective: Design two stage RC coupled amplifier for given specifications. Determine Gain and Bandwidth from its frequency response curve.CO 1

Task-3: DARLINGTON AMPLIFIER

Objective: Design Darlington amplifier and determine gain and bandwidth from frequency response.CO 2

Task-4: CASCODE AMPLIFIER

Objective: Design cascode amplifier and determine gain and bandwidth from   frequency response

Task-5: VOLTAGE SERIES FEEDBACK AMPLIFIER
Objective: Design voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.CO 2

Task-6 : CURRENT SHUNT FEEDBACK AMPLIFIER
Objective: Design and simulate current shunt feedback using PSPICE/Multisim and determine the effect of feedback on the frequency response CO 2

Task-9: RC PHASE SHIFT OSCILLATOR
Objective: Design and simulate RC Phase shift oscillator for the given specification using PSPICE /Multisim. Determine the frequency of oscillation using simulation tool.CO 2

Task-10 : HARTLEY OSCILLATOR
Oo Objective: Design and simulate Hartley oscillator using PSPICE /Multisim and determine the frequency of oscillations..CO 2

Task-9: COLPITTS OSCILLATOR
Objective: Design and simulate Colpitts oscillator using PSPICE /Multisim and determine the frequency of oscillations.CO 4

Task-10: CLASS-A POWER AMPLIFIER
Objective: Design and simulate class A power amplifier using PSPICE /Multisim, find out the efficiency and Plot the output waveforms.CO 4

Task-11: CLASS-B PUSH PULL AMPLIFIER
Objective: Design and simulate class B push-pull amplifier using PSPICE /Multisim, find out the efficiency and Plot the output waveforms.CO 2

Task-12: SINGLE TUNED AMPLIFIER
Objective: Design and simulate single tuned voltage amplifier using PSPICE /Multisim and determine the resonant frequency and bandwidth.CO 2

Text Book(s):
1. Introduction to PSPICE Using OrCAD for Circuits and Electronics by Rashid Muhammad H
2. PSPICE and MATLAB for electronics: An integrated approach by John o. Attia
3. Fundamentals of Electronic Circuit Design, Getting Started: MultiSim Textbook Edition byDavid J. Comer, Donald T. Comer.

Reference Book(s):
1.A Guide to Circuit Simulation and Analysis Using PSPICE by Paul W. Tuinenga
2.Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory" Pearson/Prentice Hall, 9th Edition, 2006.
3.Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 5th Edition.

21EC2502   MATLAB AND SIMULINK LAB   R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	0	0	2	36	1	40	60	100

Pre-requisite: Knowledge on MATLAB Basics.

Course Objectives:

To provide practical exposure with generation and simulation of basic signals using standardized tools.

To analyze signals and sequences using Fourier, Laplace and Z-transforms.

To apply Matlab tools for writing programs.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1   Demonstrate knowledge in

• Operations on Matrices.

• Generation of Various signals and Sequences.

  • Convolution and Correlation of signals and Sequences. **(BL-2)**

  CO 2 Understand the different operation that can be performed on signals and sequences. **(BL-2)**

  CO 3 Apply different transforms on a given signal to draw magnitude and phase spectrum. **(BL-3)**

  CO 4 Identify whether the given system is linear or non-linear and time variant or invariant. **(BL-3)**

  CO 5 Understand the verification of sampling theorem. **(BL-2)**

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1							2				1	2
CO2	2	1							1			2	1	2
CO3	2	2	2	1					3			1	1	2
CO4	2	2	2	1					2			1	2	2
CO5	2								1			1	1	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT

Task-1: INTRODUCTION TO MATLAB

Objective: To familiarize MATLAB Tool.**CO1**

Task-2: OPERATIONS ON MATRICES

Objective: To write a MATLAB program to perform various mathematical operations on matrices.

  A. Addition of two N×N matrices
  B. Subtraction of two N×N matrices
  C. Multiplication of two N×N matrices
  D. Inverse of a matrix

Eigen values of a matrix**CO 1**

Task-3: GENERATION OF SIGNALS AND SEQUENCES

Objective: To write a MATLAB program to generate various signals and Sequences such as unit Impulse, Unit Step, Square, Sawtooth, Triangular, Sinusoidal, Ramp, sinc function.CO 1

Task-4: OPERATIONS ON SIGNALS AND SEQUENCES

Objective: To write a MATLAB program to perform various operations on signals and sequences such as

A. Addition
B. Multiplication
C. Scaling
D. Shifting

FoldingCO 2

Task-5: ENERGY AND POWER OF A SIGNAL

Objective: To write a MATLAB program to find Energy and power of a given signal.CO 1

Task-6: CONVOLUTION AND CORRELATION OF SIGNALS AND SEQUENCES

Objective: To write a MATLAB program to perform convolution and correlation of given signals and sequences using MATLAB.CO 1

Task-7: FOURIER TRANSFORM OF A SIGNAL

Objective: To write a MATLAB program to find the Fourier Transform of a Signal and plot its Magnitude and Phase Spectrum.CO 3

Task-8: VERIFICATION OF LINEARITY AND TIME INVARIANCE PROPERTIES

Objective: To write a MATLAB program to verify Linearity and Time Invariance properties of Continuous/Discrete Systems. CO 4

Task-9: LAPLACE TRANSFORM OF CONTINUOUS SIGNAL

Objective: To write a MATLAB program to find the Laplace transform of a signal.CO 3

Task-10: Z-TRANSFORM OF DISCRETE SIGNAL

Objective: To write a MATLAB program to find the Z-transform of a discrete signal CO 3

Task-11: GAUSSIAN NOISE

Objective: To write a MATLAB program to generate Complex Gaussian noise and find its

mean, variance, Probability Density Function (pdf) and Power Spectral Density (PSD)CO 1

Task-12: VERIFICATION OF SAMPLING THEOREM

Objective: To write a MATLAB Program to verify Sampling theorem CO 4

Additional Experiments:

Task-13: LOCATING ZEROS AND POLES

Objective: To write a MATLAB program to Locate Zeros and Poles and plot in S-Plane or Z-Plane for the given Transfer Function.CO 3

Task-14: DETECTION OF NOISE BY CORRELATION

Objective: To write a MATLAB program to detect Noise by Auto Correlation / Cross correlation. CO 1

Text Book(s):
    1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2ndEdition, PHI, 2009.
    2.MATLAB for Beginners:A Gentle Approach,Petra Books,Peter I.Kattan, ISBN: 978-1438203096
    3.Stormy Attaway, "Matlab: a Practical Introduction to Programming and Problem Solving", Elsevier.
Reference Book(s):
    1.Signals & Systems Using MATLAB **Luis F. Chaparro and Aydin Akan,3rd Edition ,2019**
    2. Signals & Systems Using MATLAB **Alan V. Oppenheim**, **Alan S. Willsky**, *MIT*
        S. Hamid Nawab,2nd Edition ,1997
    3. Simon Haykin and Van Veen, "Signals & Systems", 2ndEdition, Wiley, 2005.
    4. A. Anand Kumar, Signals & Systems, PHI, 2011.
    5. B.P. Lathi, Principles of Linear Systems and Signals, Oxford University Press, 2nd Edition, 2013.
    6.Signals and Systems, J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, TMH