NARAYANA ENGINEERING COLLEGE::NELLORE

AUTONOMOUS

B.Tech – Electronics & Communication Engineering (E.C.E)

Course Structure

&

SYLLABUS

(2021-22 academic year)

(NECR B.Tech 21)

(w.e.f AY: 2021-22)

NARAYANA

ENGINEERING COLLEGE

(AUTONOMOUS)

NARAYANA ENGINEERING COLLEGE::NELLORE

AUTONOMOUS

INSTITUTE VISION & MISSION

VISION

- To be one of the nation's premier Institutions for Technical and Management Education and a key contributor for Technological and Socio-economic Development of the Nation.

MISSION

- To produce technically competent Engineers and Managers by maintaining high academic standards, world class infrastructure and core instructions.
- To enhance innovative skills and multi disciplinary approach of students through well experienced faculty and industry interactions.
- To inculcate global perspective and attitude of students to face real world challenges by developing leadership qualities, lifelong learning abilities and ethical values.

Department of E.C.E –

(Electronics and Communication Engineering)

DEPARTMENT VISION & MISSION

VISION OF THE DEPARTMENT

To produce technically competent and creative engineers who can cater to the industry and societal requirements in the field of Electronics & Communication Engineering.

MISSION OF THE DEPARTMENT

M1. To impart quality engineering education to students to enhance ability to pursue knowledge by providing core competency and state of the art infrastructure.

M2. To provide industry oriented learning for empowering and facilitating the learner through industry institute interaction and leadership qualities.

M3. To promote participation in research and extension activities for addressing the social needs by providing value based education along with life-long learning abilities.

PEOs, POs, PSOs

POs

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PEOs

PEO 1: Attain professional excellence or gain higher degree to face challenges posed by industry and society

PEO 2: Address complex problems in a responsive and innovative manner.

PEO 3: Gain reputation by functioning effectively to address social and ethical responsibilities.

PSOs

PSO_1: Domain Specific Knowledge: Implement electronic systems related to Electronics Devices & Circuits, VLSI, Signal processing, Microcomputers, Embedded and Communication Systems to fulfill the solutions to real world challenges

PSO_2: Hardware Product Development: Apply the software and hardware tools in Analog and Digital Electronic circuit design to address complex Electronics and Communication engineering problems.

NARAYANA ENGINEERING COLLEGE::NELLORE

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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

SEMESTER I

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total marks
21MA1001	BS	Algebra and Calculus	3	1	0	4	4	40	60	100
21PH1001	BS	Applied Physics	3	0	0	3	3	40	60	100
21ES1002	ES	Basic Electrical Engineering	3	0	0	3	3	40	60	100
21ES1001	ES	Problem Solving and Programming	3	0	0	3	3	40	60	100
21PH1501	BS	Applied Physics Lab	0	0	3	3	1.5	40	60	100
21ES1502	ES	Basic Electrical Engineering Lab	0	0	2	2	1	40	60	100
21ES1505	ES	Engineering and IT Workshop	0	0	3	3	1.5	40	60	100
21ES1501	ES	Problem Solving and Programming Lab	0	0	3	3	1.5	40	60	100
21EN1502	HS	Communication Skills Lab	0	0	2	2	1	40	60	100
21MC8001	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**

SEMESTER II

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total marks
21CH1001	BS	Chemistry	3	0	0	3	3	40	60	100
21MA1004	BS	Vector Calculus and Transforms	3	1	0	4	4	40	60	100
21ES1005	ES	Python Programming and Data Science	3	0	0	3	3	40	60	100
21EN1001	HS	English	2	0	0	2	2	40	60	100
21CH1501	BS	Chemistry Lab	0	0	3	3	1.5	40	60	100
21ES1503	ES	Engineering Graphics	0	1	4	5	3	40	60	100
21ES1508	ES	Python Programming and Data Science Lab	0	0	3	3	1.5	40	60	100
21EN1501	HS	English Language 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**

SEMESTER III

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21MA1005	BS	Complex Analysis and Numerical Methods	3	0	0	3	3	40	60	100
21ES1009	ES	Data Structures and Algorithms	3	0	0	3	3	40	60	100
21ES1010	ES	Electronic Devices and Circuits	3	0	0	3	3	40	60	100
21EC2001	PC	Digital Logic Design	2	0	0	2	2	40	60	100
21EC2002	PC	Network Analysis	3	0	0	3	3	40	60	100
21EC2003	PC	Signals and Systems	3	0	0	3	3	40	60	100
21ES1514	ES	Electronic Devices and Circuits Lab	0	0	2	2	1	40	60	100
21ES1513	ES	Data Structures and Algorithms Lab	0	0	3	3	1.5	40	60	100
21CD6001	SC	Career Competency Development I	0	0	2	2	1	40	60	100
21CC6001	SC	Value Added Course/ Certificate Course I	0	0	0	0	1	40	60	100
21MC8002-13	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**

SEMESTER IV

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21EN1002	HS	Universal Human Values	3	0	0	3	3	40	60	100
21EC2004	PC	Control Systems	3	0	0	3	3	40	60	100
21EC2005	PC	Electromagnetic Theory and Transmission Lines	3	0	0	3	3	40	60	100
21EC2006	PC	Electronic Circuit Analysis and Design	3	0	0	3	3	40	60	100
21EC2007	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
21EC2501	PC	Electronic Circuit Analysis and Design Lab	0	0	3	3	1.5	40	60	100
21EC2502	PC	MATLAB and Simulink Lab	0	0	3	3	1.5	40	60	100
21EC2503	PC	Networks and control systems lab	0	0	3	3	1.5	40	60	100
21IC6001	SC	Industry Oriented Course I	0	0	0	0	1	100	--	100
21CD6002	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	**18**	**0**	**12**	**30**	**24.5**	**500**	**600**	**1100**

SEMESTER V

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21EC2008	PC	Analog and Digital Communications	3	0	0	3	3	40	60	100
21EC2009	PC	IC Applications	3	0	0	3	3	40	60	100
21EC2010	PC	Microprocessors and Microcontrollers	3	0	0	3	3	40	60	100
21EC4001-06	PE	Professional Elective I	3	0	0	3	3	40	60	100
	OE	Open elective II	3	0	0	3	3	40	60	100
21EC2504	PC	Analog and Digital Communications Lab	0	0	2	2	1	40	60	100
21EC2505	PC	IC Applications Lab	0	0	2	2	1	40	60	100
21EC2506	PC	Microprocessors and Microcontrollers Lab	0	0	2	2	1	40	60	100
21CD6003	SC	Career Competency Development III	0	0	2	2	1	40	60	100
21CC6002	SC	Value Added Course/ Certificate Course II	0	0	0	0	1	40	60	100
21EC7501	PR	Internship I/on job training/Com Ser Project	0	0	0	0	1.5	00	100	100
21MC8002-13	MC	Mandatory Course III	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	**17**	**0**	**11**	**28**	**21.5**	**400**	**700**	**1100**

SEMESTER VI

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21EC2011	PC	Digital Signal Processing	3	0	0	3	3	40	60	100
21EC2012	PC	VLSI Design	3	0	0	3	3	40	60	100
21EC4007-12	PE	Professional Elective II	3	0	0	3	3	40	60	100
21EC4013-18	PE	Professional Elective III	3	0	0	3	3	40	60	100
	OE	Open Elective III	3	0	0	3	3	40	60	100
21EC2507	PC	Digital Signal Processing Lab	0	0	3	3	1.5	40	60	100
21EC2508	PC	Electronic Design Workshop	0	0	3	3	1.5	40	60	100
21EC2509	PC	VLSI Design Lab	0	0	3	3	1.5	40	60	100
21IC6002	SC	Industry Oriented Course II	0	0	0	0	1	100	--	100
21CD6004	SC	Career Competency Development IV	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**

SEMESTER VII

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21HS5001-08	HS	Humanities and Social Science Elective	2	0	0	2	2	40	60	100
21EC2013	PC	Embedded Systems	3	0	0	3	3	40	60	100
21EC2014	PC	Microwave and Optical Communications	3	0	0	3	3	40	60	100
21EC4019-24	PE	Professional Elective IV	3	0	0	3	3	40	60	100
21EC4025-30	PE	Professional Elective V	3	0	0	3	3	40	60	100
	OE	Open Elective IV	3	0	0	3	3	40	60	100
21EC2510	PC	Embedded systems Lab	0	0	2	2	1	40	60	100
21EC2511	PC	Microwave and Optical Communications Lab	0	0	3	3	1.5	40	60	100
21CD6005	SC	Career Competency Development V	0	0	2	2	1	40	60	100
21CC6501	SC	Skill Development Training	0	0	2	2	1	40	60	100
21EC7502	PR	Internship II/on job training/Com Ser Project	0	0	0	0	1.5	00	100	100
21MC8002-13	MC	Mandatory Course IV	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**	**12**	**31**	**23**	**400**	**700**	**1100**

SEMESTER VIII

Course Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
21EC7503	PR	Project work, seminar and internship	0	0	0	0	12	60	140	200
			0	**0**	**0**	**0**	**12**	**60**	**140**	**200**

Open Electives (OE) offered by ECE Department

S. No	Course Course Code	Subject
1	21EC3001	Digital Image Processing
2	21EC3002	Embedded Systems
3	21EC3003	Programming with MATLAB
4	21EC3004	VLSI Design
5	21EC3005	Sensors and Actuators
6	21EC3006	Internet of Things (IoT)
7	21EC3007	Microprocessors and Microcontrollers
8	21EC3008	Electronic Circuit Analysis and Design
9	21EC3009	Introduction to MEMS
10	21EC3010	Data Communication and Networks
11	21EC3011	Digital Logic Design
12	21EC3012	Analog and Digital Communications

PROFESSIONAL ELECTIVE (PE)

The Professional Elective Courses (PE) are shown in different tracks/groups: The students will have options of selecting the electives from the different tracks/groups depending on the specialization one wishes to acquire.

ELECTIVE TRACK/GROUP	Professional Elective-1	Professional Elective-2	Professional Elective-3	Professional Elective-4	Professional Elective-5
Communications	An Introduction to coding theory (21EC4001)	Antennas (21EC407)	Satellite communication (21EC4013)	Wireless communication (21EC4019)	Signal Processing for mm Wave Communication for 5G and Beyond (21EC4025)
Micro Electronics	Industrial Electronics (21EC4002)	Micro Electronics (21EC4008)	Introduction to MEMS (21EC4014)	Fundamentals of Nano and Quantum Photonics (21EC4020)	High Speed Electronics (21EC4026)
Signal & Image Processing	MATLAB Programming For Numerical Computation (21EC4003)	Adaptive Signal Processing (21EC4009)	Introduction to Machine Learning (21EC4015)	Digital Image Processing (21EC4021)	Digital Speech Processing (21EC4027)
VLSI	Fundamentals of Micro and Nano Fabrication (21EC4004)	Mixed Signal Design (21EC4010)	RF Integrated Circuits (21EC4016)	Low Power VLSI Design (21EC4022)	FPGA Architectures (21EC4028)
Embedded System	Semiconductor Memories (21EC4005)	Real Time Operating Systems (21EC4011)	Introduction to Internet of things (21EC4017)	Advanced Embedded Logic design (21EC4023)	Embedded System Design with ARM (21EC4029)
Automation	Programmable Logic Controllers (21EC4006)	Electronic Measurements and Instrumentation (21EC4012)	Biomedical Instrumentation (21EC4018)	Virtual Instrumentation (21EC4024)	Process Control and Instrumentation (21EC4030)
MOOCS	MOOCS-1 (21EC4031)	MOOCS-2 (21EC4032)	MOOCS-3 (21EC4033)	MOOCS-4 (21EC4034)	MOOCS-5 (21EC4035)

HONORS

S. NO.	COURSE NAME	Course Course Code	CREDITS
1	Automotive Electronics	21ECH001	4
2	Low power VLSI Design.	21ECH002	4
3	Pattern Recognition	21ECH003	4
4	Micro Electromechanical Systems	21ECH004	4
5	VLSI Testing and Testability	21ECH005	4

MINORS

S. NO	SUBJECT	Course Course Code	CREDITS
1	Signals and Systems	21ECM001	3
2	Electronic Devices Circuits	21ECM002	3
3	Digital Logic Design	21ECM003	3
4	Analog & Digital Communications	21ECM004	3
5	Digital Signal Processing	21ECM005	3

Humanities and Social Science Elective

S. NO	SUBJECT	Course Course Code	CREDITS
1	Managerial Economics & Financial Analysis	21HS5001	3
2	Management Science	21HS5002	3
3	E-Business	21HS5003	3
4	Organizational Behavior	21HS5004	3
5	Enterprise Resource Planning	21HS5005	3

HUMANITIES AND SOCIAL SCIENCES (HS)

SEMESTER	SUBJECT	Course Course Code	CREDITS
I	Communication Skills Lab	21EN1502	1
II	English	21EN1001	2
	English Language Lab	21EN1501	1.5
IV	Universal Human Values	21EN1002	3
VII	Humanities and Social Science Elective	21HS5001-08	2
	TOTAL		**9.5**

BASIC SCIENCES (BS)

SEMESTER	SUBJECT	Course Course Code	CREDITS
I	Applied Physics	21PH1001	3
	Algebra and Calculus	21MA1001	4
	Applied Physics Lab	21PH1501	1.5
II	Vector Calculus and Transforms	21MA1004	4
	Chemistry	21CH1001	3
	Chemistry Lab	21CH1501	1.5
III	Complex Analysis and Numerical Methods	21MA1005	3
	TOTAL		**20**

ENGINEERING SCIENCES (ES)

SEMESTER	SUBJECT	Course Course Code	CREDITS
I	Problem Solving and Programming	21ES1001	3
	Basic Electrical Engineering	21ES1002	3
	Engineering and IT Workshop	21ES1505	1.5
	Problem Solving and Programming Lab	21ES1501	1.5
	Basic Electrical Engineering Lab	21ES1502	1
II	Introduction to Python Programming	21ES1005	3
	Introduction to Python Programming Lab	21ES1508	1.5
	Engineering Graphics lab	21ES1503	3
III	Data Structures and Algorithms	21ES1009	2
	Electronic Devices and Circuits	21ES1010	3
	Data Structures and Algorithms Lab	21ES1513	1
	Electronic Devices and Circuits Lab	21ES1514	1.5
	TOTAL		**25**

PROFESSIONAL CORE (PC)

SEMESTER	Course Course Code	SUBJECT			CREDITS
III	21EC2001	Digital Logic Design			3
	21EC2002	Signals and Systems			3
	21EC2003	Network Analysis	(3)	9	3
IV	21EC2004	Electronic Circuit Analysis and Design			3
	21EC2005	Electromagnetic Theory and Transmission Lines			3
	21EC2006	Control System			3
	21EC2007	Probability Theory and Stochastic Process			3
	21EC2501	Networks and Control Systems Lab			1.5
	21EC2502	Electronic Circuit Analysis and Design Lab			1.5
	21EC2503	MATLAB and Simulink Lab	(4+3)	16.5	1.5
V	21EC2008	Analog and Digital Communications			3
	21EC2009	IC Applications			3
	21EC2010	Microprocessors and Microcontrollers			3
	21EC2504	Analog and Digital Communications Lab			1
	21EC2505	IC ApplicationsLab			1
	21EC2506	Microprocessors and Microcontrollers Lab	(3+2)	12	1
VI	21EC2011	Digital Signal Processing			3
	21EC2012	VLSI Design			3
	21EC2507	Digital Signal Processing Lab			1.5
	21EC2508	Electronic Design Workshop			1.5
	21EC2509	VLSI Design Lab	(3+3)	10.5	1.5
VII	21EC2013	Embedded systems			3
	21EC2014	Microwave and Optical Communications			3
	21EC2510	Embedded systems Lab			1
	21EC2511	Microwave and Optical Communications Lab	(1+2)	8.5	1.5
				TOTAL	56.5

PROFESSIONAL ELECTIVES (PE)

SEMESTER	SUBJECT	Course Course Code	CREDITS
V Sem	Professional Elective I	21EC4001-06	3
VI Sem	Professional Elective II	21EC4007-12	3
VII Sem	Professional Elective III	21EC4013-18	3
	Professional Elective IV	21EC4019-24	3
	Professional Elective V	21EC4025-30	3
	TOTAL		**15**

OPEN ELECTIVES (OE)

SEMESTER	SUBJECT	CREDITS
IVSem	Open Elective I	3
V Sem	Open Elective II	3
VI Sem	Open Elective III	3
VIISem	Open Elective IV	3
	TOTAL	**12**

SKILL ORIENTED COURSE (SC)

SEMESTER	SUBJECT		CREDITS
III Sem	Career Competency Development I	21CD6001	1
	Value Added Course/Certificate Course I	21CC6001	1
IV Sem	Industry Oriented Course I	21IC6001	1
	Career Competency Development II	21CD6002	1
V Sem	Career Competency Development III	21CD6003	1
	Value Added Course/Certificate Course II	21CC6002	1
VI Sem	Industry Oriented Course II	21IC6002	1
	Career Competency Development IV	21CD6004	1
VII Sem	Career Competency Development V	21CD6005	1
	Skill Development Training	21CC6501	1
	TOTAL		**10**

PROJECT (PR)

SEMESTER	SUBJECT	Course Course Code	CREDITS
V Sem	Internship I/on job training/Com Ser Project	21EC7501	1.5
VII Sem	Internship II/on job training/Com Ser Project	21EC7502	1.5
VIII Sem	Project work, seminar and internship	21EC7503	12
	TOTAL		**15**

S. NO	CAT	CREDITS PER SEMESTER								CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1	**HS**	1	3.5		3			2		**9.5**
2	**BS**	8.5	8.5	3						**20**
3	**ES**	10	7.5	7.5						**25**
4	**PC**			9	16.5	12	10.5	8.5		**56.5**
5	**OE**				3	3	3	3		**12**
6	**PE**					3	6	6		**15**
7	**PR**					1.5		1.5	12	**15**
8	**SC**			2	2	2	2	2		**10**
	MC	**No Credits**								
	TOTAL	**19.5**	**19.5**	**21.5**	**24.5**	**21.5**	**21.5**	**23**	**12**	**163**

NARAYANA ENGINEERING COLLEGE: NELLORE								
I-B. Tech	ALGEBRA AND CALCULUS							R-2021
Semester	Hours / Week			Total hrs	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 of the region bounded by curves and volume. (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	3	3											1	
CO2	3	3											1	
CO3	3	3											1	
CO4	3	3											1	
CO5	3	3											1	

1- Low, 2-Medium, 3- High

COURSE CONTENT

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 by Cayley-Hamilton theorem, Diagonalization.

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

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	Hours: 14h(11L+3T)

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

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

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.

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

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.

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

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.

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

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)

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

Content beyond syllabus:

1. L-U decomposition.
2. Deflection of Beams.
3. Taylor's series for function of two variables.
4. Homogeneous Linear Partial differential equations with constant coefficients.
5. Calculation of mass, Centre of gravity, moment of inertia.

Self-Study:
Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Matrices	CO1	https://youtu.be/P2pL5VThrzQ
2	Higher Order Ordinary Differential equations with constant coefficients	CO2	https://youtu.be/P7gVp333B6M https://youtu.be/btOCUmJkrrg
3	Mean value theorems & Multivariable Calculus	CO3	https://youtu.be/bJPuy0QZ-tE https://youtu.be/0apMXhWG_W8
4	Partial Differential Equations	CO4	https://youtu.be/kZ7Oa7iMiCs
5	Multiple Integrals	CO5	https://youtu.be/mIeeVrv447s

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.

Online Resources/ Web References:

1. **http://www.macs.hw.ac.uk/~simonm/linalg.pdf**
2. **http://www.e-booksdirectory.com/details.php?ebook=7400re**
3. **http://www.efunda.com/math/math_home/math cfm**
4. **http://www.ocw.mit.edu/resources/#Mathematics**
5. **http://www.sosmath.com/**
6. **http://www.mathworld.wolfram.com/**

NARAYANA ENGINEERING COLLEGE (AUTONOMOUS) :: NELLORE

	APPLIED PHYSICS							R2021
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:		BTL
CO 1	Explain optical phenomenon i.e. interference, diffraction using Huygen's wave theory.	2
CO 2	Comprehend the concepts of matter waves, wave functions and its interpretation to understand the matter at atomic scale.	1
CO 3	Comprehend Free electron theories on metals and physics of semiconductors	1
CO 4	Understand the concepts of superconductors and nanomaterials to familiarize their applications in relevant fields.	2
CO 5	Realize importance of LASERs and optical fibres in Engineering and Medical applications.	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												
CO2	3	2												
CO3	3	2											1	
CO4	3					1							1	
CO5	3	1				1							1	

1: Low, 2-Medium, 3- High

COURSE CONTENT

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

Content beyond syllabus:

Types of magnetic materials and the applications.

Characterization of nano materials: (a) X-ray diffraction & Scanning electron microscope

Self-Study:

Contents to promote self-Learning:

S.No	Topic	CO	Reference
1	Wave optics	CO1	https://nptel.ac.in/courses/122/107/122107035/
2	Introduction to quantum mechanics	CO2	https://nptel.ac.in/courses/115/101/115101107/
3	Free electron theory of metal & Semiconductors	CO3	https://nptel.ac.in/courses/113/106/113106040/ https://nptel.ac.in/courses/115/102/115102025/
4	Superconductors and nanomaterials	CO4	https://nptel.ac.in/courses/115/101/115101012/ https://nptel.ac.in/courses/118/104/118104008/
5	Lasers & optical fibers	CO5	https://nptel.ac.in/courses/115/102/115102124/ https://nptel.ac.in/courses/115/107/115107095/

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

Online Resources:

https://www.youtube.com/watch?v=-mNQW5OShMA
https://www.youtube.com/watch?v=TwlRVDM6bKY
https://www.youtube.com/watch?v=lH9SNnQCs54&t=58s
https://www.youtube.com/watch?v=Usu9xZfabPM&t=154s
https://www.youtube.com/watch?v=x4Nr93ALNjo

https://www.youtube.com/watch?v=FL4QCymhYDA
https://www.youtube.com/watch?v=PvN-cwQXBDc
https://www.youtube.com/watch?v=RAqgxH_pS7Y
https://www.youtube.com/watch?v=AhLATP5rYPs
https://www.youtube.com/watch?v=CjAVfW_6juw
https://www.youtube.com/watch?v=h6FYs_AUCsQ
https://www.youtube.com/watch?v=3-PQ8H-AI9c
https://www.youtube.com/watch?v=3-PQ8H-AI9c
https://www.youtube.com/watch?v=PNElByWIGNc
https://www.youtube.com/watch?v=1xWBPZnEJk8
https://www.youtube.com/watch?v=WgzynezPiyc
https://www.youtube.com/watch?v=T94BbyYyNpg
https://www.youtube.com/watch?v=aqazAcE19vw

Web Resources:

1. http://www.sfu.ca/phys/141/1134/Lectures/SP%20Lecture%2029%20-%20Interference&Diffraction.pdf
2. http://pages.physics.cornell.edu/~ajd268/Notes/QM-Notes.pdf
3. http://www-rjn.physics.ox.ac.uk/lectures/metalsnotes10.pdf
4. https://www.iare.ac.in/sites/default/files/lecture_notes/semiconductors%20lecture%20notes%20%281%29_0.pdf
5. http://www.gpcet.ac.in/wp-content/uploads/2018/09/UNIT-5-EP-PDF.pdf
6. https://galgotiacollege.edu/assets/pdfs/study-material/notes-Physics.pdf

NARAYANA ENGINEERING COLLEGE:NELLORE								
	BASIC ELECTRICAL ENGINEERING							R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3		0	48	3	40	60	100

Pre-requisite: Fundamental of mathematics and physics

Course Objectives:

1. To study the basics of circuit analysis.
2. To study the magnetic circuits.
3. The concepts of real power, reactive power, complex power, phase angle and phase difference.
4. To understand frequency response in electrical circuits.
5. To understand the concept of graphical solution to electrical network.
6. To impart knowledge on solving circuit equations using network theorems.

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

CO 1	Analyze DC and AC circuits with different sources and with different reduction techniques. (BL-4)
CO 2	Understand the different concepts to analyze the AC circuits or systems. (BL-2)
CO 3	Apply different concepts to analyze the Three Phase Circuits. (BL-3)
CO 4	Discuss the operation and construction of DC machine. (BL-2)
CO 5	Describe the operation and construction of single phase and three phase transformers and machines. (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	3	3										2	3
CO2	2	3										3	3	
CO3	3	3	3	2									3	3
CO4	3	3	3	2									3	3
CO5	3	3	3	2									3	1

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS	11hours

Network elements, R, L and C Parameters, Kirchhoff's Laws - Independent and Dependent sources-Source Transformation, Network Reduction Techniques, Faraday's Laws of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot Convention, Coefficient of Coupling, Composite Magnetic Circuit, MMF Calculations.

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

1. Explain the network elements.(BL-2)
2. Understand the Voltage, Current, Power, Direct Current (DC), Alternating Current.(BL-2)
3. Explain the laws of electromagnetic induction.(BL-2)
4. Explain the Single phase AC circuits.(BL-2)

MODULE -2	SINGLE PHASE AC CIRCUITS	10hours

Introduction, R.M.S, Average Values and Form Factor for Different Periodic Wave Forms. Phase and Phase Difference, Steady State Analysis of R, L, C With series and parallel Sinusoidal Excitation.

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

1. Understand the advantages of single phase AC system. (BL-2)
2. Explain the complex and polar forms representation.(BL-2)
3. Find the AC circuits in order to determine the voltage, current and power for the given problem. (BL-2)

MODULE -3	**RESONANCE & LOCUS DIAGRAMS**	**10hours**

Resonance: Introduction, Series Resonance and parallel resonance, resonance frequency, Q-factor, Bandwidth, Locus diagrams of RL, RC and RLC circuits and problems.

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

1. Explain AC circuits along with resonance and locus diagrams.(BL-2)
2. Understand the effect of resonance on series and parallel resonance circuits.(BL-2)
3. Explain the frequency response for a resonant circuits.(BL-2)

MODULE -4	**NETWORK TOPOLOGY**	**9hours**

Definitions – Graph – Tree, Incidence Matrix, Basic Cutset and Tieset matrices for planar networks - Nodal Analysis, Mesh Analysis, Super Node and Super Mesh Analysis for Dependent and Independent Voltage and Current Sources and DC & AC Excitations - Duality and Dual Networks.

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

1. Understand the overview of topology for a given network. (BL-2)
2. Find the graph for the given electrical network. (BL-2)
3. Apply graph theory to solve network equations. (BL-3)

MODULE-5	**NETWORK THEOREMS**	**08hours**

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 6, students will be able to:

1. Understand the way of approaching to solve for a given network. (BL-2)
2. Solve theorems for finding the solutions of network problem.(BL-3)
3. Explain the application of network theorems.(BL-2)

Total hours:	**48hours**

Content beyond syllabus:

1. Three Phase circuits and its Importance in Electrical Engineering.
2. Real time applications of network theorems.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Introduction to the electrical & magnetic circuits	https://nptel.ac.in/courses/117/106/117106108/
2	Single phase AC circuit	https://nptel.ac.in/courses/108/105/108105053/
3	Locus diagram and resonance	https://nptel.ac.in/courses/108/105/108105112/
4	Analysis of electrical circuit and Graph theory	https://nptel.ac.in/courses/108/105/108105159/
5	Network theorem	https://nptel.ac.in/courses/117/106/117106108/

Text Book(s):

1. A Sudhakar and Shyam Mohan S P, “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.Kishore & 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.
4. Electric Circuits by N.Sreenivasulu, REEM Publications

Online Resources / Web Reference:

1. https://nptel.ac.in/courses/108/105/108105159/
2. https://nptel.ac.in/courses/108/102/108102042/
3. https://nptel.ac.in/content/storage2/courses/108105053/pdf/L-21(TB)(ET)%20((EE)NPTEL).pdf
4. https://en.wikibooks.org/wiki/Circuit_Theory
5. http://www.mathtutordvd.com/products/Engineering-Circuit-Analysis-Volume-1.cfm
6. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-andelectronics-spring-2007/video-lectures/lecture-2/
7. http://www.facstaff.bucknell.edu/mastascu/elessonsHTML/Circuit/Circuit1.html
8. https://opencourses.emu.edu.tr/course/view.php?id=3

NARAYANA ENGINEERING COLLEGE:NELLORE								
21ES1001	**PROBLEM SOLVING AND 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:

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

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

CO 1	Understand the peripherals, ports and connecting cables and able to assemble the system. [BL- 2]
CO 2	Apply algorithmic approach to solve computational problems. [BL -3]
CO 3	Apply modular approach for solving the problems by using the control structures. [BL-3]
CO 4	Select the individual data elements to simplify solutions and provide efficient memory utilization. [BL-3]
CO 5	Develop sorting algorithms for heterogeneous data. [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	3	3	2	1										
CO2	3	3												
CO3	3	3	3											
CO4	3	3	3											
CO5	3	3	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**.**

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

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

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

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.

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

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**

Content Beyond Syllabus:

1. Analysis of Algorithms
2. Text Vs. Binary Files
3. Variable Length Argument Lists

Self-Study:

Contents to promote self-Learning:

S No.	Module	Reference
1	Fundamentals of Computers and Programming	https://nptel.ac.in/courses/106/106/106106127/ [Lec 1] https://nptel.ac.in/courses/106/105/106105214/ [Week 1 - Lec 1 To 2] https://nptel.ac.in/courses/106/105/106105171/ [Week 1 - Lec 1 To 4]
2	Operators and Input / Output	https://nptel.ac.in/courses/106/105/106105171/ [Week 1 - Lec 5] https://nptel.ac.in/courses/106/105/106105171/ [Week 2 - Lecture 7 To 10] https://nptel.ac.in/courses/106/105/106105171/ [Week 3 - Lec 11 To 14] https://nptel.ac.in/courses/106/106/106106127/ [Lec 4] https://nptel.ac.in/courses/106/106/106106127/ [Lec 5]
3	Control Statements and Functions	https://nptel.ac.in/courses/106/105/106105171/ [Week 3 - Lec 15] https://nptel.ac.in/courses/106/105/106105171/

		Week 4 - Lec 16 To 20] [Week 5 - Lec 21 To 25] https://nptel.ac.in/courses/106/106/106106127/ [Lec 6 & 7] https://nptel.ac.in/courses/106/105/106105171/ [Week 7 - Lec 35] [Week 8 - Lecture 36 To 40] https://nptel.ac.in/courses/106/105/106105171/ [Week 11 - Lec 53 To 54]
4	Arrays and Pointers	https://nptel.ac.in/courses/106/106/106106127/ [Lec 20 To 27] https://nptel.ac.in/courses/106/105/106105171/ [Week 6 - Lec 26 To 30][Week 7 - Lec 32 To 34,48] [Week 12 - Lec 58, 59, 61] https://nptel.ac.in/courses/106/106/106106127/ [Lec 9 To 19]
5	User-Defined Data Types and Files	https://nptel.ac.in/courses/106/105/106105171/ [Week 11 - Lec 55, 56, 57, 60] https://nptel.ac.in/courses/106/106/106106127/ [Lec 36, 37, 38] https://nptel.ac.in/courses/106/106/106106127/ [Lec 60]

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
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 and A.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 C – Stephen G. Kochan, 4th Edition, PearsonEductaion, 2015
11. Programming in ANSI in C, E Balaguruswamy, Tata McGraw Hill, 8th Edition, 2019
12. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing, 2017
13. Let us C, Yashavant P. Kanetkar, BBP Publications, Delhi, 16th Edition, 2017

Online Resources / Web Resources:

1. https://nptel.ac.in/courses/106/105/106105171/
2. https://nptel.ac.in/courses/106/106/106106127/
3. https://www.youtube.com/playlist?list=PLVlQHNRLflP8IGz6OXwlV_lgHgc72aXlh
4. https://www.youtube.com/watch?v=8PopR3x-VMY
5. https://www.youtube.com/watch?v=vl794HKeXug
6. https://books.goalkicker.com/CBook/
7. https://www.tutorialspoint.com/cprogramming/index.htm
8. https://www.programiz.com/c-programming
9. https://www.javatpoint.com/c-programming-language-tutorial
10. https://www.edureka.co/blog/c-programming-tutorial/
11. https://data-flair.training/blogs/c-tutorial/
12. https://www.programmingsimplified.com/c-program-examples
13. https://www.w3schools.in/category/c-tutorial/
14. C Programming Notes for Professionals book : https://books.goalkicker.com/CBook/

NARAYANA ENGINEERING COLLEGE:NELLORE

	Applied Physics lab							R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
ii	0	0	2	36	1	40	60	100

Pre-requisite: Nil

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	Understand the importance of optical phenomenon like Interference, diffraction and dispersion
CO 2	Comprehend the role of lasers in diffraction and the importance of optical fiber parameters
CO 3	Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
CO 4	Identify the Importance of four probe method in determination of resistivity of a given semiconductor

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					1								
CO3	3													
CO4	3													

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
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	CO 1
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 103 /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 2.To familiarize with the principle of diffraction in plane transmission grating 3. To know the procedure for standardization of the grating 4.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 point.	CO 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.	CO 2
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
Virtual lab: 1) Laser beam divergence and spot size https://vlab.amrita.edu/?sub=1&brch=189&sim=342&cnt=1 2. Michelson's Interferometer- Wavelength of laser beam https://vlab.amrita.edu/?sub=1&brch=189&sim=1106&cnt=1 3. Anderson's Bridge https://vlab.amrita.edu/?sub=1&brch=192&sim=859&cnt=1	

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Newton rings	**https://youtu.be/PU-SeNfIRcs**
2	Diffraction grating experiment - Wavelength of mercury spectrum	**https://youtu.be/N0lxwqANsd4**
3	Experiment - Laser Grating-Determination of Wavelength of Given Laser Source	**https://youtu.be/764Fr0mnOrQ**

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.

Web Resources:

1. https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB.
2. https://www3.nd.edu/~wzech/LabManual_0907c.pdf.
3. https://www.morebooks.de/store/gb/book/engineering-physics-lab-manual/isbn/978-3-330-34402.

NARAYANA ENGINEERING COLLEGE:NELLORE								
	BASIC ELECTRICAL ENGINEERING LAB							R2021
Semester	Hours / Week			Total	Credit	Max Marks		
	L	T	P	hrs	C	CIE	SEE	TOTAL
I	0	0	2	32	1	40	60	100

Pre-requisite: Network Analysis

Course Objectives:

1. Fundamentals of Ohm's law, Kirchhoff's current and voltage laws and its practical implementation.
2. Measurement of voltage, current, power and impedance of any circuit.
3. Analysis of a given circuit depending on types of elements.

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

CO 1	Solve the electrical circuit source resistance, currents, voltage and power by applying various network reduction techniques.
CO 2	Apply various network theorems to reduce complex network into simple equivalent network with DC excitation.
CO 3	Examine the alternating quantities for different periodic wave forms and the impedance of series RC, RL and RLC circuits.

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	2						3	2				
CO2	3	2	3						2	3				
CO3	3	3	2						2	2				
1: Low, 2-Medium, 3- High														

COURSE CONTENT	CO
Task 1 - Verification of Kirchhoff's laws	
Objective: To verify the KCL and KVL for a given circuit	CO 1
TASK-2 Determination of Self, Mutual Inductances and Coefficient of Coupling	
Objective: To determine the self and mutual inductances and coefficient of coupling for two inductive coils.	CO 1
TASK-3 Measurement of current in various branches of RLC series and draw the phasor	CO 2
diagram.	
Objective: To Analyze the series and parallel RLC circuits	
TASK-4 Locus Diagrams of RL, RC Series Circuit.	
Objective: To Plot the current locus diagrams for Series RL,RC circuit.	CO 2
TASK-5 Frequency response of series & parallel resonance circuit with analysis and design	
Objective: To determine resonant frequency, band width and Q-factor for series & parallel RLC circuits	CO 3
TASK-6 Verification of Thevenin's and Norton's theorems	
Objective: To verify the Thevinins and Norton's Theorem	CO 4
TASK-7 Verification of Reciprocity and Millman's Theorems	
Objective: To verify the reciprocity and Millman's Theorems	CO 4

TASK-8 Verification of Superposition Theorem	
Objective: To verify the superposition theorem	CO 4
TASK-9 Verification of Maximum Power Transfer Theorem	
Objective: To verify the Maximum power transfer theorem	CO 4
TASK-10 Verification of compensation Theorem	
Objective: To verify the compensation theorem	CO 4

Additional Experiments:	
TASK-11 Verification of mesh & nodal analysis using digital simulation.	CO 1
Objective: To verify mesh analysis using digital simulation.	
TASK-12 Verification of different theorems using digital simulation.	CO 1
Objective: To verify different theorems using digital simulation	
Virtual Labs: 1. Parallel RC Circuits 2. Parallel LC Circuits 3. Thevenin's theorem 4. Series RL Circuits 5. Norton's Theorem 6. Series LCR Circuit	
Self-Study: Contents to promote self-Learning:	

SNO	Topic	CO	Reference
1	Thevinins and nortons	CO1	https://www.youtube.com/watch?v=7JfoDFk61o8
2	Series Resonance in RLC Circuit	CO2	https://www.youtube.com/watch?v=YLGrugmDvc0
3	Phasor Diagram of RL, RC and RLC Circuits	CO3	https://www.youtube.com/watch?v=HaFrY0qQ-NU

Text Book(s):

1. A Chakrabarthy, “Electric Circuits”, Dhanpat Rai & Sons, 6th Edition, 2010.
2. A Sudhakar, Shyammohan S Palli, “Circuits & Networks”, Tata McGraw- Hill, 4th Edition, 2010

Reference Book(s):

1. Willam Hayt.jr, Jack E.kemmerly,Steven M.Durbin, “Engineering Circuit analysis” Tata McGraw- Hill, 8th Edition2012
2. Rudrapratap, “Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers”, Oxford University Press, 1 st Edition, 1999.

Web References:

1. https://www.ee.iitkgp.ac.in/
2. http://www.vlab.co.in/lab_ready_for_use.php
3. http://vlab.amrita.edu/?sub=1&brch=75

NARAYANA ENGINEERING COLLEGE:NELLORE								
	ENGINEERING & ITWORK SHOP							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	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	Apply tools for making models in respective trades of engineering workshop.(BL-3)
CO2	Apply basic electrical engineering knowledge to make simple house wiring circuits And check their functionality.(BL-3)
CO3	Understand to disassemble and assemble a Personal Computer and prepare the Computer ready to use(BL-2)
CO4	Apply knowledge to prepare data using the spreadsheet(BL-3)

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	2												
CO2	3	2												
CO3	3	2		1										
CO4	2	2												

1: Low, 2-Medium, 3- High

PART – A ENGINEERING WORK SHOP

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

a) Tapered tray b) Conical funnel

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

PART B: ITWORK SHOP
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.
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.
Task-3 Install Operating system (2H)
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)
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)
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)
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)
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)
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
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
Practice the following tasks and submit report A. Configure outlook and access mails. B. Create Macros in word and spreadsheet tools

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.
4. B.Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance",2nd edition, Tata McGraw-Hill, 2002
5. "MOS study guide for word, Excel, Powerpoint& Outlook Exams", Joan Lambert, Joyce Cox, PHI.
6. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.

Reference Book(s):

1. Gowri P., Hariharan and Suresh Babu A., "Manufacturing Technology-I", Pearson Education2008.
2. Rusen, "Networking your computers and devices", PHI
3. Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH.

WebResources:

1. https://www.muet.edu.pk/sites/default/files/images/users/41/Workshop%20Intro.pdf
2. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=98826
3. https://turbofuture.com/computers/Dissassembling-and-Assembling-the-computer-system

4. https://www.instructables.com/id/Disassemble-a-Computer/
5. https://www.windowscentral.com/how-do-clean-installation-windows-10
6. https://www.tutorialspoint.com/ms_excel_online_training/index.asp
7. https://www.raspberrypi.org

NARAYANA ENGINEERING COLLEGE::NELLORE								
	Problem Solving and Programming Lab							R21
Semester	Hours / Week			Total hrs	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	Select the right control structure for solving the problem (BL-1)
CO 2	Demonstrate solutions for computational problems (BL-2)
CO 3	Develop C programs which utilize the memory efficiently using programming constructs like pointers. (BL-3)

CO-PO Mapping

CO	PO												PSO	
	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	3	3	3											
CO2	3	3	3											
CO3	3	2	3	3										

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
TASK-1 (3H)	
1Practice DOS and LINUX Commands necessary for execution of C Programs. 2Study of the Editors, Integrated development environments, and Compilers in chosen platform. 3Write, 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. 3.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)	

4.Write a C program to find the sum of individual digits of a positive integer. 1. Write a program to reverse the digits of a number. 2. Write a program to generate the series of prime numbers in the given range. 7.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. 2.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] 3.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. 2.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	

Virtual Labs:
1. Problem Solving Lab (IIIT HYDERABAD) : http://ps-iiith.vlabs.ac.in/
List of Experiments

1. Numerical Representation 2. Beauty of Numbers 3. More on Numbers 4. Factorials 5. String Operations	6. Recursion 7. Advanced Arithmetic 8. Searching and Sorting 9. Permutation 10.Sequences
2. Computer Programming Lab (IIIT HYDERABAD) : http://cse02-iiith.vlabs.ac.in/	
List of Experiments	
1. Numerical Approximation 2. Functions 3. Advanced Control Flow 4. Arrays 5. Structures	6. Basic Control Flow 7. Pointers 8. Recursion 9. Expression Evaluation

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

Web Resources:

1.https://www.includehelp.com/c-programs/advacnce-c-examples.aspx

2.https://www.programiz.com/c-programming/examples

3.https://www.javatpoint.com/c-programs

4.https://www.w3resource.com/c-programming-exercises/

5.https://www.sanfoundry.com/simple-c-programs/

6.https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx

7.http://www.c4learn.com/c-programs/tag/c-programs-typical-programs

NARAYANA ENGINEERING COLLEGE::NELLORE								
	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 materials**.**(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

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	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 O_2 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. **(BL-2)**

Total hours:	**48 Hours**

Content beyond syllabus:

1. Valency bond theory
2. Compounding of natural rubber
3. Fuel analysis and methods for preparation of synthetic petrol

Self-Study:

Contents to promote self-Learning:

SNO	Module	Reference
1	Molecular orbital theory	https://www.youtube.com/watch?v=FMxuss0RXOU
2	Reference electrodes	https://www.youtube.com/watch?v=WMfXlncyMDc
3	Battreies	https://nptel.ac.in/courses/103/108/103108162/
4	Plastics	https://www.youtube.com/watch?v=FATc12opDCA
5	Refining of petroleum	https://www.youtube.com/watch?v=INqhbIl8r4Q

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.

Online Resources /Web References:

1. https://drive.google.com/file/d/0Bz82vSA0C1xlWC11WkpsTmlwQVk/view
2. https://www.cgaspirants.com/2017/08/engineering-chemistry-by-jain-jain.html
3. https://www.pdfdrive.com/concise-inorganic-chemistry-d33405948.html
4. https://chemistry.com.pk/books/skoog-principles-of-instrumental-analysis1/
5. https://www.thermalfluidscentral.org/e-books/book-intro.php?b=39
6. file:///C:/Users/DELL/Downloads/HandbookOfInstrumentalTechniquesForAnalyticalChemistryPDFDrive.com.pdf
7. https://nptel.ac.in/courses/104/106/104106096/
8. https://youtu.be/KHh_IX1G6uA
9. https://www.youtube.com/watch?v=MfbxR9ZDs0s&feature=youtu.be
10. https://nptel.ac.in/courses/113/105/113105028/
11. https://www.youtube.com/watch?v=15MY7abeCDk

NARAYANA ENGINEERING COLLEGE: NELLORE								
I-B. Tech	**VECTOR CALCULUS COMPLEX VARIABLES & TRANSFORMS**							R-2021
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 understand the concept the limit, continuity & differentiation of complex variable
3. To Evaluate the improper integrals by complex integration
4. To understand the concepts of Laplace transforms and Inverse Laplace transforms & its properties.
5. To understand the concepts of Fourier series, Fourier transforms and its properties.

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

CO 1	Make use of the concepts of Gradient, Divergence and Curl for solving various engineering problems. (BL-3)
CO 2	Apply the Vector Integral Theorems for evaluating line, surface and volume integrals which occurs frequently in engineering problems. (BL-3)
CO 3	Apply the Laplace and Inverse Laplace Transform techniques for solving problems in various engineering applications . (BL-3)
CO 4	Make Use the concepts of Fourier Series and its applications to solve various engineering problems.(BL-3)
CO 5	Interpret the concepts of Fourier transforms to solve different engineering problems. (BL-2)

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	3	3											1	
CO2	3	3											1	
CO3	3	3											1	
CO4	3	3											1	
CO5	3	3											1	

1- Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	Vector Calculus	Hours: 12h(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, Line integra 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 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)

MODULE -2	Complex variables – Differentiation	Hours: 12h(9L+3T)

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. 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	Complex variables – Integration	Hours: 12h(9L+3T)

Line integral-Contour integration, Cauchy's integral theorem (without proof) Cauchy 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:

1. Understand the integration of complex functions. (L-3)
2. Apply Cauchy's integral theorem and Cauchy's integral formula. (L-3)
3. Understand singularities of complex functions. (L-3)
4. Evaluate improper integrals of complex functions using Residue theorem. (L-3)

MODULE-4	Laplace Transforms	Hours: 16h(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 4, 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-5	Fourier Transform Fourier Series & Fourier Transforms	Hours: 12h(9L+3T)

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

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

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)

Total hours	64

Content beyond syllabus

1. Complex Fourier series.
2. Parseval's Identity for Fourier Transforms.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Vector Differentiation & vector integration	**CO1**	https://youtu.be/a19x_YG0oLg
2	Complex differentiation	**CO2**	https://youtu.be/pfCwRLK29h4https://youtu.be/KHiw9Vs-aLM
3	Complex integration	**CO3**	https://youtu.be/luJMl37-nsohttps://youtu.be/EDVJotmT584
4	Laplace transform &Inverse Laplace transforms	**CO4**	https://youtu.be/9NqdBXNyJPkhttps://youtu.be/0ZlThUd-yyw
5	Fourier series & Fourier transforms	**CO5**	https://youtu.be/4cSZDHxyBf4

Text Book(s):

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers.
2. 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. N.P. Bali and Manish Goyal, "A Text book of Engineering Mathematics", Laxmi Publication

.

Online Resources/ Web References:

1. http://keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktuebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks .
3. http://www.efunda.com/math/math_home/math.cfm
4. http://www.ocw.mit.edu/resources/#Mathematics
5. http://www.sosmath.com/
6. http://www.mathworld.wolfram.com

NARAYANA ENGINEERING COLLEGE::NELLORE							
	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)

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	
CO2	3	3		2									1	
CO3	3	2	2										2	
CO4	3	1	1										2	2
CO5	3	2	2										2	2
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 name spacing, 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:

5. **Implement Functions** to solve problems.(BL-3)
6. **Describe** various **String** handling functions in python(BL-2)
7. **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:

1. Describe the concepts of Files (BL-2).
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**

Content Beyond Syllabus:

1. Regular Expressions
2. Matplotlib

Self-Study:

Contents to promote self-Learning:

S No	Module	Reference
1	I/O and Decision Structures	https://www.youtube.com/watch?v=JBc8LLW5KLQ https://www.youtube.com/watch?v=PqFKRqpHrjw
2	Functions and Data structures	https://www.youtube.com/watch?v=XjfvaFnJ4zk https://www.youtube.com/watch?v=m9n2f9lhtrw
3	Files and Modules	https://www.youtube.com/watch?v=ixEeeNjjOJ0 https://www.youtube.com/watch?v=jZ5agHjNR3U

4	Introduction to Numpy	https://www.youtube.com/watch?v=8vVNq6JzGl8 https://www.youtube.com/watch?v=rN0TREj8G7U
5	Data Manipulation with Pandas	https://www.youtube.com/watch?v=8uK65aNfQ3I https://www.youtube.com/watch?v=B42n3Pc-N2A

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

Online Resources / Web Resources:

1. www.tutorialpoint.com/Python
2. www.geeksforgeeks.org/python
3. www.programiz.com/python-programming
4. https://numpy.org
5. https://pandas.pydata.org

NARAYANA ENGINEERING COLLEGE: NELLORE								
I-B. Tech	**ENGLISH**							R-2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	2	0	0	32	2	40	60	100

Pre-requisite: ENGLISH

Course Objectives :

1. To explore the students to develop knowledge and awareness of English sentence structure, construction and improvement.
2. To develop the students in getting the information of word power and able them to fit for the competition.
3. To enhance the ability of writing the structural English among the students.
4. To demonstrate the ability to write error free written communication.
5. To distinguish main ideas from specific details and make use of contextual clues to inform meanings of un familiar words.

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

CO 1	Practice the formulating appropriate sentences with Grammatical accuracy and also develop concept of word formation. .(BL3)
CO 2	Use coherent and unified paragraphs with adequate support and detail and can write a topic sentence, support and concluding sentence. (BL3)
CO 3	Analyze the concepts of various real time scenarios to represent in an effective model. (BL - 4)
CO 4	Explain the grammar rules for synthesis of sentences and use prewriting strategies to plan to write dialogues, reviews and edit the text effectively.(BL - 2)
CO 5	Interpret the skills and sub skills of reading effectively and provide knowledge on the structure and format of technical writing.

COURSE CONTENT

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, Parajumbles.
Vocabulary: Concept of word formation – Synonyms& Antonyms – Homonyms Homophones – Prefixes&suffixes–CommonlyconfusedWords–Onewordsubstitutes–Idioms&PhrasalVerbs.

After the completion of this Module 1 students are able to:

1. write the sentence on his/her own (L2)
2. understand the structure of the sentencesand usage(L2)
3. know the formation of words by using Affix(L1)
4. Understand the similar words and their usage in different words(L1)
5. enhance the knowledge of idiomatic language and its usage(L2)

MODULE -2

Grammar&Vocabulary: Cohesivedevices-linkers,signpostsandtransitionsignals-Articles – Prepositions – Gerund - Verbs: Auxiliary verbs (Primary & Modal) – Tenses – Subject Verbagreement.

Writing : Principles of writing: clarity, simplicity, brevity, single focus, organization of thoughts -sequencing the ideas – Punctuation - Question formation (Wh- questions, Yes or No

questions, Tagquestions) - Letters (Formal & Informal) and Emails : Structure / template of common formal lettersandemails:inquiry/complaint/placingan order.

At the end of the Module 2, students are able to:

1. use the sign posts and transition signals in his/her daily life (L2)
2. develop the knowledge in the use of preposition and Articles. (L2)
3. Know the use the different types of tenses in his/her conversation.(L2)
4. Improve the knowledge grammar and can be able to attain the success in competitive exams (L2)
5. attain the idea of how to write the different types of letters which can improve his/her writing skills (L2)
6. possess the knowledge of writing and formation of E mails (L2)

MODULE-3

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

Writing: Note Making – Summarizing -Paragraph Writing – Paraphrasing:Techniques ofparaphrasing-Replacementofwordsandphrases,changeofsentencestructures.

At the end of this Module 3, students are able to:

1. Speak or write the sentences either in active form or in passive form.(L2).
2. Develop the knowledge of verbal and adjective collocations.(L2).
3. Know how to summarize paragraphs.(L2).
4. Enhance the writing skills by using the techniques of paragraph writing. (L2).

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

At the end of the Module 4, students are able to:

1. develop the writing skills by using simple compound, complex sentences.(L2)
2. spot the error of the writing and speaking skills.(L2)
3. make conversations in formal and informal situations.(L2)
4. Write the reviews by using good writing skills.(L2)

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,communicateprocessesordisplaycomplicated data.
Writing: Describing – Report Writing: definition - purpose – types – structure-formalandinformalreports-stagesindevelopingreport-proposal,progressandfinalreports–examples.

After the completion of this module 5 students are able to:

1. gain the knowledge of different types of reading.(L2)
2. attain the good writing skills by using skimming and scanning.(L2)
3. enhance the idea of getting the information by using pie, cycle, tree, graph, flow charts.(L2)
4. write good reports on various incidents of her/his life.(L2)

Total hours: 32 hours

TextBooks:

1. Contemporary EnglishGrammar– StructuresandCompositionbyDavidGreen,MacMillanIndia,2014.
2. EffectiveTechnicalCommunicationbyAshraf,MRizvi,TataMcGraw-Hill,2006.

Reference Book(s):

1. EnglishConversationPracticebyGrantTaylor,TataMcGrawHill,2009.
2. PracticalEnglishUsagebyMichaelSwan,OUP,4th Edition.
3. TechnicalCommunicationbyMeenakshiRaman&SangeetaSharma,OxfordUniversityPress,2009.
4. EnglishVocabularyinUseAdvancedbyMichaelMcCarthy,FelicityO'Dell,Cambridge UniversityPress,2008.
5. EnglishforTechnicalCommunicationforEngineeringStudents,AyshaVishwamohan, TataMcGraw-Hill2009.

Online Resources:

https://www.youtube.com/watch?v=nQkwdAxF4xA
https://www.youtube.com/watch?v=rl85jxktfms
https://www.youtube.com/watch?v=XzkbcWh8s4w
https://www.youtube.com/watch?v=t6eQAQE1F10
https://www.youtube.com/watch?v=0IFDuhdB2Hk
https://www.youtube.com/watch?v=yqyZwm6QDWI

Web Resources:

- Grammar/Listening/Writing1-language.com
- http://www.5minuteenglish.com/
- https://www.englishpractice.com/Grammar/Vocabulary
- English Language Learning Online
- http://www.bbc.co.uk/learningenglish/
- http://www.better-english.com/
- BBC Vocabulary Games
- Free Rice Vocabulary Game Reading
- https://www.usingenglish.com/comprehension/
- https://www.englishclub.com/reading/short-stories.htm

Online Dictionaries

- Cambridge dictionary online :https://dictionary.cambridge.org/
- MacMillan dictionary :https://www.macmillandictionary.com/
- Oxford learner's dictionaries :https://www.oxfordlearnersdictionaries.com/

NARAYANA ENGINEERING COLLEGE:NELLORE

	CHEMISTRY LAB (COMMON TO CSE,ECE & EEE)							R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	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	Demonstrate the cell constant and conductance of solutions (BL2)
CO 2	Interpret the strength of an acid present in secondary batteries (BL2)
CO 3	Demonstrate advanced polymer materials are used in engineering applications (BL2)

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								
CO2	3	2				2								
CO3	3	2				2								

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
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. Discuss how the potential changes with relative concentration of oxidised/reduced from, 3. Perform a red-ox titration of ammonium iron (II) sulphate using potassium dichromate as oxidizing agent, 4. Determine the equivalence point of the redox titration by plotting titration curve using potential	CO 3

change values and amount of oxidizing agent added during titration	
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
Virtual Labs: 1. http://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1 2. http://vlab.amrita.edu/?sub=2&brch=190&sim=339&cnt=1 3. http://vlab.amrita.edu/?sub=2&brch=190&sim=606&cnt=1	

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Estimation of Ferrous Iron by Dichrometry.	CO 1	https://www.youtube.com/watch?v=LxgZsMhuyNM

2	Colorometry	CO 1	https://youtu.be/efIGmPWP-X8
3	Polymer Preparation	CO 4	https://www.youtube.com/watch?v=PSSK5VGcC_0

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

Web References:

1. https://nptel.ac.in/courses/122101001/23
2. https://nptel.ac.in/courses/104103071/39

NARAYANA ENGINEERING COLLEGE:NELLORE								
	ENGINEERING GRAPHICS							R2021
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	1	4	80	3	40	60	100

Course Outcomes: At the end of the course, student will be able to:	
CO 1	Develop the orthographic projection of points and straight lines(BL-3)
CO 2	Construct the planes and simple solids.(BL-3).
CO 3	Understand and practice basic AUTOCAD commands (BL-2)
CO 4	Construct Isometric views using AUTOCAD (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	2	2			1							2		
CO2	2	2			2	1						2		
CO4	1	1	1		1							1		
CO3	2	2	2		2							1		
1: Low, 2-Medium, 3- High														

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 isometric drawings

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 firstangle 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 to one 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:NELLORE

	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.
5. 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 statement (BL -3)
CO3	Understand the concepts of files, modules (BL -2)

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	3	2	3											
CO2	3	2	3											
CO3	2	2	3	3										

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.

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,

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.

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

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

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
   b. Merge two files

TASK-7 –- Introduction to Numpy (4 H)

1. Write a NumPy program to compute the outer product of two given vectors.
2. Write a Numpy program to compute the determinant of a given square array.

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]

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

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

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

TASK – 12 - Pandas

1. Write a Pandas program to interpolate the missing values using the Linear Interpolation method in a given DataFrame.
2. Write a Pandas program to import excel data (coalpublic2013.xlsx) into a Pandas DataFrame.

Virtual Labs	
Python Lab (IIT Bombay) : 1. http://vlabs.iitb.ac.in/vlabs-dev/labs/python-basics/experimentlist.html 2. https://pythoninstitute.org/free-python-courses/?gclid=EAIaIQobChMI4u7Uw-mZ8wIVTR0rCh0CYw2FEAAYAiAAEgL5GPD_BwE	
List of Experiments	
1. Arithmetic Operations 2. Built-in Functions 3. Loops 4. Data Types 5. Strings	6. Classes and Objects 7. Built-in Modules 8. Constructors and Inheritance 9. Numpy basics. 10. Pandas

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.

Web References:

1. https://www.tutorialspoint.com/python/index.htm
2. https://www.w3schools.com/python/
3. https://www.javatpoint.com/python-tutorial
4. https://www.geeksforgeeks.org/python-programming-language/

NARAYANA ENGINEERING COLLEGE:NELLORE								
21EN1501	ENGLISH LANGUAGE LAB							R2021
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Max Marks**		
	L	**T**	**P**		**C**	**CIE**	**SEE**	**TOTAL**
II	**0**	**0**	**3**	**48**	**1.5**	**40**	**60**	**100**

Pre-requisite: Basic English Grammar

Course Objectives:

1. To expose the students to develop knowledge and awareness of English phonetics be able to read and produce phonemic transcriptions
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To develop strategies appropriately to improve one's ability to listen and Use listening skills to create more effective, less confrontational, more productive professional and personal communication
4. To demonstrate his/her ability to write error free written communication
5. To distinguish main ideas from specific details and make use of contextual clues to infer meanings of unfamiliar words from context
6. To provide a structured methodology for participants to prepare and deliver an effective, high impact presentation that meets the objectives and brings results

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

CO 1	Understand how speech sounds are used to create meaning. Apply their knowledge of English phonetics and phonology to improve their own pronunciation.
CO 2	Recognize and use pitch patterns to signal complete and incomplete thought groups and Speak confidently and intelligibly within groups and before an audience.
CO 3	Discuss and respond to content of a lecture or listening passage orally and/or in writing and make inferences and predictions about spoken discourse
CO 4	Produce coherent and unified paragraphs with adequate support and detail and can write a paragraph with a topic sentence, support, and concluding sentence

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	3				
CO2									3	2				
CO3									3	3				
CO4									3	2				
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
Module - 1	
Introduction to Phonetics : Introduction to Sounds of Speech – Vowels – Consonants - Listening with a focus on pronunciation Reading Newspaper – Highlighting Vowels and Consonants	**CO1**
Module – 2	
Syllabification: Word Stress, Rules of word stress Practice on Intonation and Stress	**CO2**
Module – 3	
Listening Skills : Types of Listening Skills Active listening and anticipating the speaker Listening for Specific & General Details Listening Comprehension	**CO3**
Module – 4	
Defining & Describing: Objects, Places and Events Video Speech Writing Review Writing (Books / Movies / Products..etc.,)	**CO4**
Module – 5	
Reading Comprehension Everyday English – Grammar, Vocabulary, LSRW Skills, Summarizing and Note making Vocabulary Building	**CO5**
Module – 6	
JAM Role Play Giving and Asking Directions Information Transfer	**CO6**

Text Book(s):

1. A Textbook of English Phonetics for Indian Students 2nd Ed T.Balasubramanian.(Macmillian),2012
2. SkillfulLevel2Reading&WritingStudent'sBookPack(B1)MacmillanEducational.

Reference Book(s): English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009.CUP

1.Rizvi,Ashraf.M.,EffectiveTechnicalCommunication,McGrawHill,NewDelhi.2005

2Raman, Meenakshi &Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi.2011

Web References:

1. Grammar/Listening/Writing 1-language.com
2. http://www.5minuteenglish.com/
3. https://www.englishpractice.com/ Grammar/Vocabulary
4. English Language Learning Online
5. http://www.bbc.co.uk/learningenglish/
6. http://www.better-english.com/
7. http://www.nonstopenglish.com/
8. https://www.vocabulary.com/
9. BBC Vocabulary Games
10. Free Rice Vocabulary Game Reading
11. https://www.usingenglish.com/comprehension/
12. https://www.englishclub.com/reading/short-stories.htm
13. https://www.english-online.at/ Listening
14. https://learningenglish.voanews.com/z/3613
15. http://www.englishmedialab.com/listening.html Speaking

16. https://www.talkenglish.com/
17. BBC Learning English – Pronunciation tips
18. Merriam-Webster – Perfect pronunciation Exercises All Skills
19. https://www.englishclub.com/
20. http://www.world-english.org/
21. http://learnenglish.britishcouncil.org/

Online Dictionaries

- Cambridge dictionary online :https://dictionary.cambridge.org/
- MacMillan dictionary :https://www.macmillandictionary.com/
- Oxford learner's dictionaries :https://www.oxfordlearnersdictionaries.com/

NARAYANA ENGINEERING COLLEGE: NELLORE								
21MA1005	COMPLEX ANALYSIS & NUMERICAL METHODS							R-21
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: 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

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	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

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

1. Understand the integration of complex functions. (L-3)
2. Apply Cauchy's integral theorem and Cauchy's integral formula. (L-3)
3. Understand singularities of complex functions. (L-3)
4. 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:

1. Apply numerical differentiation and integration techniques to various engineering problems. (L-3)
2. Understand the techniques of Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule and its applications (L-2)
3. Work out numerical differentiation whenever and wherever routine methods are not (L-1)
4. 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. 2 Ramana B.V., “Higher Engineering Mathematics”, McGraw Hill Publishers,2017..
3. 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::NELLORE								
21ES1009	DATA STRUCTURES AND ALGORITHMS							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

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

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.Explain the energy band diagram of PN junction diode (BL-2) 4. Interpret the effect of temperature on V-I characteristics of PN junction diode (BL-2) 5. Derive the expression for transition and diffusion capacitance (BL-2) 6. Explain V-I Characteristics of various special diodes. (BL-2) 7. Describe the principle of operation of thyristors. (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**	**9 Hrs**
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.
3. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

NARAYANA ENGINEERING COLLEGE:NELLORE								
20EC2001	DIGITAL LOGIC DESIGN							R21
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	2	0	0	48	2	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)**

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
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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
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:

1. To understand frequency response in electrical circuits
2. The capability to analyze the Low and High Pass filter.
3. Evaluate the behaviour of networks for transient analysis of first order and second order.
4. Analyze and synthesize networks using Laplace transforms.
5. 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)

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:

1. Explain the transient phenomenon in DC excitations. (BL-2)
2. Explain Application of Laplace transform for solution of D.C transient circuits. (BL-2)
3. 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:

1. Explain the transient phenomenon in AC excitations. (BL-2)
2. Understand AC transient analysis in electrical circuits to know the power system stability. (BL-2)
3. 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:

1. Understand the concept of two port network theory. (BL-2)
2. Verify the Reciprocity and Symmetry conditions for the given two port network. (BL-1)
3. 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.

NARAYANA ENGINEERING COLLEGE: NELLORE								
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)**

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	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. Solve problems by using F.T properties. **(BL-3)**
4. Analyze the spectral characteristics of signals using Fourier transform. **(BL-4)**
5. Analyze of DTFT for different types of signals and systems. **(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. Compare different sampling techniques. **(BL-2)**
4. 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 continuous-time and discrete-time signals and systems using Laplace transform. **(BL-4)**
3. Interpret the relationship between Fourier and Laplace Transforms. **(BL-2)**
4. Find the stability of the systems using ROC. **(BL-1)**

5. Understand the properties of Z - transform. **(BL-02)** 6. Analyze the discrete-time signals and systems using Z - transforms. **(BL-04)** 7. Interpret the relationship between Fourier and Z - Transforms. **(BL-02)** 8. 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.
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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
21ES1514	**ELECTRONIC DEVICES AND CIRCUITS LAB**							R2020
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														
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													
CO2	2													
CO3	2	2		1									1	
CO4	2	2	2										1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT	CO
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.	CO 2
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.

NARAYANA ENGINEERING COLLEGE::NELLORE								
21ES1513	DATA STRUCTURES AND ALGORITHMS LAB							R21
SEMESTER	Hours / Week			Total hrs	Credit	Max Marks		
	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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
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
5. 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:

1. Understand the importance of basic test signals . **(BL=2)**
2. Understand the Time response of second order system with different dampings . **(BL=2)**
3. Find steady state error for the given system for any input signal. . **(BL=1)**

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:

1. Understand various stability issues **(BL=2)**
2. Apply Routh's stability criteria to given system for stability assessment **(BL=3)**
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)**
3. 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:

1. Understand the importance of state space analysis **(BL=2)**
2. Find the state model for the given transfer function through various techniques. **(BL=1)**
3. 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 :: NELLORE								
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:

1. Summarize basic laws of static electric field. (BL-2)
2. Derive the Maxwell's equations for electrostatic fields. (BL-3)
3. Solve problems applying laws of electrostatics. (BL-3)
5. Explain electric energy and potential (BL-2)
6. Define currents of conductors and dielectrics (BL-1)
7. Illustrate Poisson's and Laplace's Equations (BL-2)
8. Summarize types of capacitors (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: 1. Summarize basic laws of static magnetic field. (BL-2) 2. Derive the Maxwell's equations for magnetic fields. (BL-3) 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: 1. Derive Maxwell's equations for time varying electromagnetic fields. (BL-3) 2. Apply the boundary conditions of EM fields at the interface of different media.(BL-3) 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: 1. Derive wave equations for different media. (BL-3) 2. Explain concept of polarization of electromagnetic waves. (BL-2) 3. Solve problems using wave characteristics equations (BL-3) 4. Explain principles of reflections and refraction for different incidences. (BL-2) 5. Explain concept of power flow using Pointing vector. (BL-2) 6. Solve problems on Brewster angle, power flow and surface impedance. (BL-3)		
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.

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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
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:

1. To study the effect of negative feedback on amplifier characteristics.
2. To design RC & LC oscillator circuits.
3. To analyze amplifier frequency response at low and high frequencies.
4. To study coupling schemes and multi stage amplifiers.
5. 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 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	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

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: 1. Explain the concept of cascading and coupling schemes(BL-2) 2. Analyze two stage RC coupled amplifier (BL-4) 3. Summarize the darlington amplifier parameters.(BL-2) 1. 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) 6. Describe the effect of cascading on bandwidth of tuned amplifiers. (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

NARAYANA ENGINEERING COLLEGE: NELLORE								
21EC2007	PROBABILITY THEORY 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)**

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

COURSE CONTENT

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)
4. Apply Baye's theorem for different real time applications (BL-3)

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)
4. Apply different probability distribution and density functions on 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:

1. Understand the moments for multiple random variables. (BL-2)
2. Understand the concepts of linear transformation of Gaussian random variables. (BL-2)
3. 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. Apply the concepts and its properties of auto correlation. (BL-3)
4. Apply the concepts and its properties cross correlation functions. (BL-3)
5. Understand the concepts of power spectral density & cross power spectral density (BL-2)
6. Apply PSD & CPSD properties on random process. (BL-3)
7. 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: 1. Relate the theory of stochastic processes to analyze linear systems. (BL-2) 2. Understand the concepts of low pass and band pass noise models for random processes. (BL-2) 3. Apply the statistical characteristics to response of linear systems. (BL-3) 4. 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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
21EC2501	**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	3	36	1.5	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	**CO**
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	
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-11: 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-12: 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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
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:

1. To provide practical exposure with generation and simulation of basic signals using standardized tools.
2. To analyze signals and sequences using Fourier, Laplace and Z-transforms.
3. 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	CO
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 E. 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 E. Folding	CO 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	CO 1

correlation.	

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