NARAYANA ENGINEERING COLLEGE::NELLORE

AUTONOMOUS

B.Tech-Mechanical Engineering Course Structure

&

SYLLABUS

(2021-22 academic year)

(NECR B.Tech 21)

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

NARAYANA
ENGINEERING COLLEGE
(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 MECHANICAL ENGINEERING

DEPARTMENT VISION & MISSION

VISION OF THE DEPARTMENT

To produce Quality Mechanical Engineers having sound technical knowledge, who would serve effectively as a responsible technocrat to the demanding needs of society.

MISSION OF THE DEPARTMENT

1) To provide Quality education through effective teaching and learning methodologies for enhancing student's technical knowledge in diversified areas of Mechanical Engineering.

2) To provide opportunities for students to address the existing problems for enhancing their problem solving abilities and leadership qualities.

3) To incorporate Inter-Disciplinary areas of Engineering through training for building a good technical foundation.

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: Apply knowledge in emerging areas of Mechanical Engineering to handle the realistic problems.

PEO 2: Relate engineering issues to broader social and human context, in which their engineering contributions will be utilized.

PEO 3: Graduates will exhibit managerial skills and social responsibility in their profession and adapt to current trends.

PSOs

PSO_1: Domain Specific Knowledge: Apply the relevant techniques to plan, analyze and design Mechanical Structures.

PSO_2: Product Development: Design and deployment of principles to create a new technology for the success of business.

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DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure for B.Tech ME 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
21CH1003	BS	Chemistry for Mechanical Engineering	3	0	0	3	3	40	60	100
21ES1001	ES	Problem Solving and Programming	3	0	0	3	3	40	60	100
21EN1001	HS	English	2	0	0	2	2	40	60	100
21CH1503	BS	Chemistry for Mechanical Engineering Lab	0	0	3	3	1.5	40	60	100
21ES1504	ES	Engineering Drawing	0	1	4	5	3	40	60	100
21ES1501	ES	Problem Solving and Programming Lab	0	0	3	3	1.5	40	60	100
21EN1501	HS	English Language Lab	0	0	3	3	1.5	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	11	2	16	29	19.5	320	480	800

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
21PH1003	BS	Physics for Mechanical Engineering	3	0	0	3	3	40	60	100
21MA1003	BS	Vector calculus, Complex variablesand Transforms	3	1	0	4	4	40	60	100
21ES1006	ES	Material Science and Engineering	3	0	0	3	3	40	60	100
21ES1004	ES	Basics of Electrical and Electronics Engineering	3	0	0	3	3	40	60	100
21PH1503	BS	Physics for Mechanical Engineering Lab	0	0	3	3	1.5	40	60	100
21ES1510	ES	Engineering Workshop	0	0	3	3	1.5	40	60	100
21ES1511	ES	IT Workshop	0	0	3	3	1.5	40	60	100
21ES1509	ES	Material Science and Engineering Lab	0	0	2	2	1	40	60	100
21EN1502	HS	Communications Skills Lab	0	0	2	2	1	40	60	100
21MC8002-13	MC	Mandatory course II	2	0	0	2	0	--	--	--
		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	14	1	16	31	19.5	360	540	900

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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
21MA1006	BS	Probability, Statistics and Numerical methods	3	0	0	3	3	40	60	100
21ES1008	ES	Engineering Mechanics	3	1	0	4	4	40	60	100
21ES1011	ES	Thermodynamics	3	0	0	3	3	40	60	100
21EN1002	HS	Universal Human Values	3	0	0	3	3	40	60	100
21ME2001	PC	Fluid Mechanics and Hydraulic Machines	3	0	0	3	3	40	60	100
21ME2002	PC	Manufacturing Processes	2	0	0	2	2	40	60	100
21ES1515	ES	Computer Aided Drafting and Modeling Lab	0	0	3	3	1.5	40	60	100
21ME2501	PC	Fluid Mechanics and Hydraulic Machines Lab	0	0	3	3	1.5	40	60	100
21ME2502	PC	Manufacturing Processes 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
		Counselling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					25 Points		
		Total	17	1	14	32	24.5	440	660	1100

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
21ME2003	PC	Kinematics of Machinery	3	0	0	3	3	40	60	100
21ME2004	**PC**	Mechanics of Solids	3	0	0	3	3	40	60	100
21ME2005	**PC**	Metal Forming Processes	3	0	0	3	3	40	60	100
21ME2006	**PC**	Thermal Engineering	3	0	0	3	3	40	60	100
	OE	Open Elective I	3	0	0	3	3	40	60	100
21ME2503	PC	Computer Aided Machine Drawing	0	0	3	3	1.5	40	60	100
21ME2504	PC	Thermal Engineering Lab	0	0	3	3	1.5	40	60	100
21ME2505	PC	Mechanics of Solids 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
21MC8002-13	MC	Mandatory course III	2	0	0	2	0			
		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	14	31	21.5	460	540	1000

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
21ME2007	PC	Design of Machine Elements	3	0	0	3	3	40	60	100
21ME2008	PC	Machine Tools	2	0	0	2	2	40	60	100
21ME2009	PC	Thermal Power Systems	3	0	0	3	3	40	60	100
21ME4001-06	PE	Professional Elective I	3	0	0	3	3	40	60	100
	OE	Open elective II	3	0	0	3	3	40	60	100
21ME2506	PC	CAD and Simulation Lab	0	0	2	2	1	40	60	100
21ME2507	PC	Design Thinking and Product Innovation Lab	0	0	3	3	1.5	40	60	100
21ME2508	PC	Machine Tools Lab	0	0	3	3	1.5	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
21ME7501	PR	Internship I/on job training/Com Ser Project	0	0	0	0	1.5	00	100	100
		Counselling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					25 Points		
		Total	14	0	13	27	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
21ME2010	PC	Computer Integrated Manufacturing	3	0	0	3	3	40	60	100
21ME2011	PC	Dynamics of Machinery	3	0	0	3	3	40	60	100
21ME2012	PC	Heat Transfer	2	0	0	2	2	40	60	100
21ME4007-12	PE	Professional Elective II	3	0	0	3	3	40	60	100
21ME4013-18	PE	Professional Elective III	3	0	0	3	3	40	60	100
	OE	Open Elective III	3	0	0	3	3	40	60	100
21ME2509	PC	Computer Aided Manufacturing Lab	0	0	3	3	1.5	40	60	100
21ME2510	PC	Heat Transfer Lab	0	0	2	2	1	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
21MC8002-13	MC	Mandatory course IV	2	0	0	2	0	--	--	--
		Counselling/ Mentoring	0	0	1	1	0	--	--	--
		Sports/ Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					25 Points		
		Total	19	0	10	29	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
21HS5001-05	HS	Humanities and Social Science Elective	2	0	0	2	2	40	60	100
21ME2013	PC	Design of Transmission Systems	3	0	0	3	3	40	60	100
21ME2014	PC	Metrology and Measurements	3	0	0	3	3	40	60	100
21ME4019-24	PE	Professional Elective IV	3	0	0	3	3	40	60	100
21ME4025-30	PE	Professional Elective V	3	0	0	3	3	40	60	100
	OE	Open Elective IV	3	0	0	3	3	40	60	100
21ME2511	PC	Software Tools Lab	0	0	2	2	1	40	60	100
21ME2512	PC	Metrology and Measurements 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
21ME7502	PR	Internship II/on job training/Com Ser Project	0	0	0	0	1.5	00	100	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	17	0	12	29	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
21ME7503	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 ME Department

S. No	Course Code	Subject
1	21ME3001	Engineering Optimization
2	21ME3002	Introduction to Mechatronics
3	21ME3003	Industrial Engineering and Management
4	21ME3004	Automobile Engineering
5	21ME3005	Basics of Mechanical Engineering
6	21ME3006	Automation and Robotics
7	21ME3007	Engineering materials
8	21ME3008	Total Quality Management
9	21ME3009	Industrial Safety and Hazard Management

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
Design Engineering	Product Design & Development (20ME4001)	Design of Material Handling Equipment (20ME4007)	Finite Element Methods (20ME4013)	Computational Fluid Dynamics (20ME4019)	Geometric dimensioning an tolerancing (20ME4025)
Thermal Engineering	Gas turbines and Jet Propulsion (20ME4002)	Power plant Engineering (20ME4008)	Refrigeration & AirConditioning (20ME4014)	Hydraulic & pneumatics Systems (20ME4020)	Automobile Engineering (20ME4026)
Production Engineering	Fundamentals of Additive Manufacturing (20ME4003)	Modern Manufacturing Methods (20ME4009)	Automation In Manufacturing (20ME4015)	Surface Engineering (20ME4021)	Manufacturing & Inspection Of Gears (20ME4027)
Industrial Engineering	Management Science (20ME4004)	Engineering Optimization (20ME4010)	Industrial Engineering (20ME4016)	Production & Operation Management (20ME4022)	Industrial Management (20ME4028)
CAD/CAM	Flexible Manufacturing Systems (20ME4005)	Mechatronics (20ME4011)	Intelligent Manufacturing Systems (20ME4017)	Automation &Robotics (20ME4023)	Computer Aided Process Planning (20ME4029)
Materials Engineering	Principles of Metal Extraction & Refining (20ME4006)	Metallurgy (20ME4012)	Composite Materials (20ME4018)	Nano materials (20ME4024)	Smart Materials (20ME4030)

LIST OF HONOR SUBJECTS

S. NO.	COURSE NAME	Course Code	CREDITS
1	Alternate fuels and Emissions Control in Automotive	21MEH001	4
2	Robotics and Applications in Manufacturing	21MEH002	4
3	Product Marketing	21MEH003	4
4	Additive Manufacturing	21MEH004	4
5.	Mechanics of Composite Materials	21MEH005	4

LIST OF MINOR SUBJECTS

S. NO	SUBJECT	Course Code	CREDITS
1	Thermodynamics	21MEM001	3
2	Manufacturing Processes	21MEM002	3
3	Material Science and Engineering	21MEM003	3
4	Design of Machine Element	21MEM004	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 Code	CREDITS
I	English	21EN1001	2
	English Language Lab	21EN1501	1.5
II	Oral Communications Skills Lab	21EN1502	1
IV	Universal Human Values	21EN1002	3
VII	Humanities and Social Science Elective	21HS5001-08	2
	TOTAL		9.5

BASIC SCIENCES (BS)

SEMESTER	SUBJECT	Course Code	CREDITS
I	Algebra and Calculus	21MA1001	4
	Chemistry for Mechanical Engineering	21CH1003	3
	Chemistry for Mechanical Engineering lab	21CH1503	1.5
II	Vector Calculus, Complex Variables and Transforms	21MA1003	4
	Physics for Mechanical Engineering	21PH1003	3
	Physics for Mechanical Engineering Lab	21PH1503	1.5
III	Probability, Statistics and Numerical methods	21MA1006	3
	TOTAL		**20**

ENGINEERING SCIENCES (ES)

SEMESTER	SUBJECT	Course Code	CREDITS
I	Problem Solving and Programming	21ES1001	3
	Engineering Drawing Lab	21ES1504	3
	Problem Solving and Programming Lab	21ES1501	1.5
II	Material Science and Engineering	21ES1006	3
	Basics of Electrical and Electronics Engineering	21ES1004	3
	Engineering Workshop	21ES1510	1.5
	IT Workshop	21ES1511	1.5
	Material Science and Engineering Lab	21ES1509	1
III	Engineering Mechanics	21ES1008	4
	Thermodynamics	21ES1011	3
	Computer Aided Drafting and Modelling Lab	21ES1515	1.5
VII	Software Tools Lab	21ES1516	1
	TOTAL		**27**

PROFESSIONAL CORE (PC)

SEMESTER	Course Code	SUBJECT	CREDITS
III	21ME2001	Manufacturing Processes	2
	21ME2002	Fluid Mechanics and Hydraulic Machines	3
	21ME2502	Manufacturing Processes Lab	1.5
	21ME2501	Fluid Mechanics and Hydraulic Machines Lab	1.5
IV	21ME2003	Kinematics of Machinery	3
	21ME2004	Mechanics of Solids	3
	21ME2005	Metal Forming Processes	3
	21ME2006	Thermal Engineering	3
	21ME2503	Computer Aided Machine Drawing Lab	1.5
	21ME2504	Thermal Engineering Lab	1.5
	21ME2505	Mechanics of Solids Lab	1.5
V	21ME2007	Design of Machine Elements	3
	21ME2008	Machine Tools	3
	21ME2009	Thermal Power Systems	2
	21ME2506	CAD and Simulation Lab	1
	21ME2507	Design Thinking and Product Innovation Lab	1.5
	21ME2508	Machine Tools Lab	1.5
VI	21ME2010	Computer Integrated Manufacturing	3
	21ME2011	Dynamics of Machinery	3
	21ME2012	Heat Transfer	2
	21ME2509	Computer Aided Manufacturing Lab	1.5
	21ME2510	Heat Transfer Lab	1
VII	21ME2013	Design of Transmission Systems	3
	21ME2014	Metrology and Measurements	3
	21ME2512	Metrology and Measurements Lab	1.5
		TOTAL	54.5

PROFESSIONAL ELECTIVES (PE)

SEMESTER	SUBJECT	Course Code	CREDITS
V Sem	Professional Elective I	21ME4001-06	3
VI Sem	Professional Elective II	21ME4007-12	3
	Professional Elective III	21ME4013-18	3
VII Sem	Professional Elective IV	21ME4019-24	3
	Professional Elective V	21ME4025-30	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 Code	CREDITS
V Sem	Internship I/on job training/Com Ser Project	21ME7501	1.5
VII Sem	Internship II/on job training/Com Ser Project	21ME7502	1.5
VIII Sem	Project work, seminar and internship	21ME7503	12
	TOTAL		15

CREDITS PER SEMESTER

S. NO	CAT	CREDITS PER SEMESTER								CREDITS
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3.5	1	3				2		9.5
2	BS	8.5	8.5	3						20
3	ES	7.5	10	8.5				1		27
4	PC			8	16.5	12	10.5	7.5		54.5
5	PE					3	6	6		15
6	OE				3	3	3	3		12
7	SC			2	2	2	2	2		10
8	PR					1.5		1.5	12	15
	MC	No Credits								
	TOTAL	19.5	19.5	24.5	21.5	21.5	21.5	23	12	163

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NARAYANA ENGINEERING COLLEGE::NELLORE							
CHEMISTRY FOR CIVIL ENGINEERING							**R21**
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: Basic concepts in chemistry, Advanced engineering materials, chemistry in day to day life, awareness on environment,

Course Objectives:

1. To familiarize chemistry for civil engineering and its applications.
2. To impart the concept of soft and hard waters, softening methods of hard water
3. To make the students to get awareness on environment.
4. To train the students on the principles and applications of advanced engineering materials.
5. To train the students on the principles and applications of soil chemistry.

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

CO 1	**Illustrate** the concepts of **water technology and its applications (BL-3)**
CO 2	**Demonstrate the corrosion prevention methods and factors affecting corrosion(BL-3)**
CO 3	**Understand various causes of pollution ,global warming, ozone depletion, and acid rain.(BL-2)**
CO 4	**Explain the setting and hardening of cement and concrete phase (BL-2)**
CO 5	**Classify various soils physical and chemical properties and their impacts.(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													
CO2	3		3											
CO3	3		3											
CO4	3													
CO5	3													

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	**WATER TECHNOLOGY**	11 Hrs

Water technology : Definition of hard and soft water, Sources of water and classification of impurities, Hardness and its types, Units of hardness, Determination of hardness of water by EDTA method, problems on hardness, Determination of Dissolved oxygen, acidity and alkalinity in water. Water softening processes –Zeolite process, Ion- exchange resin process

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

1. **List** the differences between temporary and permanent hardness of water **(BL-1)**

2. **Illustrate** problems associated with hard water - scale and sludge. **(BL-3)**

3. **Explain** the working principles of different Industrial water treatment processes **(BL-2)**

MODULE -2	**CORROSION AND ITS CONTROL**	10 Hrs

Corrosion and its control: Corrosion – types of corrosion, mechanism of chemical, electrochemical corrosion - galvanic corrosion - differential aeration corrosion, Pilling Bed worth rule, factors influencing rate of corrosion. Corrosion control methods: Cathodic protection – sacrificial anodic method. Electro plating (copper plating) and electro less plating (Nickel plating).

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

1. **Identify** the reasons for corrosion. **(BL-1)**

2. **Apply** Pilling Bed worth rule for corrosion and corrosion prevention **.(BL-3)**

MODULE-3	**ENVIRONMENT CHEMISTRY**	10 Hrs

Environment chemistry: Environment and Ecology, Environmental segments, Structure and composition of atmosphere. Atmospheric pollution: Tropospheric Pollution-Gaseous air pollutants- (a) Oxides of Sulphur (b) Oxides of Nitrogen (c) Hydrocarbons, Global Warming and Greenhouse Effect, Acid rain,Stratospheric Pollution- Ozone hole, Effects of depletion of the Ozone Layer. Chemical and photochemical reactions of various species in atmosphere. Water pollution- Causes, effects and control of Water Pollution.

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

1. **To know** about the various sources of pollution.**(BL-2)**
2. **To know** about the various sources of air pollution.**(BL-2)**
3. **Summarize** the concepts of global warming ozone depletion**.(BL-2)**

MODULE-4	**ADVANCED ENGINEERING MATERIALS**	09Hrs

Advanced engineering materials :
Cement: Portland cement, constituents, Manufacture of Portland Cement, chemistry of setting and hardening of cement (hydration, hydrolysis equations).
Refractories : Definition, Classification with examples, properties of Refractory Material, Causes for the failure of a Refractory Material.
Lubricants: Functions of lubricant, Types of Lubrication, Mechanism of lubrication, Properties of lubricants and tests.

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

1. **Identify** the constituents of Portland cement **(BL-1)**
2. **Enumerate** the reactions at setting and hardening of the cement **(BL-1)**
3. **Identify** the factors affecting the refractory material **(BL-1)**
4. **Enumerate** the reactions at setting and hardening of the cement **(BL-1)**

MODULE-5	SOIL CHEMISTRY	08Hrs

Soil Chemistry: Chemical (elemental) composition of the earth's crust and soils. Types of soils, soil components (inorganic and organic), chemical properties of soil. Chemistry of soil acidity; active and potential acidity; lime potential, sub-soil acidity. Saline and alkaline soils-introduction, sources of soluble salts, Chemistry and electrochemistry of water logged soils. Soil pollution-introduction, sources and effects of soil pollution.

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

1 .**Acquire** knowledge on soil components.**(BL-3)**
2 **Understand** various soil problems & their control.**(BL-2)**
3. **Understand** various causes ,effects and their control.**(BL-2)**

	Total hours:	48 Hours

Content beyond syllabus:

1.Reverse osmosis
2. Corrosion control by using corrosion inhibitors.

Self-Study:

Contents to promote self-Learning:

SNO	Module	Reference
1	Hardness by EDTA method, Boiler troubles.	https://youtu.be/ajuG_Z1JDmM https://youtu.be/FCQ26RQBZLg
2	Galvanic corrosion Electro less plating	https://youtu.be/4HCsBMI7nSg https://youtu.be/MhbjQFhZ1bE
3	Air pollution Global warming	https://youtu.be/Tds3k97aAzo **https://youtu.be/We2nYvdjpKk?t=35**
4	Manufacture of Portland cement Refractories Thick film lubrication	https://youtu.be/Q0VLQLOsNck **https://youtu.be/xb_xndPe4n0,**
5	Soil acidityalkalinity&salinity **Soil pollution**	https://youtu.be/uXg9k72mORc https://yhttps://youtu.be/Cy6W,, https://youtu.be/Cy6W5fHPBLg

Text Book(s):

1. P. C. Jain & Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing

   Company(P) Ltd, New Delhi,16th edition, 2013.
2. K. N. Jayaveera, G. V. Subba Reddy and C. Rama chandriah, Engineering
   Chemistry, Mc.Graw Hill Publishers.New Delhi
3. Bolt GH & Bruggenweert MGM.1981.soil chemistry. Elsevier.

Reference Book(s):

1. Text book of Engineering chemistry by shashi chawla.
2. Text book of Engineering chemistry by A .jayashree ,Willey publications, New Delhi
3. A Text book of Environmental Chemistry by O.D. Tyagi and M .Mehra

Online Resources /Web References:

1.https://www.cgaspirants.com/2017/08/engineering-chemistry-by-jain-jain.html

2.https://www.scribd.com/doc/278434466/Shashi-Chawla-Engineering-Chemistry-PDF

3.file:///C:/Users/DELL/Downloads/Ch_2-EnvChemistry.pdf

4.https://nptel.ac.in/courses/105/106/105106119/

5.https://nptel.ac.in/courses/113/104/113104082/

6.https://www.youtube.com/watch?v=YH-00EOnfEE&vl=en

7. https://nptel.ac.in/courses/123/105/123105001/

8.https://nptel.ac.in/courses/113/105/113105028/

9. https://nptel.ac.in/courses/124/105/124105014/

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

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

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

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

MODULE – 1	**Fundamentals of Computers and Programming**	**10 HOURS**

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Algorithms, Flowcharts, How to Develop a Program.
Basics of C: Introduction, Character Set, Structure of a C Program, A Simple C Program, Variables, Data Types and Sizes, Declaration, Identifiers, Keywords, Constants, Assignment, and Initialization.

At the end of the Module 1, students will be able to:
1. Solve problems using language independent notations. **(BL - 3)**
2. Understand the compilers and interpreters. **(BL - 2)**
3. Understand Basic Structured of Programming in C. **(BL - 2)**
4. Develop algorithms and flowcharts for problems.**(BL - 3)**
5. Understand various Tokens in C language.**(BL - 2)**

MODULE -2	**Operators and Input and Output**	**9 HOURS**

Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Conditional Operator, Comma operator, size of 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							
ENGINEERING GRAPHICS							R2021
Semester	Hours / Week			Total	Credits	Max Marks		
	L	T	P	hrs	C	CIE	SEE	TOTAL
I	0	1	4	80	3	40	60	100

Pre-Requisite: Basic Mathematics (Geometry)

Course Objectives:

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

Course Outcomes: At the end of the course, student will be able to:	
CO 1	Define the qualities of precision and accuracy in engineering drawing. (BL-1)
CO 2	Draw engineering curves with different methods(BL-3).
CO 3	Develop the orthographic projection of points and straight lines(BL-3)
CO 4	Construct the planes and simple solids.(BL-3).
CO 5	Understand and practice basic AUTOCAD commands (BL-2)

COURSE CONTENT
Part-A Manual Drawing

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

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

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

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

TASK–2	**Orthographic Projections**	10 Hours

Objectives and Principle of projection, Methods of projections, Comparison between 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

1. ENGLISH
Common to all Branches (CSE,ECE,EEE,CE,ME)

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

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

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

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

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

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

Module 1

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

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

Module 2

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

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

Module 3

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

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

Module 4

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

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

Module 5

Reading Skills : Types of reading: Skimming, Scanning, Intensive & Extensive Reading – Reading Comprehension - Scramble Sentences - Complete the passage using contextual clues Identifying Main Ideas using Scanning - Technique Identifying Specific Ideas using Skimming Technique - Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

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

Text Books:

1. Contemporary English Grammar –Structures and Composition by David Green, MacMillan India, 2014.

2. <u>Effective Technical Communication by Ashraf, M Rizvi,Tata McGraw-Hill, 2006.</u>

Reference Books:

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

NARAYANA ENGINEERING COLLEGE:NELLORE

	Chemistry for Civil Engineering lab						R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks	

Semester	L	T	P	Total hrs	C	CIE	SEE	TOTAL
I	0	0	3		1.5	40	60	100

Pre-requisite: Nil

Course Objectives:

1. **To provide the learners hands-on-training on the practical applications of the concepts learnt in the theoretical sessions on water treatment, electrochemistry, lubricants, and using simple chemical methods.**

2. **The course will also train the learner to observe good lab practices, record readings and graphically represent the results, as well as analyze and interpret the influence of reaction conditions on the results.**

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

CO 1	Analyze quality parameters of water samples from different sources
CO 2	Perform quantitative analysis using instrumental methods.
CO 3	Utilize the fundamental laboratory techniques for analyses such as titrations, separation/purification/ and Spectroscopy
CO 4	**To be able to analyze and gain experimental skill.**

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
Task-1 : Determination of Hardness of a ground water sample	
Objectives **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-2 : Estimation of DO by winklers method	
Objectives: 1. To determine the level of dissolved oxygen in a sample of water using Winkler's method. 2. Analyze the effects of various factors on the level of dissolved oxygen in a water sample (e.g., salt content, temperature, degree of mixing, and the presence of reducing compounds).	CO 1
Task- 3: Determination of chloride content of water.	
Objectives: 1. To determine the amount of chlorine present in given water sample. 2.Learn how to titrate with Silver nitrate and observe different levels of titration	CO 1
Task-4 : Potentiometry - determination of red -ox potentials and emf	

Objectives: 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 red ox titration by plotting titration curve using potential change values and amount of oxidizing agent added during titration.	CO 1
Task-5: Determination of Alkalinity in water	
Objectives: 1. To determine the amount of base present in given samples. 2. Collect water samples from different industrial areas and determine the percentage of base by using hydrochloric acid.	CO 3
Task-6 : Determination of Strength of an acid in Pb-Acid battery	
Objective: 1. To determine the half –reactions involved in spontaneous oxidation –reduction reactions. 2. Explain the function of the lead storage and dry cell batteries …electrolysis involving two lead strips immersed in sulfuric acid.	CO 3
Task-7: Preparation of a Bakelite	
Objective: 1. To prepare phenol formaldehyde resin. (Bakelite) 2. Understand the differences between linear and cross linked polymers. 3. Compare and contrast the recycling properties of linear and cross linked polymers. 4. Compare the combustion properties of various types of material. 5. Define the following terms: polymer, monomer, repeat unit, cross linking, biopolymer	CO 1
Task-8: Estimation of Calcium in port land Cement	
Objective: 1. To estimate calcium cement by EDTA method. 2. To understand the strength of the port land cement.	CO 2
Task-9: Determination of Viscosity of lubricating oil by Red Viscometer	
Objective: 1. Measuring viscosity of fluids. 2.Describe a fluid as having "high "or "low" viscosity	CO 4
Task-10: Estimation of Ferrous Iron by Potassium Dichromate method.	
Objective: 1. Determine the percentage of ferrous iron in an unknown sample by red ox 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
Additional Experiments:	
Task-11: 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-12: Determination of percentage of Iron in Cement sample by colorimeter	
Objective: **1.To provides practical knowledge of instrumental for developing experimental skill in building colorimetric estimation of iron in cement.** **2.understand beers –lamberts law principle**	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 hardness of water	CO 1	https://www.youtube.com/watch?v=Sa0WfA9UGG0
2	Potentiometric red-ox titration	CO 1	https://www.youtube.com/watch?v=wVJ8WQax0rQ
3	Preparation of polymer	CO 4	https://www.youtube.com/watch?v=PSSK5VGcC_0

Text Book(s):
   1. **A Textbook of Quantitative Analysis, Arthur J. Vogel.**
   2. Jaya Shree, Anjireddy, Textbook of Engineering Chemistry, Wiley Precise Textbook Series, 20

   3. **Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company**

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

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

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

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

CO-PO Mapping

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											1	
CO2	1	2	1										1	
CO3	1	2	1		2								2	2
CO4	2	2	3	2	1						2		3	2
CO5	3	3	2	2								1	2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT

MODULE – 1	Fundamentals of Computers and Programming	10 HOURS

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Algorithms, Flowcharts, How to Develop a Program.
Basics of C: Introduction, Character Set, Structure of a C Program, A Simple C Program, Variables, Data Types and Sizes, Declaration, Identifiers, Keywords, Constants, Assignment, and Initialization.

At the end of the Module 1, students will be able to:
4. Solve problems using language independent notations. **(BL - 3)**
5. Understand the compilers and interpreters. **(BL - 2)**
6. 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, size of 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:
5. Illustrate the working of expressions.**(BL - 2)**
6. Understand the precedence and Associativity rules of operators. **(BL - 2)**
7. Understand the rules of type conversion. **(BL - 2)**
8. 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:

5. Understand Selection Statements. **(BL - 2)**
6. Understand Looping and Unconditional Statements. **(BL - 2)**
7. Understand the basic concept of functions. **(BL - 2)**
8. 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:

4. Understand the concept of Arrays. **(BL - 2)**
5. Understand the concept of pointers. **(BL - 2)**
6. 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:

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

	Total hours:	**48 HOURS**

Content Beyond Syllabus:

4. Analysis of Algorithms
5. Text Vs. Binary Files
6. 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):
3. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
4. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill

Reference Books :
14. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
15. Computer Fundamentals by Anita Goel, 2010, Pearson Publication
16. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.
17. Programming in C, 3/e : A Practical Approach by Ajay Mittal, Pearson Publication
18. C: The Complete Reference by SCHILDT and HERBERT, McGraw Hill, 4th Edition, 2020
19. Problem Solving with C by SOMASHEKARA, M. T., GURU, D. S., MANJUNATHA, K. S., PHI Learning, 2nd Edition, 2018
20. C How to Program,Paul Deitel, Deitel & Harvey Deitel, 6th Edition, Pearson Education
21. Programming in C and Data Structures, Jeri R. Hanly, Elliot B. Koffman, Ashok Kamthane and A.Ananda Rao, Pearson Education, 1st Edition, 2010.
22. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition Education / PHI, 2009
23. Programming in C – Stephen G. Kochan, 4th Edition, PearsonEductaion, 2015
24. Programming in ANSI in C, E Balaguruswamy, Tata McGraw Hill, 8th Edition, 2019
25. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing, 2017
26. Let us C, Yashavant P. Kanetkar, BBP Publications, Delhi, 16th Edition, 2017

Online Resources / Web Resources:
15. https://nptel.ac.in/courses/106/105/106105171/
16. https://nptel.ac.in/courses/106/106/106106127/
17. https://www.youtube.com/playlist?list=PLVlQHNRLflP8IGz6OXwlV_lgHgc72aXlh
18. https://www.youtube.com/watch?v=8PopR3x-VMY
19. https://www.youtube.com/watch?v=vl794HKeXug
20. https://books.goalkicker.com/CBook/
21. https://www.tutorialspoint.com/cprogramming/index.htm
22. https://www.programiz.com/c-programming
23. https://www.javatpoint.com/c-programming-language-tutorial
24. https://www.edureka.co/blog/c-programming-tutorial/
25. https://data-flair.training/blogs/c-tutorial/
26. https://www.programmingsimplified.com/c-program-examples
27. https://www.w3schools.in/category/c-tutorial/
28. C Programming Notes for Professionals book : https://books.goalkicker.com/CBook/

ENGLISH LANGUAGE LAB

Common to all Branches (CSE,ECE,EEE,CE,ME)

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

Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
II	0	0	3	48	1.5	40	60	100

word
        accent, intonation and rhythm

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

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

CO-4: T o improve the descriptive strategies and presentation styles

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

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

TASK – 1

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

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

TASK – 2

Syllabification: Word Stress, Rules of word stress

Practice-3 : Practice on Intonation and Stress

TASK – 3

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

Practice-4 : Listening for Specific & General Details

Practice-5 : Listening Comprehension

TASK – 4

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

Practice-6 : Describing: Objects and Places

Practice-7 : Describing: Events and Process

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

Practice-9: Video Speech Writing

TASK – 5

Reading Comprehension- Information Transfer.

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

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

TASK – 6

Giving and Asking Directions - Poster Presentation

Practice-12 : Giving and Asking Directions

Reference Books:

1. A Textbook of English Phonetics for Indian Students 2nd Ed .Balasubramanian (Macmillian),2012

2. SkillfulLevel2Reading&WritingStudent'sBookPack(B1)MacmillanEducational.

3. English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009.CUP

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

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

Software :

1. Walden ELCS&AECS Lab
2. English In Mind (EIM) all level by Cambridge University
3. Cambridge Pronunciation Dictionary by Cambridge University
4. Oxford Advanced Learners Dictionary, Oxford University

Web Resources:
- *Grammar/Listening/Writing 1-language.com*
- *http://www.5minuteenglish.com/*
- *https://www.englishpra ctice.com/ Grammar/Vocabulary*
- *English Language Learning Online*
- *http://www.bbc.co.uk/learningenglish/*
- *http://www.better-english.com/*
- *http://www.nonstopenglish.com/*
- *https://www.vocabulary.com/*
- *BBC Vocabulary Games*
- *Free Rice Vocabulary Game Reading*
- *https://www.usingenglish.com/comprehension/*
- *https://www.englishclub.com/reading/short-stories.htm*
- *https://www.english -online.at/Listening*
- *https://learningenglish.voanews.com/z/3613*
- *http://www.englishmedialab.com/liste ning.htmlSpeaking*
- *https://www.talkenglish.com/*
- *BBC Learning English – Pronunciation tips*
- *Merriam-Webster – Perfect pronunciation ExercisesAll Skills*
- *https://www.englishclub.com/*
- *http://www.world-english.org/*
- *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		
I-B. Tech	**VECTOR CALCULUS COMPLEX VARIABLES & TRANSFORMS**	R-2021

Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			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	Interpretate the different operators such as gradient, curl and divergence to find out point function (L-3)
CO 2	Understand the concept the limit, continuity & differentiation of complex variable (L-3)
CO 3	Evaluate the integral by using contour integration .(L-5)
CO 4	Apply the Laplace transform to convert time domain into frequency domain & Inverse Laplace transforms techniques to solve the differential equations. (L-3
CO 5	Develop the Fourier Series to the given periodic functions (L-3)

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

COURSE CONTENT		
MODULE – 1	**Vector 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,"AText ook 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

https://youtu.be/VzGnb2K4RGQ

NARAYANA ENGINEERING COLLEGE: NELLORE							
	ENGINEERING MECHANICS						R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	1	0	48	4	40	60	100

Pre-requisite: Differentiation and integration topics in mathematics.

Course Objectives:
1. To learn the fundamentals of mechanics concept of force and its types.
2. To learn the effect of friction on equilibrium.
3. To develop knowledge in analyzing different types of trusses.
4. To gain proficiency in understanding the concept moment of inertia.
5. To learn kinematics, kinetics of particle and rigid body, related principles.

Course Outcomes: After successful completion of the course, the student will be able to:
Compute the resultant of system of forces in plane and space acting on bodies. (BL-3) Solve the mechanics problems associated with friction forces. (BL-3)
Determine the support-reactions and analyze the internal forces of the members of various trusses and frames. (BL-4)
Calculate the location of centroid of composite areas. (BL-4)
Apply transfer theorems to determine properties of various sections. (BL-4)
Solve problems related to kinetics. (BL-3)

COURSE CONTENT

MODULE – 1	System of Forces	10 H

Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

MODULE -2	Friction	09 H

Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes.

MODULE-3	Analysis of Trusses	09 H

Introduction to plane trusses, analysis of plane trusses by method of Joints, method of sections & tension coefficient method.

MODULE-4	Centroid & Moment of Inertia	10H

Definition of Centroid & Centre of Gravity, Axes of Symmetry, Location of Centroid of Rectangle, Triangle, Semicircle, Quadrant and sector of a circle by method of integration. Numerical problems on Centroid of Composite sections.
Concept of Moment of inertia, perpendicular axis theorem, parallel axis theorem, and moment of inertia of Rectangular, Circular, Semicircular, Quadrant of a circle Triangular sections by method of integration. Numerical Problems on moment of inertia of composite section.

MODULE-5	Kinematics & Kinetics	10 H

Rectilinear and Curvilinear motion, Velocity, Acceleration, and Motion of a projectile, Relative motion. Kinetics of rectilinear motion, Newton's laws of motion, D'Alembert's principle, Work-energymethod, Impulse-momentum equation, Kinetics of circular motion, Rotation.	
Total	**48 h**

Text Book(s):	
1. S.S .Bhavikatti, "Engineering Mechanics", 4th edition, New Age International, 2008. 2. R.K. Bansal, "A text book of Engineering Mechanics", LaxmiPublications,2010 3. Irving Shames, GKM Rao, "Engineering Mechanics: Statics and Dynamics", 4thedition, Pearson,2009.	
Reference Book(s):	
1. Basudeb Bhattacharya., "Engineering Mechanics", 2ndedition, Oxford University Press (India),2015. 2. K L Kumar, Veenu Kumar, "Engineering Mechanics", 4th edition, Tata McGraw-Hill, 2010. 3. Engineering Mechanics, R.S.Khurmi, S.Chand, 2012.	

NARAYANA ENGINEERING COLLEGE:NELLORE								
	ENGINEERING WORK SHOP						R2021	
Semester	Hours / Week			Totalhrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	3	48	1.5	40	60	100

COURSE CONTENT (TRADES FOR PRACTICE)

Trade -1 Carpentry (10 H)

Familiarity with different types of wood sand tools used in wood working and make following joints from out of 300x40x25mm soft wood stock.

a) Half–Lap joint.

b) Mortise and Tenon joint

Trade-2 Fitting (10 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 (10 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 (9 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 (9 H)

Familiarity with different types of tools used in welding and do the following welding exercises

1. Single V butt joint

2. Lap joint

DEMO EXPERIMENTS:

1. **Plumbing,**
2. **Two wheeler tyre puncture**
3. **Power 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. Kalpakjian S. and Steven S.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.

Reference Book(s):

1. Gowri P., Hariharan and Suresh Babu A., "Manufacturing Technology-I", PearsonEducation2008.

NARAYANA ENGINEERING COLLEGE:NELLORE

	I T WORK SHOP	R2021

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.

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 andSearching

Course Outcomes: After successful completion of the course, the student will be able to
CO 1	Understand the safety aspects in using the tools and equipments. (BL-2)
CO 2	Apply tools for making models in respective trades of engineering workshop.(BL-3
CO 3	Apply basic electrical engineering knowledge to make simple house wiring circuits and check their functionality.(BL-3)
CO 4	Understand to disassemble and assemble a Personal Computer and prepare the computer ready to use (BL-2)
CO 5	Apply knowledge to Interconnect two or more computers for information sharing (B 3)

COURSE CONTENT (TRADES FOR PRACTICE)

Trade -1 Carpentry (8 H)

Familiarity with different types of woods and tools used in wood working and make following joints from out of 300x40x25mm soft wood stock.
 a) Half–Lap joint.
 b) Mortise and Tenon joint

Trade-2 Fitting (8 H)

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 (8 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 (8 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

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. **Kalpakjian S. and Steven S.Schmid, "Manufacturing Engineering and Technology" 4th Edition, Pearson Education IndiaEdition,2002.**

3. **P. Kannaiah &K. L. Narayana "Workshop manual" 2nd Ed., Scitech publications**

4. **Pvt.Ltd., Hyderabad,2008.**

COMMUNICATION SKILLS LAB
Common to all Branches (CSE, ECE,EEE,CE,ME)

CO ~1: To enable students comprehend the concept of communication skills.
CO~2: To enable students to participate and learn the right ways of debating
CO ~3: To enable students to participate and learn the right ways of Group discussion
CO ~ 4: To improve the skills of writing resume
CO –5: To enhance the skills of oral presentation

TASK – 1
Ice - Breaking Activity, Introducing Oneself and Others – Role Plays - Oral Description of Pictures, Photographs, Products, and Process
Practice-1 : - Ice Breaking Activity, Introducing Oneself and Others.
Practice-2 : Role Plays
Practice-3 : Oral Description of Pictures, Photographs, Products, and Process

TASK – 2
What is Debate, How to Debate, Tips for Debate, Debate Practice, Explanation of Debate Techniques, Debate Videos Presentation-Telephone Etiquette, Making an Appointment, Telephone Talk and Tips
Practice-4: Debate (Planned & Extempore)
Practice-5: Telephonic Conversation Practice

TASK – 3
What is Group Discussion, Types of Group Discussion, Tips and Techniques for Effective Group Discussion, Group Discussion Videos Presentation
Practice-6: Group Discussions (Planned & Extempore)
Practice-7 : Group Discussions ()

TASK – 4
Email writing - Resume Writing: Cover Letter – Structure of Resumes – Types of Resumes
Practice-8 : Cover Letter
Practice-9 : Resume Writing

TASK – 5
Oral presentations (individual and group) through Seminars / PPTs - Importance of Body Language - Poster Presentation - Public Speaking Tips, Effective Presentation of renowned speakers.
Practice-10 : Public Speaking / Oral Presentations
Practice-11 : Presentation using PPTs
Practice-12 : Poster Presentation

Software :

5. Walden ELCS&AECS Lab
6. English In Mind (EIM) all level by Cambridge University
7. Cambridge Pronunciation Dictionary by Cambridge University
8. Oxford Advanced Learners Dictionary, Oxford University

Web Resources:
- *Grammar/Listening/Writing 1-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/*
- *http://www.nonstopenglish.com/*
- *https://www.vocabulary.com/*
- *BBC Vocabulary Games*
- *Free Rice Vocabulary GameReading*
- *https://www.usingenglish.com/comprehension/*
- *https://www.englishclub.com/reading/short-stories.htm*
- *https://www.english-online.at/Listening*
- *https://learningenglish.voanews.com/z/3613*
- *http://www.englishmedialab.com/listening.htmlSpeaking*
- *https://www.talkenglish.com/*
- *BBC Learning English – Pronunciation tips*
- *Merriam-Webster – Perfect pronunciation ExercisesAll Skills*
- *https://www.englishclub.com/*
- *http://www.world-english.org/*
- *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							
	ENGINEERING MECHANICS						R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	1	0	48	4	40	60	100

Pre-requisite: Differentiation and integration topics in mathematics.

Course Objectives:
6. To learn the fundamentals of mechanics concept of force and its types.
7. To learn the effect of friction on equilibrium.
8. To develop knowledge in analyzing different types of trusses.
9. To gain proficiency in understanding the concept moment of inertia.
10. To learn kinematics, kinetics of particle and rigid body, related principles.

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

Compute the resultant of system of forces in plane and space acting on bodies. (BL-3)
Solve the mechanics problems associated with friction forces. (BL-3)
Determine the support-reactions and analyze the internal forces of the members of various trusses and frames. (BL-4)
Calculate the location of centroid of composite areas. (BL-4)
Apply transfer theorems to determine properties of various sections. (BL-4)
Solve problems related to kinetics. (BL-3)

COURSE CONTENT

MODULE – 1	**System of Forces**	**10 H**

Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

MODULE -2	**Friction**	**09 H**

Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes.

MODULE-3	**Analysis of Trusses**	**09 H**

Introduction to plane trusses, analysis of plane trusses by method of Joints, method of sections & tension coefficient method.

MODULE-4	**Centroid & Moment of Inertia**	**10H**

Definition of Centroid & Centre of Gravity, Axes of Symmetry, Location of Centroid of Rectangle, Triangle, Semicircle, Quadrant and sector of a circle by method of integration. Numerical problems on Centroid of Composite sections.

Concept of Moment of inertia, perpendicular axis theorem, parallel axis theorem, and moment of inertia of Rectangular, Circular, Semicircular, Quadrant of a circle Triangular sections by method of integration. Numerical Problems on moment of inertia of composite section.

MODULE-5	**Kinematics & Kinetics**	**10 H**

Rectilinear and Curvilinear motion, Velocity, Acceleration, and Motion of a projectile, Relative motion. Kinetics of rectilinear motion, Newton's laws of motion, D'Alembert's principle, Work-energy method, Impulse-momentum equation, Kinetics of circular motion, Rotation.

	Total	**48 h**

Text Book(s):
4.   S.S .Bhavikatti, "Engineering Mechanics", 4th edition, New Age International, 2008. 5. R.K. Bansal, "A text book of Engineering Mechanics", LaxmiPublications,2010 6. Irving Shames, GKM Rao, "Engineering Mechanics: Statics and Dynamics", 4thedition, Pearson,2009.

Reference Book(s):
4. Basudeb Bhattacharya., "Engineering Mechanics", 2ndedition, Oxford University Press (India),2015. 5. K L Kumar, Veenu Kumar, "Engineering Mechanics", 4th edition, Tata McGraw-Hill, 2010. 6. Engineering Mechanics, R.S.Khurmi, S.Chand, 2012.

NARAYANA ENGINEERING COLLEGE: NELLORE

	MATERIAL SCIENCE and ENGINEERING							R2021
Semester		Hours / Week			Total hrs	Credits	Max Marks	
	L	T	P			C	CIE	SEE	TOTAL
II	3	0	0		48	3	40	60	100

Course Objectives:

1. To study structure of metals and types of solids.

2. To understand about equilibrium diagrams and properties of steel and iron.

3. To learn about heat treatment of steel.

4. To study about properties and structures of ceramic materials.
5. To study about properties and structures of composite materials.

Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Define bonds, crystallization of metals ,grain sizes of metals and alloys . (BL-1)
CO 2	Understand about construction of equilibrium diagrams and to study about phase diagrams.(BL-2)
CO 3	Understand properties and structures of various ferrous and non-ferrous metals and alloys.(BL-2)
CO 4	apply the concepts of heat treatment of alloys. (BL-3)
CO 5	Find various ceramic materials and composite materials (BL-1)

COURSE CONTENT

MODULE – 1	Structure of Metals	10 H

Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.
Constitution of Alloys : Necessity of alloying, types of solid solutions,

MODULE -2	Equilibrium of Diagrams	10 H

Experimental methods of construction of equilibrium diagrams, Isomorphism alloy systems, equilibrium cooling and heating of alloys, Lever rule, eutectic systems, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule.

MODULE-3	Metals & Alloys	9 H

Cast Irons and Steels : Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels. **Non-ferrous Metals and Alloys:**

Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

MODULE-4	Heat treatment of Alloys	10 H

Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Harden ability, surface - hardening methods, Age hardening treatment,.

MODULE-5	Ceramics and Composites	9H

Structure, properties and applications of ceramics, composites.
Introduction to super alloys and nano materials.

Text Book(s):
1. Introduction to Physical Metallurgy / Sidney H.Avener. 2017
2. A Text of Essential of Materials science and engineering/ Donald R.Askeland/Thomson.2013
3. Material Science and Metallurgy/ Dr.V.D.Kodgire,2011
Reference Book(s):
1. Science of Engineering Materials / B.K.Agarwal,2017.
2. Engineering materials and metallurgy/R. K. Rajput/S.Chand,2015.
3. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books 1995.

NARAYANA ENGINEERING COLLEGE: NELLORE

	Physics for Mechanical Engineering						R21

Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	49	3	40	60	100

Pre-requisite:

Course Objectives:

6. To explain the significant concepts of Crystals and different types of ultrasonic's.
7. To impart knowledge in basic concepts of mechanics.
8. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
9. To impart knowledge in basic concepts of Optical fibers and LASERs along with its¬ Engineering applications.
10. Familiarize types of sensors for various engineering applications

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

CO 1	Classify types of crystal structures
CO 2	Understand the basic concept of Oscillations
CO 3	Describe the phenomenon of interference, diffraction and polarization.
CO 4	Make use of the lasers and optical fibers
CO 5	Apply the different types of sensors for Engineering applications

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	7												2	
CO2	9													
CO3	15												1	
CO4	9												2	
CO5	8												7	7

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	CRYSTALLOGRAPHY AND ULTRASONICS	7 Hrs

Crystallography: Introduction – Space lattice –Unit cell – Lattice parameters – Crystal systems, Bravias lattice, directions and planes in a crystal, Miller indices – inter-planar distances – Packing fractions of SC, BCC and FCC. Bragg's law-Laue method and powder methods for crystal structure

analysis

Ultrasonics – Introduction, Properties and Production by magnetostriction& piezoelectric methods, acoustic grating, detection of ultrasonic waves, Non Destructive Testing – pulse echo system through transmission and reflection modes ,Medical applications.

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

1. Expalin the different properties of crystals like the presence of long range order and periodicity, structure determination (L2)
2. Identify the use of ultrasonic's in different fields (L3)
3. Apply the concept of ultrasonic's in Engineering Applications (L3)

MODULE -2	OSCILLATIONS	11 Hrs

OSCILLATIONS: Mechanical simple harmonic oscillator (compound pendulum),derivation of an expression for time period; electrical simple harmonic oscillator (L.C CIRCUIT), derivation of an expression for time period; Damped harmonic oscillator-derivation of an expression for angular frequency of damped oscillations, discussion of weak damping, heavy damping, and critical damping condtions; forced mechanical oscillator- derivation of expression for amplitude and mechanical

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

1. Explain The phenomenon of Oscillations (L2)
2. Analyze the types of oscillations (L4)¬
3. Apply the concept of Oscillation to the applications (L2)

MODULE-3	WAVE OPTICS	15 Hrs

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 3, 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)
4. illustrate the concept of polarization of light and its applications (L2)
5. classify ordinary polarized light and extraordinary polarized light (L2)

MODULE-4	LASERS & OPTICAL FIBERS	8 Hrs

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 4, students will be able to:

1. Identifies the Engineering applications of Lasers (L2)
2. Apply the concepts to learn the types of Lasers (L3)
3. Understand the basic concepts of Optical fibre (L2)
4. explain the working principle of optical fibers (L2)
5. classify optical fibers based on refractive index profile and mode of propagation (L2)

6. Identify the applications of optical fibers in medical, communication and other fields (L2)
7. Apply the fiber optic concepts in various fields (L3).

MODULE-5	SENSORS	8 Hrs

Sensors:(qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Fibre optic methods of pressure sensing; Temperature sensors - bimetallic strip, pyroelectric detectors, Hall-effect sensor, smoke and fire

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

1. Explain how Sensors will work in buildings (L2)
2. Identify the working principle of sensors (L2)
3. Apply the concept of sensors in buildings (L4)

	Total hours:	49 Hours

Content beyond syllabus:

1. Types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties
2. Rotating crystal method

Self-Study:

Contents to promote self-Learning:

SNO	Module	Reference
1	Crystallography and Ultrasonics	http://www.gpcet.ac.in/wp-content/uploads/2018/09/UNIT-2-EP-PDF.pdf
2	Oscillations	https://www.vssut.ac.in/lecture_notes/lecture1430261805.pdf
3	Wave Optics	http://engineeringphysics.weebly.com/uploads/8/2/4/3/8243106/svck_-_physical_optics.pdf
4	Lasers & Optical Fibers	https://www.britannica.com/technology/laser
5	Sensors	https://www.electronicshub.org/different-types-sensors/

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. H.J. Pain, "The physics of vibrations and waves", Wiley, 2006.

Reference Book(s):

1. G. Main, "Vibrations and waves in physics", Cambridge University Press, 1993.
2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018
3. N. Subrahmanyam, BrijLal, A Textbook of Optics, S. Chand, New Delhi, 2015
4. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
5. Ajoy Ghatak, Optics, 5th Edition, McGraw Hill, 2012

Online Resources /Web References:

1. http://www.gpcet.ac.in/wp-content/uploads/2018/09/UNIT-2-EP-PDF.pdf
2. https://www.vssut.ac.in/lecture_notes/lecture1430261805.pdf
3. http://engineeringphysics.weebly.com/uploads/8/2/4/3/8243106/svck_-_physical_optics.pdf
4. https://www.britannica.com/technology/laser
5. https://www.electronicshub.org/different-types-sensors/

DEPARTMENT OF MECHANICAL ENGINEERING

List of R21 III & IV Sem Subjects

S.No	BoS Subjects from The Department of ME	Sem/Branch	Category
1.	Engineering Mechanics	III Sem ME	ES
2.	Thermodynamics	III Sem ME	ES
3.	Manufacturing Processes	III Sem ME	PC
4.	Fluid Mechanics &Hydraulic Machines	III Sem ME	PC
5.	Computer Aided Drafting and Modeling Lab	III Sem ME	ES
6.	Manufacturing Process Lab	III Sem ME	PC
7.	Fluid Mechanics & Hydraulic Machines Lab	III Sem ME	PC
8.	Thermal Engineering	IV Sem ME	PC
9.	Kinematics of Machinery	IV Sem ME	PC
10.	Mechanics of Solids	IV Sem ME	PC
11.	Metal Forming Processes	IV Sem ME	PC
12.	Thermal Engineering Lab	IV Sem ME	PC
13.	Mechanics of Solids Lab	IV Sem ME	PC
14.	Computer Aided Machine Drawing	IV Sem ME	PC

NARAYANA ENGINEERING COLLEGE: NELLORE							
21ES1008	ENGINEERING MECHANICS						R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
III	2	1	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	System of Forces	10 H

Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

MODULE -2	Friction	09 H

Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes.

MODULE-3	Analysis of Trusses	09 H

Introduction to plane trusses, analysis of plane trusses by method of Joints, method of sections & tension coefficient method.

MODULE-4	Centroid & Moment of Inertia	10H

Definition of Centroid & Centre of Gravity, Axes of Symmetry, Location of Centroid of Rectangle, Triangle, Semicircle, Quadrant and sector of a circle by method of integration. Numerical problems on Centroid of Composite sections.

Concept of Moment of inertia, perpendicular axis theorem, parallel axis theorem, and moment of inertia of Rectangular, Circular, Semicircular, Quadrant of a circle Triangular sections by method of integration. Numerical Problems on moment of inertia of composite section.

MODULE-5	Kinematics & Kinetics	10 H

Rectilinear and Curvilinear motion, Velocity, Acceleration, Motion of a projectile, Relative motion.
Kinetics of rectilinear motion, Newton's laws of motion, D'Alembert's principle, Work-energy method, Impulse-momentum equation, Kinetics of circular motion, Rotation.

	Total hours:	48 h

Text Book(s):
1. S S.Bhavikatti, "Engineering Mechanics", 4th edition, New Age International,2008.

2. R.K. Bansal, "A text book of Engineering Mechanics", LaxmiPublications,2010

3. Irving Shames, GKM Rao, "Engineering Mechanics: Statics and Dynamics", 4thedition, Pearson,2009.

Reference Book(s):
1. BasudebBhattacharya.,"EngineeringMechanics",2ndedition,OxfordUniversityPress (India),2015.
2. K L Kumar, Veenu Kumar, "Engineering Mechanics", 4th edition, Tata McGrawHill,2010.
3. Engineering Mechanics, R.S.Khurmi, S.Chand, 2012.
4. Engineering Mechanics Statics and Dynamics by Ferdinand Singer,2011

NARAYANA ENGINEERING COLLEGE: NELLORE							
21ES1011	**THERMODYNAMICS**						R2021
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	**FUNDAMENTAL CONCEPTS**	09 Hours

Fundamental Concepts and Definitions: Microscopic and Macroscopic approaches, Concept of continuum and control volume, Systems of Thermodynamics, State, Property, Process, Homogeneous and Heterogeneous systems, Thermodynamic equilibrium, Quasi – static Process, Zeroth Law of Thermodynamics, Temperature Measurement .
Work And Heat Transfer: Thermodynamic Definition of Work and Heat, Different forms of Work and Work transfer and Heat and Heat Transfer, Path Function and Point Function.

MODULE -2	**FIRST LAW OF THERMODYNAMICS**	10 Hours

First Law of Thermodynamics: First law applied to a closed system undergoing a cyclic process and a change of state, Concept of Energy and its forms – Internal Energy and Enthalpy, Perpetual Motion Machine of First Kind (PMM1), First Law Limitations.
Systems of flow : First law applied to a control volume, Steady flow process and its mass and energy balance, Steady flow energy equation on unit mass and time basis, Application of SFEE for devices like boiler, turbine, compressor, heat exchanger, nozzle, diffuser and throttling device.

MODULE-3	**SECOND LAW OF THERMODYNAMICS**	10Hours

Second Law of Thermodynamics: Definition of a heat engine and energy reservoir, thermal efficiency of heat engine, Refrigerator and heat pump and their coefficient of performances, Kelvin-Planck and Clausius Statements ofthe Second Law and their equivalence, Carnot Cycle and Reversible Heat Engine, Carnot theorems and corollaries, Absolute Thermodynamic Temperature Scale, PMMI and PMM II, Reversible process, Irreversible process, Causes of Irreversibility,
Entropy : Concept of Entropy, Clausius theorem, Clausius inequality, Entropy changes in an irreversible and reversible process, Principle of increase of entropy with its application, Absolute entropy.

MODULE-4	**PURE SUBSTANCES**	09 Hours

PURE SUBSTANCE: Behavior of pure substance (steam) explained through T-v, P-T, P-v, P-h & T-s diagrams Triple point and critical point, Quality or Dryness Fraction, Wetness Fraction, Steam Tables, Mollier Chart Measurement of dryness fraction using throttling and separating- throttling calorimeters and also from steam tables Steam processes; expressions for the change in internal energy, enthalpy, work, heat, entropy in various Processes.

MODULE – 5	**IDEAL GASES AND GAS POWER CYCLES**	10 Hours

Ideal Gas and Real Gas: Ideal gas, relation among the specific heats, internal energy, enthalpy. Analysis of isochoric, isobaric, isothermal, isentropic, isenthalpic processes, representation of the above processes on P-v, T- s planes. Determination of work, heat, entropy and enthalpy changes during the above processes, problems Characteristic gas equations of a real gas, law of corresponding states, compressibility factor, problems.

MODELLING OF BASIC ENERGY CONVERSION CYCLES:
Air standard cycle assumptions, Overview of reciprocating engines, Air standard cycles for reciprocating engines – Otto, Diesel &dual, Derivation for efficiency and Mean effective pressure (MEP) and Problems.

	Total hours:	**48 hours**

Text Book(s):
1. P.K.Nag, Engineering Thermodynamics, TMH, New Delhi,2013

2. G.J.Vanwylen and R.E.Sonntag, Fundamentals of Classical Thermodynamics, Wiley Eastern, NewDelhi,2008.

3. Yonus A Cengel and Michael A Boles, Thermodynamics: An Engineering Approach, McGraw Hill, 2002.

4. Principles of engineering thermodynamics by morani 8THedition, SI version.

Reference Book(s):
1. Thermal engineering by R.K Rajput 6thedition.

2. R. K. Rajput (2010), A text book of Engineering Thermodynamics, Fourth Edition, Laxmi Publications, New Delhi, India.

3. Engineering thermodynamics by RK Rajput,5TH edition, Laxmi Publications, New Delhi, India.

4. Engineering thermodynamics, work and heat transfer by Gordon rogers 4TH edition, person educationindia2002.

NARAYANA ENGINEERING COLLEGE::NELLORE							
21ME2002		MANUFACTURING PROCESSES					R2021
Semester	Hours / Week			Total hrs	Credits	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	**CASTING PROCESSES**	10 h

Introduction: Importance and selection of manufacturing processes.
Casting Processes: Introduction to casting process, process steps; Sand Casting – Sand Molds - Typesof Molding Sands and Testing; pattern: types, materials and allowance; Cores: Types of cores, core prints, principles and design of gating system;
Solidification of casting: Concept, solidification of pure metal and alloy.

MODULE -2	**SPECIAL CASTING PROCESSES**	9h

Special casting processes: Process Mechanics, characteristics, parameters and applications of Shellcasting, investment casting, die casting, centrifugal casting;
RISERS – Types, function and design, casting design considerations, Design of feeding systems i.e.,sprue, runner, gate and riser, moulding flasks ; casting defects and remedies
METHODS OF MELTING: Crucible melting and cupola operation, steel making processes

MODULE-3	**METAL JOINING PROCESSES - WELDING**	10h

WELDING : Classification of welding processes ;types of welds and welded joints and V-I characteristics, design of welded joints, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding submerged arc welding, Laser welding, applications, advantages and disadvantages of the above processes, other fabrication processes.
Heat affected zones in welding; Arc Welding defects: causes and remedies.

MODULE-4	**GAS WELDING**	10h

Gas Welding: – Flame Characteristics-Equipment, fluxes and filler rods-Ultrasonic Welding – Friction Welding-Resistance Spot Welding-Resistance Seam Welding – Stud Welding – PercussionWelding -
Brazing:- Filler Metals, Methods - Soldering:- Techniques, Types of Solders and Fluxes
;TIG& MIG welding

CUTTING OF METALS: Oxy – Acetylene Gas cutting, water plasma. Cutting of ferrous, non-ferrous metals soldering and brazing and adhesive bonding : Types and their applications, gas welding defects– causes and remedies–destructive and nondestructive testing of welds

MODULE-5	**SURFACE ENGINEERING & POWDERMETALLURGY**	9 h

SURFACE ENGINEERING: Surface treatment processes and their characteristics and applications.
(a) Overlay coatings (b) Diffusion coatings (c) Thermal or mechanical modification of surfaces. **Ceramics**: Classification of ceramic materials, ceramic powder preparation; Processing of ceramic parts:Pressing, casting, sintering; Secondary processing of ceramics: Coatings, finishing.
Powder Metallurgy: Principle, manufacture of powders, steps involved.

	Total hours	48 hours

Text Book(s):

1. Rao P.N.,“ Manufacturing Technology–Volume I”, 5thedition, McGraw-Hill Education, 2018.

2. Kalpak Jains and SchmidS.R.,“Manufacturing Engineering andTechnology”,7th edition, Pearson,2018

3. Production Technology by R.K. Jain and S.C. Gupta, Khanna Publishers, 17th edition,2012

4. Ian Gibson, Davin Rosen, Brent Stucker "Additive Manufacturing Technologies, Springer, 2ndEd,2014.

5. Welding and Welding Technology, Richard Little McGraw Hill Education,2017

6. Manufacturing Science by Amitabh Ghosh ,east-west press pvt. Ltd. Second Edition

Reference Book(s):
1. Manufacturing Technology, R.K. Rajput, Laxmi Publications
2. Production Technology by R.K.Jainand S.C.Gupta,KhannaPublishers,17 th qedition,2012
3. Production Technology, K.L Narayana, I.K. International Pub, 3rdEdition,2013
4. Manufacturing Process Vol. I, H.S.ShahPearson,2013,
5. Principles of Metal Castings, Rosenthal, Tata Mc Graw Hill ,2ndEdition,2001
6. Workshop Technology–B.S.RaghuVamshi–Vol I.

NARAYANA ENGINEERING COLLEGE:NELLORE

21ME2001	Fluid Mechanics and Hydraulic Machines					R2021	
Semester	Hrs / Week			Total hrs	Credits C	Max Marks	

Semester	L	T	P	Total hrs	C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	PROPERTIES OF FLUIDS	10 Hrs

Definition of fluid, Dimensions and units, physical properties of fluids–density. specific weight, specific gravity, surface tension– vapor pressure and their influence on fluid motion–Newton's Law Of Viscosity,

Fluid Statics-Atmospheric, Gauge and Vacuum pressure–measurement of pressure–Piezometer, manometers-simple, U-tube manometers, U-tube differential manometers.

Fluid Kinematics : stream line, path line and streak lines and steam tube, classification of flows- steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows-equation of continuity for one dimensional flow.

MODULE -2	FLUID DYNAMICS	9 Hrs

Fluid Dynamics: surface and body forces – Euler's and Bernoulli's equations for flowing stream line, momentum equation and its application on force on pipe bend

Flow Through Pipes: Reynolds's Number, Darcy Weisbach equation–Minor losses in pipes–pipes in series and pipes in parallel. Measurement of flow: Pitot Tube, Venturi Meter - horizontal position only and Orifice Meter.

MODULE-3	IMPACT OF JET ON VANES	10 Hrs

Dimensional Analysis- dimensional homogeneity- methods of dimensional analysis-Rayleigh's method-Buckingham theorem.

Impact Of Jet : Introduction to Hydrodynamic Thrust of jet on fixed and moving surfaces (flat and curved), series of flat vanes and series of radial curved vanes -velocity diagrams, work done and efficiency

MODULE-4	HYDRAULIC TURBINES	10 Hrs

Classification of turbines, Impulse and Reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies(theory & derivations), hydraulic design-draft tube-theory- functions and efficiency.

MODULE-5	CENTRIFUGAL PUMPS	9 Hrs

Introduction, Classification -components and working of centrifugal pumps, - work done – manometric head, losses, efficiencies–specific speed–pumps in series and parallel–performance characteristic curves and NPSH.

	Total Hrs:	48 Hrs

Text Book(s):

1. Hydraulic and Fluid Mechanics including Hydraulic Machines by Modi &Seth, Standard book house

2. A Text of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., NewDelhi,2019.

3.Dr D S Kumar, "Fluid Mechanics and Fluid Power Engineering" S K Katariua&Sons,2014.

Reference Book(s):

1. Fluid mechanics and fluid machines by Rajput, S.Chand & Co.

2. Mechanics of Fluids by Potter, Wiggert, Ramadan, M.M.M.SARCAR, Cengage Publishers.

3. Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, Universities Press.

NARAYANA ENGINEERING COLLEGE:NELLORE							
21ES1515	COMPUTER AIDED DRAFTING AND MODELLING LAB						R2021
Semester	Hours / Week			Total	Credit	Max Marks	
	L	T	P	hrs	C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100

COURSE CONTENT
Task -1 Introduction to AutoCAD commands
Study capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
Task -2
. Draw Title Block with necessary text and projection symbol
Task -3
Draw the methods of Dimensioning
TASK-4
Draw front view and top view of pentagon & hexagon by using 2D modeling
TASK-5
Draw front view and top view of simple solids like prism, pyramid, cylinder, cone by using 2D modeling
TASK-6
Draw front view, top view and side view of objects from the given pictorial views (eg. V-block,, steppedblock, pulley, Simple stool,).
TASK-7
Draw sectional views of prism, pyramid, , etc,
TASK-8
Draw isometric projection of simple objects. cylinder, cone and sphere
TASK-9
Creation of 3-D models of simple objects like journal bearing and spiral steps
TASK-10
Draw a layout of Engineering workshop.

Text Book(s):

1. Ibrahim Zeid, "CAD / CAM - Theory and Practice 2E", Tata Mcgraw-Hill, NewDelhi,2010.

2. P. Radhakrishnan, S. Subramanyan, V. Raju "CAD/CAM/CIM", New Age International,2015.

3. M.M.M. Sarcar, K. Mallikarjuna Rao, K. Lalit Narayan "computer aided design and manufacturing", prentice hall of India,2008.

Reference Book(s):

1. Mikell.P.Groover, "CAD/CAM: Computer-Aided Design and Manufacturing", Prenticehall of India Pvt. Ltd.,NewDelhi.2008

2. Chriss McMahon and Jimmie Browne, "CAD/CAM", Addision Wesley, New York,2000.

3. Tien-chienchang, Richard A wysk, Hsu-pin wang, "Computer-Aided Manufacturing", PearsonEdition,2009.

NARAYANA ENGINEERING COLLEGE::NELLORE							
21ME2502			**Manufacturing process Lab**				R2021
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
Pattern Design and making on lathe machine
Task 2
Sand Properties Testing – Exercise for Strength and Permeability
Task -3
Gating Design and pouring time and solidification time calculations
TASK -4
Molding, Melting and Casting for ferrous/ non ferrous materials
TASK -5
Arc Welding: Lap & Butt Joint of M.S. plates -5mm
TASK-6
Brazing on copper pipes- 6mm pipe
TASK -7
Spot Welding on M.S PLATE- 2mm size
TASK -8
Tig Welding : Lap & Butt Joint of M.S. plates -5mm
TASK -9
Hydraulic Press: Deep drawing Press Tool: Blanking and Piercing operation with Simple dies
TASK -10
Additive manufacturing-3D printing
ADDITIONAL EXPERIMENTS
TASK-11
Design the mould for making chalk pieces
TASK-12
Design the small components by using 3D Printing

Text Book(s):
1. .W. A. J. Chapman, Workshop Technology Part I, ELBS & Edward Arnold Publishers.
2. A charkan. N., Machine Tool Design Vol. 1 to 4, MIR Publication.
3. HMT, Production Technology, Tata McGraw Hill.

Reference Book(s):

1 .Hajra Choudary, Elements of workshop technology, Vol I & II, Media Publishers,

2 .Malkin Stephen, Grinding Technology: Theory and Applications of Machining with Abrasives,Industrial press,2008

3 .PoulDeGarmo, J.T.Black,R.A.Kosher, Materials and Processes in Manufacturing, Prentice Hall of India Pvt.Ltd.,1997.

NARAYANA ENGINEERING COLLEGE:NELLORE							
21ME2501	**Fluid Mechanics and Hydraulic Machines Lab**						R2021
Semester	Hours / Week			Total	Credits	Max Marks	
	L	T	P	hrs	C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100

COURSE CONTENT
Task 1 – Calibration of Venturi Meter
Calibrate the coefficient of Discharge of a Venturi Meter.
Task -2 Calibration of Orifice Meter
Calibrate the coefficient of Discharge of an Orifice Meter.
TASK-3 External Mouth Piece
Calibrate the coefficient of Discharge of external mouth piece.
TASK-4 Rectangular Notch
Calibrate the coefficient of Discharge of Rectangular Notch.
TASK-5 Minor Losses
Find the loss of head due to sudden contraction.
TASK-6 Major Losses
Find the friction factor of pipes having different diameters and same material.
TASK-7 Verification of Bernoulli's Theorem.
Prove that the total energy remains constant by using Bernoulli's tube withdifferent cross section.
TASK -8 Impact of jet on vanes
Measure the co efficient of impact of jet on flat and curved vanes.
TASK-9 Pelton wheel turbine
Conduct performance test on Pelton Wheel and find it's efficiency.
TASK-10 Single stage centrifugal pump.
Calculate the efficiency of a single stage centrifugal pump with constant speed.
ADDITIONAL EXPERIMENTS
TASK-11 Multi stage centrifugal pump.
Calculate the efficiency of a Multi stage centrifugal pump with constant speed.
TASK-12 Reciprocating pump.

Calculate the efficiency of a Reciprocating pump with constant speed.

VirtualLabs:

1http://eerc03-iiith.vlabs.ac.in/
2.http://fmc-nitk.vlabs.ac.in/fluid-machinery/

Text Book(s):
1. Hydraulic and Fluid Mechanics including Hydraulic Machines by Modi &Seth, Standard book house

A Text of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd.,New Delhi.

Reference Book(s):
1. Fluid mechanics and fluid machines by Rajput, S.Chand & Co.

2. Mechanics of Fluids by Potter, Wiggert, Ramadan, M.M.M.SARCAR, Cengage Publishers.

3. Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, Universities Press.

NARAYANA ENGINEERING COLLEGE:NELLORE							
21ME2006		THERMAL ENGINEERING					R2021
Semester	Hours / Week			Total hrs	Credits	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION TO IC ENGINES	09 Hours

IC ENGINES: Classification, Various parts and their uses, Materials of parts, Working principles of two stroke and four stroke engines and SI and CI engines, Valve and Port Timing Diagrams, Scavenging of IC Engines.

MODULE -2	VARIOUS SYSTEMS OF IC ENGINES	10 Hours

FUEL SUPPLY SYSTEM (IN SI ENGINES) : Line diagram of fuel supply, Fuel pumps – Mechanical and Electrical, Air cleaners , Fuel filters, Simple Carburettor – its working principle and types, Carburettor defects.

COOLING SYSTEM (IN SI ENGINES) : Methods – Air cooling, water cooling and liquid cooling, Types of water cooling – Thermosyphon system and Pump Circulation system, Radiator and Thermostat. Pressure sealed cooling, Anti freeze solutions.

LUBRICATION SYSTEM (IN SI ENGINES) : Dry sump and Wet sump systems. Crankcase ventilation, Oil pumps – Gear pump and Plunger pump, Oil filters – Bypass system and Full flow system.

IGNITION SYSTEM (IN SI ENGINES) : Requirements of ignition system, Types – Battery Ignition, Magneto Ignition and Electronic Ignition, Working principles of all the ignition systems, Spark Advance and Retard Mechanisms.

MODULE -3	COMBUSTION IN IC ENGINES	10 Hours

COMBUSTION IN SI ENGINES: Combustion in SI Engines Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Type of Abnormal combustion, pre-ignition and knocking (explanation of) Fuel requirements and fuel rating, anti-knock additives, combustion chamber – requirements, types.

COMBUSTION IN CI ENGINES: Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Need for air movement, open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

MODULE-4	TESTING AND PERFORMANCE OF IC ENGINES	09 Hours

TESTING AND PERFORMANCE OF IC ENGINES: Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power, Determination of frictional losses and indicated power, Performance test, Heat balance sheet.

MODULE-5	COMPRESSORS	10 Hours

RECIPROCATING COMPRESSORS: Classification of compressors, Principle of operation of reciprocating compressors, work required, Isothermal efficiency volumetric efficiency and effect of clearance multistage compression, under cooling, saving of work, minimum work condition for multi-stagecompression.

CENTRIFUGAL COMPRESSORS: Mechanical details, principle of operation, velocity and pressure variation, impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient, velocity diagrams, power required.

	Total hours:	48 Hours

Text Book(s):

1. R.S. Khurmi and J.K. Gupta, A Textbook of Thermal Engineering, (2011), 3rd Edition, S. Chand & Company Ltd., New Delhi
2. R. K. Rajput (2011), Thermal Engineering, 18th edition, Lakshmi Publications, New Delhi,India.
3. Dr. Kirpal Singh, Automobile Engineering (Volume II), 6th Edition, Standard Publisher, New Delhi.
4. V. Ganesan (2011), I.C. Engines, 3rd edition, Tata McGraw-Hill, New Delhi,India.

Reference Book(s):

1. Mathur, Sharma (2008), IC Engines, 3rd edition, Dhanpat Rai & Sons, New Delhi,India.
2. B.JohnHeywood (2011), internalcombustionenginefundamentals,2ndedition, TataMcGraw-Hill, NewDelhi.
3. Pulkrabek (2008), Engineering fundamentals of IC Engines, 2nd edition, Pearson Education.

NARAYANA ENGINEERING COLLEGE:NELLORE

21ME2003	**KINEMATICS OF MACHINERY**						R2021
Semester	Hours / Week			Total hrs	Credits C	Max Marks		

Semester	L	T	P	Total hrs	C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	**Introduction**	**10 Hrs**

Definitions of link or element, kinematic pairs, degrees of freedom, Grubler's criterion (without derivation), kinematic chain, mechanism, structure, mobility of mechanism, inversion, machine, kinematic chains and inversions. Inversions of four bar chain, single slider crank chain and double slider crank chain, Quick return motion mechanisms – drag link mechanism.

MODULE -2	**Mechanisms with LowerPairs**	**9 Hrs**

straight line motion mechanisms – Peaucellier'smechanism and Robert's mechanism, intermittent motion mechanisms – Geneva mechanism and ratchetand pawl mechanism, pantograph.
Steering Mechanism: Condition for perfect steering, Steering gear mechanisms, Davis and Ackermann– Hooke's Joint.

MODULE-3	**Velocity and Acceleration of Mechanisms**	**10 Hrs**

Determination of velocity and acceleration of a point/link in simple mechanisms by relative velocity method (graphical) – Coriolis component of acceleration. Instantaneous centre – Centrodes – Kennedy's theorem – To determine linear velocity and angular velocity of links of simple mechanisms by instantaneous center method.

Klein's Construction for velocity and acceleration of slider crank mechanism.

MODULE-4	**Gears & Gear Trains**	**10 Hrs**

Classification of Gears – Gear terminology –Law of gearing –Velocity of sliding – Length of path o contact, Arc of contact – Contact ratio – Interference in Involute gears, Methods of avoiding interference – Minimum number of teeth to avoid interference on pinion meshing with gear and on pinion meshing with rack. Characteristics of involutes action, Comparison of Involute and Cycloidal teeth profiles. Numerical problems.
Velocity ratio & Train value, Types of gear trains– Simple, Compound, Reverted & Epicyclic gear trains. Algebraic/Tabular method of finding Train value of Epicyclic gear trains, Bevel gear Differential of an automobile

MODULE-5	**CAMS**	**9 Hrs**

.
Types of cams, types of followers, displacement, velocity and acceleration time curves for cam profiles, disc cam with reciprocating follower having knife-edge, roller and flat faced follower, disc cam with oscillating roller follower. Follower motions including, SHM, uniform velocity, uniform acceleration and retardation and Cycloidal motion

	Total hours:	**48 hours**

Text Book(s):
1. Thomas Bevan, Theory of Machines, CBS Publishers,2009.
2. S.S. Rattan, Theory of Machines, Tata McGraw Hill Publishers, 3rd Edition,2009.
3. Kinematics & Theory of Machines, Sadhu Singh,Pearson

Reference Book(s):
1. J.E.Shigley, Theory of Machines, Tata McGraw Hill Publishers, New Delhi, 3rd Edition, 2005.
2.C.S. Sharma and Kamlesh Purohit, Theory of Mechanisms and Machines, PHI Learning Pvt. Limited,2006
3.Amitabh Ghosh and A.K. Mallik, Theory of Machines, East West Publications, 3rd Edition, 2009.

NARAYANA ENGINEERING COLLEGE:NELLORE

21ME2004		MECHANICS OF SOLIDS					R2021
Semester	Hours / Week			Total hrs	Credits		Max Marks
	L	T	P		L	T	P	
IV	2	1	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	**SIMPLE STRESSES AND STRAINS**	08 hours

Types of Stresses, Strains, Hooke's law, Stress–Strain diagram for various materials, Working Stress, Factor of safety, Lateral strain, Poisson's ratio, Volumetric strain, relation between three elastic module, Bars of Varying section, Composite bars, Temperature stresses, Strain energy.

MODULE -2	**SHEAR FORCE AND BENDING MOMENT**	10 hours

Concept of shear force and bending moment, S.F and B.M. diagrams for cantilever, Simply supported, Over hanging beams subjected to Point loads, Uniformly distributed loads, Uniformly varying loads and combinationof these loads, Point of contra flexure.

MODULE-3	**BENDING STRESS AND SHEAR STRESS**	10 hours

Theory of simple bending, Bending equation, Determination of flexural stresses for simple cases, Section modulus.

Shear stress formula, Shear stress distribution across various beams & sections - Rectangular, Circular, Triangular, I, T sections

MODULE-4	**TORSION AND DEFLECTION OF BEAMS**	10 hours

Theory of pure torsion, Torsion Equation, transmission of power in solid and hollow circular shafts, comparison o strengths of solid and hollow shafts, shafts in series and parallel, combined bending and torsion.

Relationship between curvature, slope and deflection, Slope and deflection of cantilever and simply supported beams by Double Integration method and Macaulay's method.

MODULE-5	**PRESSURE VESSELS AND COMPLEX STRESSES**	10 hours

Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses, Volumetric strain, Thin spherical shells, Thick cylinders under internal and external pressure.
Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions – Principal planes and principal stresses - Mohr's circle

	Total hours:	**48 hours**

Text Book(s):
1. F.P. Beer, E.R. Johnston, Jr&John.T. DeWolf, "Mechanics of Materials", 7th edition, Tata McGraw-Hill,2016.
2. SS Rattan, Strength of materials, 3rd edition, Tata McGraw-Hill,2016.
3. Strength of Materials by R.K. Bansal, Laxmi Publishers, 5thEdition,2012.
4. Mechanics of Materials, Andrews Pytel,J aan Kiusallaas & M.M.M.Sarcar (Second Edition),Cengage LearningPublishers.

Reference Book(s):

1. Timoshenko, "Strength of Materials Part-I&II", 3rd edition, CBS Publishers,2004.

2. Popov, "Mechanics of Solids", 2nd edition, New Pearson Education,2015

3. R.K.Rajput, *Strength of materials*, S.Chand Publications, Revised Edition,2006.

4. Strength of Materials by M.Chakraborti, S.K.Kataria &Sons, 2ndEdition,2011.

NARAYANA ENGINEERING COLLEGE:NELLORE							
21ME2005	**METAL FORMING PROCESSES**						R2021
Semester	Hours / Week			Total hrs	Credits	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

COURSE CONTENT

MODULE – 1	**INTRODUCTION TO METAL FORMING**	**10 Hrs**

Stress, strain, Two-dimensional stress analysis, and three-dimensional stress analysis, the relation between engineering stress and true stress, the relation between engineering strain and true strain, yield criteria, yield locus, theory of plasticity, Hot working, cold working, strain hardening, recovery, recrystallization, and grainGrowth

MODULE -2	**ROLLING & FORGING**	**9Hrs**

Introduction to bulk and sheet metal forming, Economics of bulk-forming
ROLLING: principles and theory of rolling, Process description of Rolling. Forces in rolling and power requirements, applications and, limitations, defects in rolled products – Numerical problems on Rolling. FORGING PROCESSES: Principles of forging – Process description of Forging -Types Forging – Smith forging, Drop Forging – Roll forging –: Rotary forging – forging defects, Forces in forging of the strip,disc and power requirements. applications

MODULE-3	**EXTRUSION PROCESSES**	**10Hrs**

EXTRUSION PROCESSES: Basic extrusion process and its characteristics. Mechanics of hot and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion, forces in extrusion of cylindrical and non-cylindrical components – characteristics and defects in extruded parts.
WIRE DRAWING: Process Mechanics and its characteristics, determination of the degree of drawing, Drawing force, power, and number of stages-defects in products, Numerical problems on drawing

MODULE-4	**WIRE DRAWING & SHEET METAL WORKING**	**9Hrs**

Sheet Metal Working – Economical Considerations - Stamping, forming, and other cold working processes: Blanking and piercing – Bending and forming – Drawing and its types – Cup drawing and Tube drawing – coining – Hot and cold spinning. Force and power requirements in sheet metal operations, defects in sheet metal products

MODULE-5	**PROCESSING OF PLASTICS**	**10Hrs**

Processing of plastics, injection and blow molding, calendaring, thermos forming, compression molding,transfer molding, and joining of plastics.
Rapid manufacturing: - Introduction – concepts of rapid manufacturing, information flow forrapid prototyping, classification of the rapid prototyping process, stereolithographic process, fused deposition modeling, selective laser sintering

	Total hours:	48 hours

Text Book(s):

1. Manufacturing Technology, Schmid and kalpak Jain, Pearson Education,2016
2. Production Technology by R.K. Jain and S.C. Gupta, Khanna Publishers, 17th edition,2012
3. Manufacturing technology Vol I by P.N. Rao, Tata McGraw Hill, 4th edition,2013

Reference Book(s):

1. Manufacturing Technology, R.K. Rajput, Laxmi Pub
2. Rapid Prototyping Principles and Applications, Rafiq Noorani, WielyPub

NARAYANA ENGINEERING COLLEGE:NELLORE								
21ME2504	THERMAL ENGINEERING LAB							R2021
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	0	0	3	48	1.5	40	60	100

COURSE CONTENT

Task 1

Performance test on Spark Ignition engine and Compression Ignition using the alternate fuels.

Task-2

Valve Timing Diagram of an 4 stroke diesel engine .

Task-3

Port Timing Diagram of an 2-Stroke Petrol engine.

TASK-4

Performance Test on a 4 -Stroke Diesel Engines.

TASK-5

Performance Test on 2-Stroke Petrol engine.

TASK-6

Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinderEngine.

TASK-7

Retardation and motoring test on 4- stroke engine.

TASK-8

Heat Balance of an I.C. Engine.

TASK-9

/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.

TASK-10

Performance Test on Variable Compression Ratio Engines for CI Engines.

Additional Experiments

TASK -11

Performance Test on Reciprocating Air – Compressor Unit.

TASK -12

Study of Boilers.

Text Book(s):

1. Vasandani V.P. and Kumar, D.S., Treatise on Heat Engineering, Chand & Co   Publishers,   New Delhi,2011.

2.Ganesan, V., Gas Turbines 3rd Edition, Tata McGraw Hill Book Company, New Delhi,2010.

3. Internal Combustion Engines / V. Ganesan- TMH, 4thEdition,2012

4. Thermal Engineering / Rajput / Lakshmi Publications, 9thEdition,2013

Reference Book(s):

1.I.C. Engines fundamentals, Heywood, McGraw-Hill, 1st Edition,2011

2. IC Engines – Mathur & Sharma – DhanpathRai&Sons,,2010

3. Engineering fundamentals of IC Engines – Pulkrabek, Pearson, PHI, 2ndEdition,2009

4. Thermal Engineering, Rudra moorthy – TMH, 10thEdition,2010

NARAYANA ENGINEERING COLLEGE:NELLORE							
21ME2505		**Mechanics of Solids Lab**					**R2021**
Semester	Hours / Week			Total hrs	Credit	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
IV	0	0	3	48	1.5	40	60	100

COURSE CONTENT
Task 1 Tension on U.T.M.
Study the stress – strain relations of (a) Mild Steel b) Cast iron and (c) Tor Steel be conducting tension test on U.T.M
Task 2 Compression test on U.T.M.
Study the stress – strain relations of (a) Mild Steel b) Cast iron and (c) Tor Steel be conducting compression test on U.T.M
Task -3 Compressive and Shear strength.
Find the compressive and shear strength of wood and shear strength of GI sheet by conducting relevant tests.
TASK -4 Brinnell's and Vicker's hardness.
Find the Brinnell's and Vicker's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper.
TASK -5 Modulus of rigidity.
Determine the Modulus of rigidity (a) Solid shaft (b) Hollow shaft made of steel and aluminium.
TASK-6 Compression and Tensile tests.
Find the spring index and modulus of rigidity of the material of a spring by conducting compression and tensile tests.
TASK -7 Deflection test.
Determine the Young's modulus of the material by conducting deflection test on a simply supported, and continuous beams.
TASK -8 Deflection test.
Determine the Young's modulus of the material by conducting deflection test on propped cantilever beam
TASK -9 Impact strength .
Find impact strength of a given material by conducting a Charpy test
TASK -10 Impact strength.
Find impact strength of a given material by conducting a Izod test

Additional Experiments:
TASK -11 Deflection.
Determine the deflection in leaf spring with a single leaf and multiple leafs.
TASK -12 Bending Test
Determine the bending stress by conducting Bending test on 1. Mild steel 2. Wood
VirtualLabs http://sm-nitk.vlabs.ac.in/

Text Book(s):
1. F.P.Beer,E.R.Johnston,Jr&John.T.DeWolf,"Mechanics ofMaterials",7thedition,TataMcGraw-Hill,2016.
2. SS Rattan, Strength of materials, 3rd edition, Tata McGraw-Hill,2016.
3. Strength of Materials by R.K. Bansal , Laxmi Publishers, 5thEdition,2012.
4. Mechanics of Materials, Andrews Pytel,JaanKiusallaas&M.M.M.Sarcar (SecondEdition),Cengage Learning Publishers.
Reference Book(s):
1. Timoshenko, "Strength of Materials Part-I& II", 3rd edition, CBS Publishers,2004.
2. Popov, "Mechanics of Solids", 2nd edition, New Pearson Education,2015
3. R.K.Rajput, *Strength of materials*, S.Chand Publications, Revised Edition,2006.
4. Strength of Materials by M.Chakraborti, S.K.Kataria& Sons, 2ndEdition,2011.

NARAYANAENGINEERINGCOLLEGE:NELLORE							
21ME2503	**Computer Aided Machine Drawing Lab**						R2021
Semester	Hours /Week			Total	Credit	MaxMarks	
	L	T	P	hrs	C	CIE	SEE	TOTAL
IV	0	1	2	48	2	40	60	100

COURSE CONTENT
PART -A The following contents are to be done by any 2D software package
Task 1
1. Conventional representation of materials. 2. Conventional representation of machine components.
Task 2 Conventional representation
1. Conventional representation of dimensioning on the drawings. 2. Conventional representation sectional views.
Task -3 Detachable joints
Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.
PART B
The following contents are to be done by any 2D software package
TASK -4 Riveted joints
Drawing of rivet, lap joint, butt joint with single strap, single riveted , double riveted double strap joints.,
TASK -5 Welded joints
Lap joint and T joint with fillet, butt joint with conventions
TASK-6 Keys & Couplings
Taper key, sunk taper key, round key, saddle key, feather key, woodruff key. Shaft coupling, bushed pin-type flange coupling, universal coupling, Oldhams' coupling
PART-C
The following contents are to be done by any 3D software package:
TASK -7 Assembly drawings
Lathe tool post, , tail stock, machine vice, gate valve
TASK -8 Assembly drawings
screw jack, plumber block, clamping device, Geneva cam, universal coupling, connecting rod, eccentric.

Additional Experiments:
TASK -9 Manufacturing drawing
Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Text Book(s):
1.K.L. Narayana, P. Kannaiah, "A text book on Engineering Drawing", SciTech Publications, 2014
2. N.D.Bhatt, "Machine Drawing", Charotar, 50th edition, 2014.
3"Software tools/packages", Auto CAD, Solid works or equalent.
4.Machine Drawing With AutoCAD, GoutamPohit, GoutamGhosh, Pearson Publications

Reference Book(s):
1. CecilJensen, JayHelsel and Donald D.Voisinet, "Computer Aided Engineering Drawing",
TataMcGraw-Hill, NY,2000.
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