NARAYANA ENGINEERING COLLEGE: NELLORE								
20MA1001	**Algebra &Calculus (CSE, ECE, EEE, CE, ME)**							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	1	0	69	4	40	60	100

Pre-requisite: Intermediate Mathematics

Course Objectives:

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

Course Outcomes: After successful completion of the course, the student will be able to		**Blooms taxonomy Level**
CO 1	**Solve** the system of Linear Equations	**(BTL-3)**
CO 2	**Solve** first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.	**(BTL-3)**
CO 3	**Obtain** the complete solution of a higher order differential equations	**(BTL-2)**
CO 4	**Make use of** the Taylor's and Maclaurin's Series and Maxima, Minima for the given function	**(BTL-3)**
CO 5	**Apply** a range of techniques for solutions of first order Linear and non linear Partial Differential Equations (PDE)	**(BTL-3)**
CO 6	**Apply** the techniques of Multiple integrals for the Area of the region bounded by curves and volume	**(BTL-3)**

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2												
CO2	3	3	1											
CO3	3	3	1											
CO4	3	2												
CO5	3	3	1											
CO6	3	2												

1: Low, 2-Medium, 3- High

COURSE CONTENT

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

Introduction to matrices, Definition of Rank ,Definition of Echelon form , Problems, Solving System of Non-Homogeneous equations- Definition, Conditions for Consistency, Problems, Solving System of Homogeneous equations- Definition, Problems, Eigen values & Eigen Vectors- Definition, Problems

NARAYANA ENGINEERING COLLEGE:NELLORE								
20CH1003	CHEMISTRY FOR MECHANICAL ENGINEERING							R2020
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: Nil

Course Objectives:

1. The main objective of the course is to impart knowledge on the fundamental concepts of chemistry involved in application of several important engineering materials that are used in the industry/day-to-day life.
2. To include the importance of water in industrial usage, significance of corrosion control to protect the structures, polymers and their controlled usage
3. To acquire knowledge of engineering materials and about fuels ,batteries, surface chemistry and lubricants

Course Outcomes: After successful completion of the course, the student will be able to:		BL
CO 1	**Select** and employ suitable water treatment technologies for domestic and industrial applications	1
CO 2	**Apply** the knowledge of electrochemistry to improve the efficiency of batteries	3
CO 3	**Illustrate** various corrosion situations and implement suitable corrosion control measures.	2
CO 4	**Explain** the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.	2
CO 5	**Explain** calorific values, octane number, refining of petroleum and cracking of oils	2
CO 6	**Select** lubricants for various mechines.and demonstrate the preparation of colloids	1

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1				2	1					1		
CO2	3	2				1						1		
CO3	3	1				1	2					1		
CO4	2	1				1	2					1		
CO5	1	1				1	1					1		
CO6	2	1										1		

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1

WATER TECHNOLOGY **8hrs**

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, Boiler problems – Scale and Sludge formation in boiler, Priming & Foaming,. Internal treatment methods. Water softening processes –Zeolite process, Ion- exchange process. Brackish water treatment- Electrodialysis, Reverse osmosis.

NARAYANA ENGINEERING COLLEGE:NELLORE								
20ES1001	**PROBLEM SOLVING AND PROGRAMMING**							R20
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100

Pre-requisite: Mathematics Knowledge, Analytical and Logical skills

Course Objectives:

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

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

CO 1	Identify methods to solve a problem through computer programming. (BL - 3)
CO 2	Understand the use of basic elements of C language. (BL - 2)
CO 3	Understand the difference and the usage of various control statement. (BL - 2)
CO 4	Apply the modular approach for solving the problems. (BL - 3)
CO 5	Apply the Arrays and Pointers for solving problems. (BL - 3)
CO 6	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	
CO6	2	2	2	2								1	2	

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	**FUNDAMENTALS OF COMPUTERS AND PROGRAMMING**	**8h**

Fundamentals of computers: History of Computers, Generations of Computer, The Computer System - The Input-Process-Output Concept, Components of Computer System, Operating System - Introduction, Objectives, Functions.

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

Fundamental Algorithms: Exchanging the values of Two Variables, Counting, Summation of a setof numbers, Factorial computation, Generation of the FibonacciSequence, Reversing the digits of an integer.

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

1. Illustrate the working of a Computer. (BL - 2)
2. Solve problems using language independent notations. (BL - 3)

NARAYANA ENGINEERING COLLEGE :: NELLORE								
20EN1001	ENGLISH							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	2	0	0	32	2	40	60	100
Pre-requisite: Knowledge of fundamentals of English Language & Grammar								

Module	Module 1	Module 1	Module 1	Module 1	Module 1	Module 1	Total
No. of Hours	05	05	06	05	05	06	32

Course Objectives:

1. To enhance the linguistic and communicative competence.
2. To improve the Language proficiency of students in English with an emphasis on Vocabulary, Reading and Writing skills.
3. To provide knowledge of grammatical structures & rules and encourage their appropriate use.
4. To expose the students to Reading skills and apply the skill & strategies of a successful reader
5. To acquaint the students with effective strategies of paragraphs, note making, text editing, review writing and formal correspondence such as letter writing, e mail, and memos.
6. To aid the students acquire appropriate and adequate knowledge on writing Technical Reports.

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

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 learn to use sentences unambiguously. **(B.L:2)**
CO 3	Impart effective strategies for professional written communication using devices of coherence & cohesion with adequate support & detail. **(B.L:3)**
CO 4	Provide knowledge of use of phrases & clauses and improve effective writing Note making & Paraphrasing. **(B.L:2)**
CO 5	Understanding the grammar rules for synthesis of sentences and use prewriting strategies to plan to write dialogues, reviews and edit the text effectively. **(B.L:2)**
CO 6	Master 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)**

NARAYANA ENGINEERING COLLEGE:NELLORE								
20CH1503	CHEMISTRY FOR MECHANICAL ENGINEERING LAB							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100

Pre-requisite: 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, 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											1		
CO2	3											1		
CO3	3											1		
CO4	3											1		

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
Task-1 : Determination of Hardness of a water sample	
Objective **1.** Determine the total hardness (total calcium and magnesium ion concentration). 2. Learn how to titrate with EDTA solution. 3.Determine permanent hardness and the temporary hardness	CO1
Task-2 : Estimation of DO	
Objective: 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	
Objective: define precipitation titrations, 1. state and explain the principle of precipitation titrations with reference to the determination	CO 1

NARAYANAENGINEERINGCOLLEGE:NELLORE								
20ES1503	ENGINEERINGDRAWING							R2020
Semester	Hours /Week			Total hrs	Credits	Max Marks		
	L	T	P		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 explore various Scales in Engineering practice
3. To convey exact in formation of any physical object on drawing sheet.
4. To Construct Engineering Curves by using general methods
5. To impart skills of drawing instruments and their use to convey exact and complete information of any object.
6. To gain knowledge for conversion of isometric views in to orthographic views.

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

CO1	Define the qualities of precision and accuracy in engineering drawing.(BL-1)
CO2	Draw engineering curves with different methods(BL-3).
CO3	Develop the orthographic projection of points,lines,planesandsolids.(BL-3)
CO4	Construct Projections of solids and development of surfaces.(BL-3)
CO5	Construct the development of surfaces.(BL-3)
CO6	Construct Isometric and Perspective views(BL-3).

COURSECONTENT

TASK–1	**Introduction & Conic sections**	14Hours

Introduction to Engineering Drawing :Principles of Engineering Drawing 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),. Cycloid, Epicycloids and Hypocycloid, Involute

Scales: Reduced and Enlarged scales, Representative fraction, Scales: plain, diagonal only.

AttheendoftheTask1,studentswillbeableto:

1. Understand of Geometrical Constructions.(BL-3).
2. Understand principles of engineering scales(BL-3).
3. Draw Conical and Cycloidal curves by using general method.(BL-3).

TASK-2	**Orthographic Projections**	13Hours

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

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

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

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

At the end of theTask2,students will be able to:

1. Understand Orthographic Projections.(BL-2).
2. Draw Projection of lines inclined to one and two reference planes.(BL-3).
3. Construct Projection of planes inclined to one and two reference planes.(BL-3).

NARAYANA ENGINEERING COLLEGE::NELLORE								
20ES1506	PROBLEM SOLVING AND PROGRAMMING LAB							R20
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100
Pre-requisite: Mathematics Knowledge, Analytical & Logical Skills								

Course Objectives:

1. To work with the compound data types
2. To explore dynamic memory allocation concepts
3. To able to design the flowchart and algorithm for real world problems
4. To able to write C programs for real world problems using simple and compound datatypes
5. To employee good programming style, standards and practices during program development

Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Translate algorithms into programs (In C language) (BL - 2)
CO 2	Code and debug programs in C program language using various constructs.(BL-3)
CO 3	Solve the problems and implement algorithms in C. (BL - 3)
CO 4	Make use of different data types to handle the real time data (BL - 3)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
TASK-1 (3H)	
1. Practice DOS and LINUX Commands necessary for execution of C Programs. 2. Study of the Editors, Integrated development environments, and Compilers in chosen platform. 3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.	CO 1
TASK-2 (6H)	
1. Practice programs: Finding the sum of three numbers, exchange of two numbers, largest of two numbers, to find the size of data types, Programs on precedence and associativity of operators, sample programs on various library functions.	CO 1
TASK-3 (6H)	
1. Write a C program to calculate the factorial of a given number 2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 & 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence. 3. Write a program to find the roots of a Quadratic equation.	CO1
TASK-4 (6H)	
1. Write a program to generate the series of prime numbers in the given range. 2. Write a program to reverse the digits of a number.	CO 2

NARAYANA ENGINEERING COLLEGE:NELLORE								
20EN1501	**ENGLISH LANGUAGE LAB**							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100

Pre-requisite: Basic English Grammar

Course Objectives:

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

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

CO 1	Understand how speech sounds are used to create meaning. Apply their knowledge of English phonetics and phonology to improve their own pronunciation.
CO 2	Recognize and use pitch patterns to signal complete and incomplete thought groups and Speak confidently and intelligibly within groups and before an audience.
CO 3	Discuss and respond to content of a lecture or listening passage orally and/or in writing and make inferences and predictions about spoken discourse
CO 4	Produce coherent and unified paragraphs with adequate support and detail and can write a paragraph with a topic sentence, support, and concluding sentence
CO 5	To help the students to cultivate the habit of reading passages for competitive exams such as GRE, TOEFL, GMAT etc.
CO 6	Learn, practice and acquire the skills necessary to deliver effective, presentation with clarity and enable them to prepare resume with cover letter.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1									3		2		
CO2	1									2		3		
CO3	1									3		3		
CO4	1									2		3		
CO5	1									3		3		
CO6	1									3		3		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
Module - 1	8 hrs
Introduction to Phonetics : Introduction to Sounds of Speech – Vowels – Consonants - Listening with a focus on pronunciation Reading Newspaper – Highlighting Vowels and Consonants	**CO1**
Module – 2	8 hrs
Syllabification: Word Stress, Rules of word stress Practice on Intonation and Stress	**CO2**
Module – 3	8 hrs
Listening Skills : Types of Listening Skills Active listening and anticipating the speaker Listening for Specific & General Details Listening Comprehension	**CO3**
Module – 4	8 hrs
Defining & Describing: Objects, Places and Events Video Speech Writing Review Writing (Books / Movies / Products..etc.,)	**CO4**
Module – 5	8 hrs
Reading Comprehension Everyday English – Grammar, Vocabulary, LSRW Skills, Summarizing and Note making Vocabulary Building	**CO5**
Module – 6	8 hrs
JAM Role Play Giving and Asking Directions Information Transfer	**CO6**

NARAYANA ENGINEERING COLLEGE:NELLORE								
20PH1003	PHYSICS FOR MECHANICAL ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Fundamental concepts of Physics

Course Objectives:

1. To gain knowledge on different types of oscillations and ultrasonics.
2. To provide knowledge on the phenomenon of heat transfer so as to understand a wide variety of practical engineering problems
3. To identify the importance of the optical phenomenon i.e. interference and diffraction related to its Engineering applications.
4. To impart knowledge in basic concepts of LASERs along with its Engineering applications
5. To Understand the nature and characteristics of modern engineering materials.
6. Familiarize types of sensors for various engineering applications

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

CO 1	Acquire knowledge on mechanical and sound waves in the perspective of engineering applications
CO 2	classify different modes of heat transfer and explain heat conduction in a bad conductor and compound media.
CO 3	Explain optical phenomenon i.e. interference, diffraction using Huygen's wave theory.
CO 4	Realize importance of LASERs in Engineering and Medical applications.
CO 5	Demonstrate the knowledge on characteristics and applications of modern engineering materials.
CO 6	Identify the sensors for various 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	3	2				1						2		
CO2	3	2										2		
CO3	3	2	1									2		
CO4	3	2				1						2		
CO5	3	3	1			1						2		
CO6	3	2	2			2						2		

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1

OSCILLATIONS & ULTRASONICS (8 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

NARAYANA ENGINEERING COLLEGE: NELLORE								
20MA1003	VECTOR CALCULUS, COMPLEX VARIABLES & TRANSFORMS (VC-CV&TS)							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Intermediate Mathematics

Course Objectives:

1. To illustrate the physical interpretation of gradient, divergence and curl.
2. To apply the basic concepts of vector integration and their applications.
3. To acquire the knowledge on the calculus of functions of complex variables.
4. To understand the concepts of Laplace transforms and its properties.
5. To apply the concepts of Laplace, transform to solve the ordinary differential equations.
6. To understand the concepts of Fourier series and Fourier transforms and itsproperties.

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

CO 1	Utilize different operators such as gradient, curl and divergence find the function BL-3
CO 2	Evaluate area and volumes by fundamental theorems of vector integration BL-5
CO 3	Apply the complex functions, Cauchy's integral Theorem to find the integral values BL-3
CO 4	Solve the differential equation by using Laplace transforms and its techniques BL-3
CO 5	Apply the Inverse Laplace transforms techniques to covert into time Domaine BL-3
CO 6	Find the Fourier Series and Fourier Transform for the given functions BL-2

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**3**	**2**	**2**										**PSO1**	**PSO 2**
CO2	**3**	**2**	**2**										3	
CO3	**3**	**3**	**1**										3	
CO4	**3**	**3**	**2**										2	
CO5	**3**	**3**	**2**										3	2
CO6	**3**	**3**	**2**										2	2

1- Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:: NELLORE								
20ES1008	**MATERIAL SCIENCE**							R2020
Semester	H / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-Requisite : To have basic knowledge in Engineering mathematics and Engineering Chemistry.

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

CO1	Learn about bonds, crystallization of metals and determination of grain sizes of metals and alloys and constitution of alloys. (BL-1)
CO2	Understand about construction of equilibrium diagrams and to study about phase diagrams. (BL-2)
CO3	Understand properties and structures of various ferrous and non-ferrous metals and alloys. (BL-2)
CO4	Know and apply the concepts of heat treatment of alloys.(BL-3)
CO5	Learn about various ceramic materials. (BL-1)
CO6	Learn about various composite materials. (BL-1)

CO-PO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1													
CO2	2													
CO3	2													
CO4	3													3
CO5	1					1	1						1	1
CO6	1					1	1						1	1

1:Low,2-Medium,3-High

COURSE CONTENT

MODULE – 1	**Structure of Metals**	**8 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,

At the end of theModule1,students will be able to:

1. Acquire knowledge about various bonds in solids. (BL-3)
2. learn about grains and determination of grain sizes. (BL-2)
3. understand the concepts of constitution of alloys. (BL-2)

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MODULE -2	**Equilibrium of Diagrams**	**8 H**

Experimental methods of construction of equilibrium diagrams, Isomorphism alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys.

NARAYANAENGINEERINGCOLLEGE:NELLORE								
20ES1003	**PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING**							R2020
Semester	Hours /Week			Total **hrs**	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100

Pre-requisite: Fundamental concepts of Electrical Circuits Analysis and Electro Magnetic Fields. Basic Knowledge on Semiconductor materials.

Course Objectives:

1. Able to understand the performance of Electrical circuit elements.
2. To understand the Principle of Operation of electrical machines.
3. Able to Explain Typical AC Power Supply scheme.
4. To provide comprehensive idea about working principle, operation and applications of PN Diode.
5. To provide comprehensive idea about working principle, operation and applications of BJT
6. To provide comprehensive idea about working principle, operation and applications of MOSFET.

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

CO1	Understand DC and AC electrical circuit analysis.(BL-2)
CO2	Demonstrate working principles of transformers and electrical machines.(BL-2)
CO3	Understand the generation, Transmission and distribution of Electrical Power.(BL-2)
CO4	Understand the operation, characteristics of PN junction diode. (BL-02)
CO5	Understand the operation, characteristics of BJT. (BL-02)
CO6	Explain the concept of MOSFET and applications of MOSFET.(BL-02)

CO-POMapping

CO	PO												PSO	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	1										2	3
CO2	1	2	2										2	3
CO3	2	3	2										3	3
CO4	1	2	1									1	1	
CO5	1	2	1									1	1	1
CO6	1		1									1	1	

1:Low,2-Medium,3-High

COURSECONTENT

MODULE–1	**DC & AC Circuits**	**08Hours**

Electrical circuit elements (R- L and C) - Kirchhoff laws- Series and parallel connection ofresistanceswithDCexcitation.SuperpositionTheorem-Representationofsinusoidalwaveforms-peak andrmsvalues-phasorrepresentation-realpower-reactivepower–apparent.

At the end of theModule1,students will be able to:

1. Understand the Basic Electrical circuit elements.(BL-2)
2. Able to understand the parallel connection of resistances.(BL-2)
3. Demonstrate on real power, reactive power and apparent power.(BL-2)

MODULE-2	**DC &AC Machines**	**08Hours**

Principle and operation of DC Generator-EMF equations- principle and operation of DC Motor–Performance Characteristics of DC Motor-Speed control of DC Motor–Principle and operation of Single Phase Transformer -OC and SC test on transformer-principle and operation of Induction Motor.

NARAYANA ENGINEERING COLLEGE:NELLORE								
20PH1503	**ENGINEERING PHYSICS LAB-1(MECHANICAL ENGINEERING)**							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
ii	0	0	2	36	1	40	60	100

Pre-requisite: Nil

Course Objectives:

To provide student to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field. To prepare students for performing requirement analysis and design of variety of applications.

To enable the students to understand the concepts of interference and diffraction , their applications and role of optical fibre parameters in communication.

To educate students to recognize the applications of laser in finding the wavelength, slit width and its role in diffraction studies

To make the students to identify the importance of sensors

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

CO 1	learn important concepts of physics through involvement in the experiments by applying theoretical knowledge.
CO 2	understand the concepts of interference and diffraction , their applications and role of optical fiber parameters in communication.
CO 3	recognize the applications of laser in finding the wavelength, slit width and its role in diffraction studies
CO 4	identify the importance of sensors

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT	**CO**
Task 1 - Determination of spring constant of springs using Coupled Oscillator	
objective:To study normal modes of oscillation of two coupled pendulums and to measure the normal mode frequencies as well as spring constant. Two identical compound pendulums are coupled by means of a spring. Normal mode oscillations are excited and their frequencies are measured.	CO 1
Task - 2 Determination of the rigidity modulus of the material of a given wire using Torsional Pendulum	
objective: To determine the rigidity modulus of the material of a given wire using Torsional Pendulum A torsion pendulum consist of a disk-like mass suspended from thin rod. When the mass is	CO 1

NARAYANA ENGINEERING COLLEGE:NELLORE								
20ES1505	ENGINEERING & ITWORK SHOP							R2020
PART – A ENGINEERING WORK SHOP								
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 equipment.
2. To identify, select and use various marking, measuring, holding, striking and cutting tools & equipment.
3. To know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
4. To gain knowledge about the usage of tools like Word processors, Spreadsheets, Presentations.
5. To learn about Networking of computers and use Internet facility for Browsing and Searching

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

CO1	Understand the safety aspects in using the tools and equipment.(BL-2)
CO2	Apply tools for making models in respective trades of engineering workshop.(BL-3)
CO3	Apply basic electrical engineering knowledge to makes house wiring circuits and check their functionality.(BL-3)
CO4	Understand to disassemble and assemble a Personal Computer and prepare the Computer ready to use(BL-2)
CO5	Apply knowledge to Interconnect two or more computers for information sharing. (BL-3)

COURSE CONTENT (TRADES FOR PRACTICE)

Trade -1 Carpentry (6 H)

Familiarity with different types of woods and tools used in wood working and make following joints from out of 300x40x25mms of wood stock.

a) Half–Lap joint.

b) Mortise and Ten on joint

Trade-2 Fitting (6 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 (6 H)

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

a) Tapered tray b) Conical funnel

Trade - 4 Electrical House Wiring (6 H)
Familiarities with different types of basic electrical circuits and make the following electrical connections. a) Two lamps in series b) Two way switch c) Tube light d) Two lamps in parallel with 3 pin plug and switches
Trade 5 – Welding(8H)
Familiarity with different types of tools used in welding and do the following welding exercises. 1. Single V butt joint 2.Lap joint

Text Book(s):

1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjar Roy S.K. "Elements of WorkshopTechnology"Vol-I2008&Vol-II2010MediaPromoters&Publishers Pvt.Limited,Mumbai.
2. KalpakjianS.and StevenS.Schmid,"Manufacturing Engineering and Technology" 4th Edition, Pearson Education IndiaEdition,2002.
3. P. Kannaiah&K. L. Narayana "Workshop manual" 2nd Ed., Scitech publications Pvt.Ltd.,Hyderabad,2008.

Reference Book(s):

1. Gowri P., Hariharan and Suresh Babu A., "Manufacturing Technology-I", Pearson Education2008.

WebResources:

1. https://www.muet.edu.pk/sites/default/files/images/users/41/Workshop%20Intro.pdf
2. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=98826

PART-B IT WORKSHOP LAB	
Course Objectives: 1. To provide technical training on Productivity tools like Word processors, Spreadsheets, Presentations. 2. To make the students know about the internal parts of a computer, assembling, installing the operating system. 3. To teach connecting two or more computers.	
Course Outcomes: After successful completion of the course, student will be able to:	
CO 1	Understand functionalities of a computer and operating system. (BL-2)
CO 2	Practice Word processors, Presentation and Spreadsheet tool. (BL-2)
CO 3	Connect computer using wired and wireless connections. (BL-2)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE: NELLORE								
20ES1511	**Material Science Lab**							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	2	32	1	40	60	100

Pre-requisite: To have basic knowledge in Engineering Chemistry.

Course Objectives:

1. To Prepare metallographic sample.
2. To impart knowledge on metallographic techniques for studying the microstructures of alloys.
3. To perform heat treatment of various steels
4. TogainknowledgeonCrystalstructureandmicrostructuresofuntreatedsteels.

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

CO1	Describe the relation between microstructure and properties of ferrous alloys. (BL-2)
CO2	Understand various crystal structures (BL-1)
CO3	Study thermosetting of ferrous and nonferrous alloys (BL-1)
CO4	Determine the strength and magnetic defects of materials. (BL-3)

CO-POMapping

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

1:Low,2-Medium,3-High

COURSE CONTENT

Task-1

Study of general procedure for specimen preparation and Metallurgical Microscope.

Task -2

Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.

Task -3

Preparation and study of the Microstructure of Mild steels.

Task -4

Preparation and study of the Microstructure of low carbon steel.

Task -5

Preparation and study of the Microstructure of high carbon steels.

TASK-6

Study of microstructures of Cast Iron.

TASK-7

Study of microstructures of Nonferrous alloys.

TASK-8

Study of microstructures of Heat-treated steels.

TASK-9

NARAYANA ENGINEERING COLLEGE:NELLORE								
20ES1508	**Principles Of Electrical And Electronics Engineering Lab**							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100

Pre-requisite: Network Analysis

Course Objectives:

1. To design electrical circuits
2. To analyze a given network by using mesh & Nodal analysis
3. To measure three phase Active and Reactive power.
4. To understand the locus diagrams.
5. To Conduct Experiment on semiconductor devices.
6. To verify amplification of Transistor, FET & MOSFET.

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

CO 1	Verify electrical circuits. (BL-2)
CO 2	Experimentally determine self-inductance, mutual inductance and coefficient of coupling Practically. (BL-2)
CO 3	Describe construction, working and characteristics of diodes, transistors and operational amplifiers (BL-03)
CO 4	Demonstrate how electronic devices are used for applications such as rectification, switching and amplification (BL-01)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT	**CO**
Task 1 - Verification of Kirchhoff laws.	
Objectives: a) To Verify the KCL b) To Verify the KVL	CO 1
TASK-2 Determination of Self, Mutual Inductances and Coefficient of Coupling	
Objective: To determine the self and mutual inductances and coefficient of coupling for two inductive coils.	
Task-3 verification of RL ,RC& RLC series circuits	
Objectives: To Verify the Resistance, inductance & Capacitance effects in series Ac circuits	CO 1
TASK-4 Locus Diagrams of RL and RC Series Circuits	
Objective: To Plot the current locus diagrams for RL and RC circuits.	CO 2

NARAYANA ENGINEERING COLLEGE:NELLORE								
20EN1502	**ORAL COMMUNICATION SKILLS LAB**							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	2	32	1	40	60	100

Pre-requisite:Nil

Course Objectives:

1. Understand the role of communication in personal & professional success and developawareness of appropriate communicationstrategies.
2. Understand and learn to distinguish informal speech from formal speech through role playsand can handle a concern or complaint, with empathy andunderstanding.
3. Improves speaking ability in English both in terms of fluency andcomprehensibility.
4. Understand the essential points in preparing an oralpresentation
5. To improve the mass communication and provide an opportunity to exercise their rights toexpress them effectively
6. To equip students with knowledge and techniques to effectively tackle the interviewprocess

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

CO 1	To develop knowledge, skills, and judgment around human communication that facilitates their ability to work collaboratively with others.
CO 2	Use listening skills to create more effective, less confrontational, more productive professional & personal relationships and understand techniques required for excellent telephone etiquette.
CO 3	Develop their public speaking abilities to speak both formally and informally.
CO 4	Learn the skills necessary to deliver effective presentation with clarity and impact.
CO 5	Understand the nuances of English language and skills required for effective participation in group activities.
CO 6	Learn to face different types of interviews with confidence and understand the procedure& preparation required for attending an interview.

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1									3		2		
CO2	1									2		3		
CO3	1									3		2		
CO4	1									3		3		
CO5	1									3		2		
CO6	1									2		3		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	**CO**
Module - 1	
Ice - Breaking Activity – Introducing Oneself and Others – Greetings – Taking Leave - Introduction to Communication Skills – Verbal & Non Verbal Communication - Barriers to effective communication - Kinesics - Proxemics – Chronemics - Haptics- Paralanguage.	**CO1**
Module - 2	
Situational Dialogues and Role play – Expressions in various Situations - Greetings – Apologies – Requests – Giving directions -Social and Professional etiquettes – TelephoneEtiquettes	**CO2**
Module - 3	
Just a Minute (JAM) - Asking for Information and Giving Directions–Description (Oral): Pictures, Photographs, Products, and Process	**CO3**
Module – 4	
Presentation Skills – Oral presentations (individual and group) through Seminars / PPTs - Fluency & accuracy in speech – Improving self- expression– Tonal variations – Listener oriented speaking - Developing persuasive speakingskills.	**CO4**
Module - 5	
Debate : concepts, types, do's and don'ts - intensive practice- Group Discussion and Group Discussion : Dynamics of group discussion,intervention, summarizing, modulationofvoice, body language, relevance, fluency and organization of ideas and rubrics for evaluation.	**CO5**
Module - 6	
Interview Skills: Concept and process, pre-interview planning, opening strategies,answering strategies, interview through Tele - Conference & video - conference and Mock Interviews.	**CO6**

NARAYANA ENGINEERING COLLEGE: NELLORE								
	ENGINEERING MECHANICS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	2	1	0	48	3	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 center of gravity & moment of inertia.
5. To learn kinematics, kinetics of particle and rigid body, related principles.

CO1	Compute the resultant of system of forces in plane and space acting on bodies. (BL-3)
CO2	Solve the mechanics problems associated with friction forces. (BL-3)
CO3	Determine the support-reactions and analyze the internal forces of the members of various trusses and frames. (BL-4)
CO4	Calculate the location of centroid of composite areas. (BL-4)
CO5	Solve problems related to kinetics. (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	PS 2
CO1	2	1	1										1	
CO2	2	2	2										1	
CO3	2	2	2											
CO4	2	2	2										2	
CO5	2	2	2										1	

1:Low,2-Medium,3-High

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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
	THERMODYNAMICS							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite : Engineering physics, Mathematics

Course Objectives:

1. To learn the fundamental concepts of thermodynamics and related definitions
2. To understand the concept of law of conservation of energy for a process or cycle andto create awareness of principle of working of various thermodynamic systems to learntheir practical applications.
3. To describe the principle of entropy, availability, irreversibility and combustion thermodynamics.
4. To study the behavior of pure substance, ideal and real gases during various thermodynamic processes and to study change in various properties.
5. To Prepare students to apply principle of thermodynamics to solve numerical and designproblems of various thermodynamic processes and systems to provide useful solutions**.**

Course Outcomes: At the end of the course, student will be able to:	
CO 1	Understand the concepts of system, control volume, thermodynamic properties, thermal equilibrium, work and heat. (BL-2)
CO 2	Apply the laws of thermodynamics for different workstations.(BL-3)
CO 3	Analyze the performance of steam power cycles .(BL-4)
CO 4	Measure the properties of pure substances and gas mixtures.(BL-3)
CO 5	Analyze air standard cycles applied in prime movers. (BL-4)

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

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

NARAYANA ENGINEERING COLLEGE::NELLORE							
	MANUFACTURING PROCESSES						R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-requisite:

Knowledge in strength of materials

Knowledge in engineering materials

Basic knowledge in mathematical calculations

Preliminary Knowledge about various Mechanical Manufacturing methods

Course Objectives:

1. To give an exposure to different techniques of casting and moulds required
2. To learn the Working principle of different special casting processes and gating system 3.To give an understanding of welding metallurgy and weldability and to introduce variousmetal joining techniques
4. To Classify the working of different types of GAS welding processes and GAS welding defects
5. To study the concepts of surface treatment process and manufacturing methods of ceramics andpowder metallurgy.

Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	introduce the basic concepts of casting, pattern preparation and gating system [BL-2]
CO 2	Demonstrate different special casting processes and melting systems[BL-2]
CO 3	Classify working of various welding processes,weld joint and their characteristics[BL-2]
CO 4	Apply the principles of various gas welding and cutting processes[BL-3]
CO 5	Outline the manufacturing methods of ceramics and powder metallurgy[BL-2]

CO-PO Mapping

CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											1	
CO2	1	1	2										2	
CO3	1	1	2										2	
CO4	1	1	2		1							1	3	
CO5	1	1		1	2							1	1	2
1:Low,2-Medium,3-High														

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Fluid Mechanics and Hydraulic Machines							R2020
Semester	Hrs / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100

Pre-Requisite: To have basic knowledge in Mechanics, Mathematics and Integral and Differential Calculus.

Course Objectives:

1. To study the Properties of Fluids.
2. To acquire fundamental knowledge in flow through pipes.
3. To learn various concepts in impact of jet on vanes
4. To understand the various types of hydraulic turbines
5. To analyze the flow in Hydraulic Pumps.

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

CO 1	Apply the concepts of fluid statics, fluid kinematics and fluid dynamics in solving the problems of fluid flows (BL-3)
CO 2	Become conversant with concepts of flow through pipes, pitot tube, venturi meter, orifice meter, flow nozzle and turbine meter and able to describe them.(BL-1)
CO 3	Illustrate the concepts of fluid jets on stationary and moving flat, inclined and curved vanes and also hydro power stations (BL-2)
CO 4	Make use of the various concepts of water turbines for calculating the efficiencies and unit and specific quantities (BL-3)
CO 5	Demonstrate the knowledge of working principles of centrifugal pumps (BL-2)

CO-POMapping

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

1:Low,2-Medium,3-High

COURSE CONTENT

MODULE – 1	**PROPERTIES OF FLUIDS**	**10 Hrs**

NARAYANA ENGINEERING COLLEGE: NELLORE								
	Computer Aided Drafting and Modeling Lab							R2020
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

Pre-requisite: To have basic knowledge in Computers and Engineering Drawing.

Course Objectives:

1. To study the basics of CAD software
2. To develop skills to create 2D models.
3. To develop skills to create 3D models.
4. To study the basics of obtaining 2D Multi view drawings from 3D models.

Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	Study basic of CAD software and study basic concept of product design (BL-1)
CO 2	Use the software package for drafting and modelling and explain representation of curves for real time applications. (BL-2)
CO 3	Construct 2D models of Engineering Components (BL-3)
CO 4	construct 3D models of Engineering Components (BL-3)

CO-POMapping

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

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.

NARAYANA ENGINEERING COLLEGE::NELLORE								
	Manufacturing process Lab							R2020
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

Pre-requisite:

Knowledge in strength of materials

Knowledge in engineering materials

Course Objectives:

1. To acquire practical knowledge on Metal Casting and Welding,
2. To Study and practice arc and gas welding technologies.
3. To Gain knowledge on the properties, testing and applications of Steel, Cast Iron and Brass
4. To acquire practical knowledge on Press Working and unconventional machining Processes.
5. To Make the students practice on machine tools so that they can identify, manipulate and control various process parameters during machining processes in machine tool shop.

Course Outcomes: After successful completion of the course, the student will be able to:	
CO 1	understand the importance of safety in metal casting technology[BL-2]
CO 2	Apply Hands on experience on welding machine to perform welding and cutting operations[BL-3]
CO 3	Demonstrate Press Working operations on jobs[BL-2]
CO 4	select the proper tools to work on a machine for the type of part required[BL-4]
CO 5	Fabricate different types of components using various manufacturing techniques. [BL-3

CO-PO Mapping

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Fluid Mechanics and Hydraulic Machines Lab							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100

Pre-requisite: To have basic knowledge in Mechanics, Mathematics and Integral and Differential Calculus.

Course Objectives:

1. To study the frictional losses of fluid flow in pipes of different diameters.
2. To acquire fundamental knowledge of Bernoulli's principle.
3. To analyze the flow in Hydraulic Machines such as Turbines and pumps

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

CO 1	Familiar with Calibration of discharge measuring devices such as Venturi meter and Orifice meter.(BL-3)
CO 2	Familiarize with measuring minor loss (sudden contraction) and major loss (Frictional factor) of a given pipe.(BL-3)
CO 3	Apply the Bernoulli's Theorem (BL-3)
CO 4	Gain practical experience in handling various hydraulic machines (BL-3)

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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
	THERMAL ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge of engineering thermodynamics

Course Objectives:

1. To make students familiar with the design and operating characteristics of modern internal combustion engines.
2. To discuss about the various working systems in IC engines.
3. To describe the combustion mechanisms in IC engines.
4. To examine the IC engines performance by various testing procedures
5. To understand the different types of Compressors.

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

CO 1	Understand the working principle of IC engine.(BL-2)
CO 2	Explain about various working systems in IC engines.(BL-2)
CO 3	Describe the combustion processes of engines and identify the combustionchamber – requirements.(BL-2)
CO 4	Evaluate the performance of IC engine.(BL-4)
CO 5	Summarize about the types and working principles of compressors.(BL-2)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	KINEMATICS OF MACHINERY							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite: Basics in Engineering Mathematics, Physics & Engineering Mechanics

Course Objectives:

1. To understand the basic principles of kinematics and the related terminology of machines.
2. To learn the principle of steering mechanisms and its types.
3. To analyse a mechanism for displacement, velocity and acceleration of links in a machine.
4. To gain proficiency in understanding the terminology of gears.
5. To acquire knowledge in cam profile drawing for various followers.

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

CO 1	Identify different types of mechanisms and inversions of different kinematic chains.(BL-3)
CO 2	Identify and enumerate different mechanisms with basic understanding of motion andmachine. (BL-3)
CO 3	Draw velocity and acceleration diagrams for different mechanisms. (BL-4)
CO 4	Apply the knowledge of gears to Calculate pitch, module, number of teeth, path of contact for meshing gears. (BL-3)
CO 5	Draw displacement diagrams and cam profile diagram for followers executing differenttypes of motions and various configurations of followers. (BL-5)

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

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	MECHANICS OF MATERIALS							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		L	T	P	
IV	2	1	0	48	3	40	60	100

Pre-requisite: Course on Engineering Mechanics.

Course Objectives:

1. To learn the concepts of stress, strain and its relation.
2. To acquire knowledge in bending moment diagrams of beams .
3. To calculate slope and deflection for various types of beams.
4. To Analyze the shear stresses in beams of different cross sections,
5. To determine the deflection in helical springs.

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

CO 1	Explain the fundamentals of Stress and Elastic Constants.(BL-2)
CO 2	Illustrate shear force and bending moment diagrams.(BL-2)
CO 3	Explain the methods for calculating the stress in the beams with different sections.(BL-2)
CO 4	Find the shear strength of solid and hallow shafts.(BL-1)
CO 5	Classify different stresses and strains for the thin and thick cylinders (BL-2)

CO-POMapping

CO	PO												P
	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
CO1	3	2	2			2						2	
CO2	3	3	2			2				3		2	
CO3	2	1	2			2				3		2	
CO4	3	2	2			2				3		2	
CO5	3	2	2			2				3		2	
1:Low,2-Medium,3-High													

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	METAL FORMING PROCESSES							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite:

Knowledge of strength of materials is essential

Basics concepts of mechanical components and manufacturing processKnowledge in engineering materials

Basic knowledge in mathematical calculations

Course Objectives:

The objective of this course is to

1. Introduce the concepts of one, two and three dimensional stress analysis, theory of plasticity, strain hardening, hot and cold working process.
2. Create awareness among the students on various types of rolling mills, forgings.
3. .Create awareness among the students on extrusions, wire drawing processes.
4. Understand the concepts of sheet metal operations.
5. Understand the concepts on plastic manufacturing processes and rapid manufacturing process and its applications.

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

CO 1	Understand the basic concept on one, two and three dimensional stress analysis, theory of plasticity, strain hardening, hot and cold working process [BL-2]
CO 2	Define different rolling and forging processes and their defects [BL-1]
CO 3	Familiarize the fundamentals of extrusion process and their industrial applications[BL-2]
CO 4	Identify various press working processes, their advantages and disadvantages. [BL-3]
CO 5	Explain the concept of plastic manufacturing process, [BL-2]

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	IC ENGINES LAB							R2020
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

Pre-requisite: BASICS IN THERMODYNAMICS

Course Objectives:

1. To enable the students understand the principles, working and performance of IC engines.
2. To introduce students to the working of compressors, steam nozzles
3. To understand principle of various refrigeration and air-conditioning systems.
4. To teach students the principles of waste heat recovery and thermal storage systems.

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

CO1	Conduct constant speed and variable speed tests on IC engines and interpret their performance.(BL-3)
CO2	Determine the valve timing diagram of SI engine& CI engine. (BL-3)
CO3	Estimate energy distribution by conducting heat balance test on IC engines(BL-5) Apply the concept of Morse test on SI engine.(multi cylinder)
CO4	Experiment on IC engine load variations with Air fuel ratio. (BL-3)

CO-PO Mapping

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

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.

NARAYANA ENGINEERING COLLEGE:NELLORE

	Mechanics of Materials Lab							**R2020**
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

Pre-requisite: Should possess basic knowledge in Engineering drawing, Standards, Dimensioning and preparation of neat drawings and to understand symbols used in engineering drawings.

Course Objectives:

1. To conduct uni-axial tension test on Steel, Aluminium, Copper and Brass.
2. To perform compression test on spring and wood.
3. To determine elastic constants of materials using flexural and torsion tests.
4. To find hardness of given metals.
5. To acquire knowledge on mechanical properties of materials such as various Elastic Moduli

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

CO 1	Understand the stress-strain behaviour of different materials.(BL-2)
CO 2	Explain the hardness of different materials.(BL-2)
CO 3	Identify the difference between compression and tension testing.(BL-3)
CO 4	Find the Young's modulus of the material by conducting deflection test(BL-1)
CO 5	Identify the toughness of a specimen using Impact testing machine (BL-3)

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

NARAYANAENGINEERINGCOLLEGE:NELLORE								
	Computer Aided Machine Drawing Lab							R2020
Semester	Hours /Week			Total hrs	Credit	MaxMarks		
	L	T	P		C	CIE	SEE	TOTAL
IV	0	1	2	48	2	40	60	100

Pre-requisite: Should possess basic knowledge in Engineering drawing, Standards, Dimensioning and preparation of neat drawings and to understand symbols used in engineering drawings.

Course Objectives:

1. To introduce students to the basics and standards of engineering drawing related to machines and components.
2. To teach students technical skills regarding assembly, production and part drawings.
3. To help students gain knowledge about standard CAD packages on modelling and
   i. drafting.
4. 4. To Communicate about the assemble and part drawings through the computer aided drawings.5.To familiarize students with various limits, fits and tolerances.

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

CO 1	Define various standards, specifications, dimensioning methods followed while preparing Engineering drawings. (BL-1)
CO 2	Understand and practice to represent symbols for Foundation bolts and keys in drawings.(BL-2)
CO 3	Develop, assemble and sketch assembled views of mechanical systems. (BL-3)
CO 4	Develop suitable drawing views to represent part drawings of different machine parts in CAD software. (BL-3)
CO 5	Design machine components and assembly using CAD software. (BL-3)

CO-PO Mapping

CO	PO												PS
	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
CO1	1	1										1	1
CO2	1	1										1	1
CO3												1	1
CO4	1	1										1	1
CO5	1	1										1	2

1: Low, 2-Medium, 3-High

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.

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Design of Transmission Systems							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100

Course Objectives:

1. To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components.
2. To understand the standard procedure available for Design of Transmission of Mechanical elements
3. To learn to use standard data and catalogues

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

CO 1	Design for the different types of belt drives (BTL-4)
CO 2	Design for the spur gear and analysis of speed ratios (BTL-4)
CO 3	Design of bevel, worm and helical gears (BTL-4)
CO 4	Design of different gear boxes (BTL-4)
CO 5	Design of cams and analysis of profiles (BTL-4)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Thermal Power Systems							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100

Pre-Requisite: Thermal Power Systems

Course Objectives:

1. To understand working steam power plant
2. To explain the functions of steam nozzle
3. To draw velocity diagram of steam turbine
4. To understand working of jet propulsion
5 To define the basics of refrigeration and air conditioning system

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

CO 1	Interpret the layout of various steam power plant and boilers operation. (BTL-5)
CO 2	Understand the stagnation properties.(BTL-2)
CO 3	Solve the problems on turbine velocity diagram. (BTL-6)
CO 4	Explain the working of gas turbines. (BTL-2)
CO 5	Analyze the working of vapor compression refrigeration cycle. (BTL-4)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Dynamics of Machinery							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100

Course Objectives:

1. Explain the importance of friction and apply for brakes and dynamometers
2. Analyze the turning moment diagrams and discuss the applications of flywheel
3. Familiarizes the concept of gyroscope and its applications for aero plane, motor cycle and motor cars
4. Uses of governors and its applications
5. Explain the need of balancing of rotating and reciprocating masses

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

CO 1	Understand the effect of reactive gyroscopic couple on the stability of vehicles (BTL-2)
CO 2	Understand the use of governors (BTL-2)
CO 3	Identify and correct the unbalances of rotating body (BTL-4)
CO 4	Reduce the magnitude of vibration (BTL -4)
CO 5	Explain isolate vibration of dynamic systems (BTL-4)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE: NELLORE								
	HEAT TRANSFER							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To impart the basic laws of conduction, convection and radiation heat transfer and their applications
2. To familiarize the convective heat transfer concepts
3. To explain basics of radiation heat transfer
4. To explain basics of radiation heat transfer and to make conversant with the heat transfer analysis related to thermal systems like heat exchangers, evaporator, and condenser.
5. To understand the phenomenon of boiling and condensation to familiarize the mass transfer process

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

CO 1	Apply the conduction, convection and radiation mode of heat transfer through various applications
CO 2	Evaluate heat transfer for forced and free convection applications
CO 3	Explain the radiation heat transfer problems.
CO 4	Calculate the parameters of heat exchangers, condensers and evaporator using LMTDand NTU Methods for various applications.
CO 5	Apply principles of heat and mass transfer to basic thermal engineering systems

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

	NARAYANA ENGINEERING COLLEGE:NELLORE							
	COMPUTER INTEGRATED MANUFACTURING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	48	3	40	60	100

Course Objectives:

1. To understand the basic concepts of CAD/CAM in CIM environment.
2. To develop an understanding of the underlying knowledge and related methods of Computer Aided Process Planning.
3. To understand the different methods to improve application of Group Technology in manufacturing.
4. To understand the use of FMS in CIM environment.
5. To understand the use of robotics in manufacturing environment.

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

CO1	Apply the concepts of CAD/ CAM systems in CIM.(BL-3)
CO2	Examine the integration of computer in process & production planning.(BL-1)
CO3	Extend the concept of GT to improve efficiency in manufacturing..(BL-2)
CO4	Apply the concept of AGV'S in FMS to improve material handling.(BL-3)
CO5	Identify the application of robotic technology in CIM environment.(BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	2	1	1	-	-	-	-	-	-	-	2	2
CO2	3	3	1	1	-	-	-	-	-	-	-	-	2	2
CO3	2	2	-	-	-	-	-	-	-	-	-	-	1	1
CO4	2	2	2	2	2	-	-	-	-	-	-	-	2	2
CO5	1	1	2	2	2	-	-	-	-	-	-	-	2	2

1:Low,2-Medium,3-High

COURSE CONTENT

MODULE – 1	INTRODUCTION	9h

Brief introduction to CAD and CAM – Manufacturing Planning, Manufacturing control – Concurrent Engineering- CIM concepts – Computerised elements of CIM system –Types of production — Manufacturing Control — Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production.

MODULE -2	COMPUTERISED PROCESS PLANNING	10h

Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Computer Aided Process Planning – Aggregate Production Planning and the Master Production Schedule – Material Requirement planning – Capacity Planning- Control Systems-Shop Floor Control

MODULE-3	CELLULAR MANUFACTURING	9h

Group Technology(GT), Part Families – Parts Classification and coding ,Part Coding system – Production flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method – Arranging Machines in a GT cell – Hollier Method

NARAYANA ENGINEERING COLLEGE: NELLORE								
	Smart Materials							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To study various types of smart materials used in engineering application.
2. To study various properties i.e. optical, electric, dielectric etc. of smart materials.
3. To study different synthesis techniques of smart materials.
4. To study different characterization techniques of smart materials.
5. To study devices based on smart materials such as sensors, actuators etc.

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

CO 1	Understand various smart material kinds applied to engineering. (BTL-2)
CO 2	Demonstrate the various optical, electric, dielectric, etc. properties of intelligent materials. (BTL-2)
CO 3	Classify different smart material manufacturing methods. (BTL-4)
CO 4	Explain various methods for characterizing smart materials. (BTL-2)
CO 5	Develop products made of smart materials, as sensors, actuators, etc. (BTL-3)

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

COURSE CONTENT		
MODULE – 1	**INTRODUCTION**	**9 Hours**

NARAYANA ENGINEERING COLLEGE: NELLORE								
	AUTOMATION IN MANUFACTURING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

COURSE OBJECTIVES:

1. To understand the principles of automation.
2. To understand and outline the system configurations used in automated production.
3. To recognize and articulate the foundational assumption of the transfer mechanism, types of transfer mechanism that may be used for work part transfer
4. To understand principle of FMS and group technology.
5. To understand importance of inspection.

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

CO 1	understand to know what is automation, types of automation, components of automation, strategies and levels of automation.(BTL-1)
CO 2	understand to know basic elements of automated systems.(BTL-2)
CO 3	understand the components of manufacturing systems.(BTL-2)
CO 4	understand the group technology and flexible manufacturing systems .(BTL-2)
CO 5	understand importance of inspection .(BTL-3)

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	AUTOMATION & ROBOTICS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Pre-Requisite: CAD/CAM

Course Objectives:

1. To Understand robot configuration, structures, basic components, workspace and generations of robots.
2. To Get acquainted with performing spatial transformations and solve kinematics of the robot
3. To Get knowledge and analysis skills associated with trajectory planning
4. To Learn about various sensors, actuators, robot programming
5. To Understand the present &future applications of a robot

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

CO 1	Demonstrate knowledge of industrial robots, characteristics, end effectors and actuators. (BTL-3)
CO 2	Apply spatial transformation to obtain forward and inverse kinematics (BTL-3)
CO 3	Solve robot dynamics problems, generate joint trajectory for path planning (BTL-3)
CO 4	Describe working principle of various sensors and program different operations (BTL-2)
CO 5	Apply the applications of robots in industry. (BTL-3)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	AUTOMATION	**10 Hours**

NARAYANA ENGINEERING COLLEGE:NELLORE								
	AUTOMOBILE ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Pre-Requisite: Basics in Thermal Engineering

Course Objectives:

1. To understand the working of automobile components
2. To illustrate the principle of ignition system
3. To gain the knowledge on steering and suspension system
4. To study construction of wheel and different brake system
5 To understand the working of Automobile Electrical system

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

CO 1	Illustrate the working of automobile components (BTL-2)
CO 2	Demonstrate the working of different ignition and fuel systems (BTL-2)
CO 3	Identify the principle of steering geometry and wheel alignment.(BT L3)
CO 4	Predict the possible failures in the braking systems.(BT- L5)
CO 5	Identify Modern technology and safety measures used in Automotive Vehicles. (BTL-3)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE: NELLORE								
	COMPOSITE MATERIALS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Course Objectives:

1. To define composite material, classification and characteristics of composite materials.
2. To explain micro mechanical analysis of a lamina
3. To apply the knowledge of biaxial strength theories in solving the problem
4. To under the metal matrix composites materials
5. To explain the micromechanics of Failure of Unidirectional Lamina

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

CO 1	Define the composite material and characteristics of composite materials .(**BTL-1)**
CO 2	Explain micro mechanical analysis of a lamina and evaluation of the four elastic moduli by Rule of mixture . .(**BTL-2)**
CO 3	Solve the numerical problems on Tsai-Hill theory, Tsai, Wu theory ..(**BT-3)**
CO 4	Explain about Metal Matrix Composites and reinforcement of materials (.(**BTL-2)**
CO 5	Explain the micromechanics of Failure of Unidirectional Lamina .(**BTL-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										2	2	
CO2	3	3										2	2	
CO3	3	3										2	2	
CO4	3	3										2	2	
CO5	3	3										2	2	
1: Low, 2-Medium, 3- High														

NARAYANA ENGINEERING COLLEGE: NELLORE								
	Design of Material Handling Equipment							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100

Course Objectives:

1. To understand about material handling equipment
2. To explain the design of hoisting Equipment likes: Wire and Hemp Rope
3. To classify the different types of conveyors
4. To understand design of Bucket elevators: Loading and bucket arrangements
5. To understand the environmental and human factors in material handling

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

CO 1	Understand material handling equipment working principle in detail.(BTL-2)
CO 2	Explain the design of hoisting Equipment likes: Wire and Hemp Rope, Welded and roller chains.(BTL-2)
CO 3	Classify different types of Conveyors and applications of Belt Conveyors (BTL-3)
CO 4	Explain the concept of loading and bucket arrangements.(BTL-2)
CO 5	Explain about environmental and human factors in material handling.(BTL-2)

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	2	2										2	2	
CO2	2	2										2	2	
CO3	2	2										2	2	
CO4	2	2										2	2	
CO5	2	2										2	2	
1: Low, 2-Medium, 3- High														

NARAYANA ENGINEERING COLLEGE:GUDUR							
	MATERIALS HANDLING EQUIPMENT						R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks	
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100

NARAYANA ENGINEERING COLLEGE:NELLORE								
	ENGINEERING OPTIMIZATION							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100

Course Objectives:

1. To acquire knowledge on operations research modeling and essential tools for optimization
2. To develop formulation skills in transportation models and finding solutions.
3. To understand the concepts of Project Evaluation Review Technique and Critical Path Method in project management.
4. To provide a systematic procedure for determining the optimal combination of decisions.
5. To acquire knowledge on optimization techniques & important algorithmic design paradigms and methods of analysis.

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

CO1	List & understand the different operations research modeling and essential tools for optimization.(BL- 1)
CO2	Interpret the formulation skills in transportation models and finding solutions.(BL- 3)
CO3	Discuss the concepts of Project Evaluation Review Technique and Critical Path Method in project management. (BL-2)
CO4	Identify a systematic procedure for determining the optimal combination of decisions.(BL-2)
CO5	Summarize the optimization techniques & important algorithmic design paradigms and methods of analysis.(BL-2)

CO-PO Mapping.

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

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	LINEAR PROGRAMMING PROBLEM	10h

OR definition– Classification of Models –Types of Operations Research models, Linear Programming Problem Formulation, Graphical Method, Simplex Method, Two– Phase Simplex Method, Big-M Method, Problem of Degeneracy, conversion to primal to dual and dual simplex method

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

1. Learn numerical methods of solving linear programming problems.
2. Learn about the various optimization methods to slove problems.
3. Understand the various the theory and numerical methods needed to understand and solve the mathematical problems.

MODULE -2	TRANSPORTATION PROBLEM	9h

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Finite Element Method							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Course Objectives:

The subject should enable the students to learn the principles involved in discretization in finite element approach, form stiffness matrices and force vectors for simple elements, find the various approach followed in finite element approach, use the various elements for discretization and learn about shape functions.

To learn the application of FEM to various structural problems incorporating temperature. and boundary conditions and heat transfer problems.

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

CO 1	Solve complex problems using FEM.(BTL-6)
CO 2	Formulate isoparametric elements with different irregular boundaries (BTL-6)
CO 3	Implement solution techniques for higher order problems in practice. (BTL-3)
CO 4	Determine the thermal stresses (BTL-3)
CO 5	Apply concepts for modeling of non-linear materials and geometry (BTL-3)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

TNARAYANA ENGINEERING COLLEGE:NELLORE								
	FLEXIBLE MANUFACTURING SYSTEMS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To Examine the basic concepts on design and modes of manufacturing systems.
2. To Discuss the scheduling and controlling methods used in manufacturing systems.
3. To the concepts of Group Technology to the development of FMS.
4. To Analyze and control the software components of FMS.
5. To Summarize the concepts of modern trends and applications of FMS.

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

CO 1	Understand the basic concepts of design procedures and modes of manufacturing systems.(BTL-1)
CO 2	Understand the concepts of developing the manufacturing systems.(BTL-2)
CO 3	Acquire the knowledge on formulation of Group Technology and its applications.(BTL-3)
CO 4	Understand the concepts of computer controlling systems and software for flexible manufacturing systems.(BTL-4)
CO 5	Understand concepts of modern trends and applications of FMS. .(BL5)

CO-PO Mapping

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	GAS TURBINES AND JET PROPULSION							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To Acquire knowledge about the gas turbine cycles, classification, working Principles and its efficiencies.
2. To Describe the different operating modes for gas turbines.
3. To Evaluate, enumerate, and resolve problems of jet propulsion
4. To Identify the essential principles, uses, and workings of rocket and Ram engines.
5. To Explain the functionalities of different components of Rocket Technology.

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

CO 1	Explain the basic fundamentals of the various gas turbine operating cycles.(BTL-1)
CO 2	Discuss the various modes pertaining to gas turbines.(BTL-2)
CO 3	Identify, formulate and solve problems related to jet propulsion. (BTL-3)
CO 4	Understand the basic fundamentals, applications and operations of Ram jet and Rocket engines. (BTL-4)
CO 5	Illustrate the different components and its functions of Rocket Technology.(BTL-5)

CO-PO Mapping

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	HYDRAULIC &PNEUMATICS SYSTEMS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Pre-Requisite: BASICS IN HYDRAULICS & PNEUMATICS

Course Objectives:

1. To understand various properties of fluids and basics of hydraulics
2. To define the purpose of Actuator
3. To identify the working of hydraulic circuits
4. To understand the working of compressors
5. To describe the trouble shooting and remedies in Hydraulic and Pneumatic systems

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

CO 1	Calculate the fluid properties and flow characteristics (BTL-3)
CO 2	Explain the working of hydraulic actuator (BTL-2)
CO 3	Calculate the flow of fluid in hydraulic circuits (BTL-3)
CO 4	Solve the problems on Pneumatic system (BTL-3)
CO 5	Illustrate different applications of hydraulic and pneumatic system (BTL-4)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT

NARAYANA ENGINEERING COLLEGE:GUDUR								
	Industrial Engineering							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To Illustrate the fundamental concepts of management administration and organization.
2. To study the systematic method of improving the value of a product that a project produces.
3. To improve the design and condition of the workspace by using method study.
4. To know sound Inventory Management techniques by maintaining the optimal amount of inventory to meet customer demand.
5. To collect information regarding the performance of the product with established standards for the use of engineering production, purchasing and quality control etc.

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

CO 1	Explain the core ideas in management, administration, and organization. (BTL-1)
CO 2	Evaluate the systematic approach of increasing the value of a product. (BTL-6)
CO 3	Apply method study to enhance the layout and condition of the workspace. (BTL-3)
CO 4	Evaluate the right amount of inventory on hand to satisfy consumer demand. (BTL-1)
CO 5	Defined standards for the use of engineering production, purchasing and quality control etc. (BTL-1)

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1													1
CO2		1										1		1
CO3				2										
CO4	1	2											2	1
CO5				1								1		
CO6	2	3												
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	**INTRODUCTION**	**10 Hours**
Concepts of Management-Administration and Organization – Functions of Management – Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Y, Hertzberg's Two factor Theory of Motivation, Maslow's Hierarchy of Human needs – Organizational Structures Functional- virtual - Matrix Basic Concepts Related to Organization		
MODULE -2	**Plant location AND PLANT LAYOUT**	**10 Hours**
Plant Location : Objectives, Product Life Cycle, – Factor Considerations in Plant Location, Comparative Study of Rural and Urban Sites, Methods of Selection of Plant Layout, Objectives of Good layout, Principles, Types of Layout, Line Balancing.		
MODULE-3	**WORK STUDY**	**10 Hours**
– Definition, Objectives, Method Study – Steps Involved – Various Types of Process Charts –. Work Measurement - Definition, Time Study, Steps involved - Equipment, Different Methods of Performance Rating - Allowances, Standard Time Calculation. Work Sampling - Definition, Steps Involved,		
MODULE-4	**INVENTORY MODELS**	**9 Hours**
Deterministic models- EOQ Models – With and Without Shortages Models; Inventory Models with Price Breaks -Probabilistic Models –Discrete Variable, Continuous Variable. Inventory Control Systems		
MODULE-5	**INSPECTION & QUALITY CONTROL**	**9 Hours**
Inspection & Quality Control: Statistical Quality Control- Techniques-Variables and Attributes-Control Charts: X and R Charts; P Charts and C Charts. Acceptance Sampling Plan - Single Sampling and Double Sampling Plans- OC Curves. Introduction to TQM- Quality circles-.		
	Total hours:	**48 hours**

NARAYANA ENGINEERING COLLEGE:NELLORE								
	INDUSTRIAL MANAGEMENT							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. to understand the Basic management .
2. to understand strategic management.
3. to understand statistics in quality control and management.
4. to understand human resource development.
5. to understand management information systems .

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

CO 1	know the concept of Basic management and Levels of management (BTL-1)
CO 2	know strategic management.(BTL-2)
CO 3	Apply the statistics in quality control and management. (BTL-2)
CO 4	understand the objectives of HRM .(BTL-2)
CO 5	understand management information systems.(BTL3)

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	INTELLIGENT MANUFACTURING SYSTEMS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Course Objectives:

1. Learn computer integrated manufacturing systems.
2. Apply the principles of artificial intelligence in manufacturing system
3. Explain various process planning techniques in intelligent manufacturing
4. Describe the Group Technology based on knowledge base system
5. Demonstrate knowledge group technology in automated manufacturing

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

CO 1	Assess the performance of manufacturing systems
CO 2	Develop a systematic approach for design and implementation of manufacturing systems
CO 3	Suggest new procedures to improve the productivity of existing manufacturing systems
CO 4	Utilize online collaboration tools to work in complex teams
CO 5	study the group technology

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	MANAGEMENT SCIENCE							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100

Course Objectives:

1. To understand the concept of management and Organization designs
2. To explain principle of operations management and types of plant layout
3. To develop an understanding of the human resource management nature
4. To explain about strategy formulation and Implementation
5. Gain knowledge on Management Information System

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

CO 1	Explain the importance of management science and types of organization designs
CO 2	Illustrate about operations management and material management
CO 3	Summarize the human resource management operations and process
CO 4	Explain the SWOT analysis and Project management network analysis
CO 5	Define the concept of Management Information System and Materials Requirement Planning

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1		2						2					
CO2	1	2		1								1		
CO3		1	1						1					
CO4	1	1								1				
CO5												1		
CO6		2	1	1								1		

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Manufacturing & Inspection of Gears							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Course Objectives:

1. To Identify methods of manufacturing external and internal spur, single and double helical, and bevel and worm gears
2. To Describe the methodology and underlying theory for basic manufacture and inspection of each.
3. To Discuss the "features" associated with each manufacturing method .
4. To determine acceptability for a specific application, and interpreting the inspection data for purposes other than simply determining accept/reject status.
5. To Specify the data required to control both the manufacturing and inspection processes on an engineering drawing.

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

CO 1	To develop the different types of gears (BTL-3)
CO 2	To describe the applications of helical and bevel gears (BTL-2)
CO 3	To finish the gears by hobbling (BTL-4)
CO 4	To learn the quality standards tooth thickness (BTL-2)
CO 5	To learn the production of gears with die casting (BTL-2)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE-I	**INTRODUCTION TO**	**10 Hrs**

NARAYANA ENGINEERING COLLEGE: NELLORE								
	Mechatronics							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To understand the significance of mechatronic systems and sensors.
2. To research different kinds of electronic devices.
3. To study importance of hydraulic and pneumatic systems.
4. To study various types of digital electronic systems.
5. To describe the various interface device kinds.

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

CO 1	Illustrate the significance of sensors and mechatronic systems. (BTL-4)
CO 2	Understand various types' electronic devices. (BTL-2)
CO 3	Illustrate the importance of actuation systems, both hydraulic and pneumatic. (BTL-4)
CO 4	Understanding of digital electronic systems. (BTL-2)
CO 5	Illustrate the significance of multiple interfaces. (BTL-4)

CO-PO Mapping

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

NARAYANA ENGINEERING COLLEGE: NELLORE								
	METALLURGY							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100

Course Objectives:

1. To explain the constitution of alloys and purpose of alloying metals
2. To classify the tool steels and selection of tool steels
3. To explain the modes of fracture and fatigue fractures
4. To understand the structure and properties of polymers
5. To make use of different methods of testing materials under tension, compression and shear load

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

CO 1	Understand about constitution of alloy and purpose of alloying, effect of alloying elements with other metals (**BTL-2**)
CO 2	Classify the tool steels and explain the method of heat treatment of tool steels (**BTL-2**)
CO 3	Explain the modes of fracture and fatigue fractures Identify (**BTL-2**)
CO 4	Define about polymers and types of polymers (**BTL-1**)
CO 5	Make use of different methods of testing materials under tension, compression and shear load **(BTL-3)**

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	MODERN MANUFACTURING METHODS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Pre-Requisite: Basics on conventional manufacturing processes

Course Objectives:

1. Understand the basics of unconventional processes and Mechanical Energy Based Processes (BL2).
2. Describe the Electrical Energy Based Processes for machining different materials (BL2)..
3. Explain Chemical and Electro Chemical Energy Based Processes and their suitability to machine different materials (BL2)..
4. Describe various Thermal Energy Based Processes for machining applications (BL2).
5. Explain Ultrasonic and Abrasive jet machining process their advantages and limitations(BL2).

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

CO 1	Understand the advantages and limitations of unconventional machining processes
CO 2	Understand the Electrical energy based processes and its limitations
CO 3	Students can understand the use of electro chemical energy process and their applications
CO 4	Analyse the thermal energy based process and their limitations
CO 5	Understand the applications and limitations of ultrasonic and Abrasive jet machining process.

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

NARAYANA ENGINEERING COLLEGE:NELLORE								
	NANO MATERIALS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Course Objectives:

1. To Understand the properties of Nano-materials in diverse fields.
2. To Gain knowledge about the Nanomaterials and their properties,
3. To emphasis on the physics of Nanomaterials in detail .
4. To Highlights of the virtual way of understanding the courses materials.
5. To know the application based approach.

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

CO 1	Find the scope of nano science and technology (BTL-4)
CO 2	Design the down top approach different types of electro chemical deposition (BTL-6)
CO 3	Understand Diffraction technique, spectroscopy techniques (BTL-2)
CO 4	Study the properties of synthesis of nano materials (BTL-1)
CO 5	Understand the application of nano materials (BTL-2)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE - I	**INTRODUCTION**	**10 Hrs**

NARAYANA ENGINEERING COLLEGE:NELLORE								
	POWER PLANT ENGINEERING							R2022
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100

Pre-requisite:BasicsinEngineeringMathematics,Physics&EngineeringMechanics

Course Objectives:

1. To understand the sources of energy, power plant economics and environmental aspects.
2. To learn about the working of the components of different power plants.
3. To understand the working principle, types, layout of diesel power plant & Gas turbines.
4. To acquire knowledge on working principle, layout, auxiliary equipments of hydro electric power plant.
5. To acquire knowledge on renewable energy sources, working principle and types of nuclear power plants, working principle and advantages and hazards.

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

CO1	List & understand the sources of energy, power plant economics and environmental aspects. (BL-1)
CO2	Explain the working of the components of different power plants. (BL-2)
CO3	Discuss the working principle, types, layout of diesel power plant & Gas turbines.(BL-2)
CO4	Explain the working principle, layout, auxiliary equipments of hydro electric power plant.(BL-2)
CO5	Interpret the renewable energy sources, working principle and types of nuclear power plants, working principle and advantages and hazards.(BL-2)

CO-PO Mapping

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

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	INTRODUCTION	10 Hours

Introduction to the Sources Of Energy - Resources and Development of Power in India. Conventional and non- conventional energy sources, Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, Diversity Factor - Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment - Pollutants and Pollution Standards - Methods of Pollution Control. Inspection And Safety Regulations.

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

1. Acquire knowledge about various sources of energy.
2. Learn about the various costs associated with power plant.
3. Understand the various environmental aspects of power plants.

MODULE -2	STEAM POWER PLANT	10 Hours

NARAYANA ENGINEERING COLLEGE: NELLORE								
	Product Design and Development							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To understand the basic structure of Product Design, Product Development Process and Explain the techniques uses in product design and development.
2. To develop ability for analyzing the life cycle assessment and Justify physical prototype in line with design for robustness.

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

CO 1	Interpret basic structure of Product Design , Product Development Process and Scope of Product Development. (BTL-2)
CO 2	Illustrate the techniques of Product Function, Product Teardown And Experimentation. (BTL-1)
CO 3	Apply the knowledge of Benchmarking, Establishing Engineering Specifications and Product Architecture in product. (BTL-3)
CO 4	Relate the knowledge of Brainstorming, Directed Search, Morphological Analysis and Concept Variants for concept selection and embodiment. (BTL-2)
CO 5	Analysis of Product Metrics and life cycle assessment. (BTL-4)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1													2
CO2		1										1		1
CO3				2										
CO4	2	1											2	1
CO5				2								2		
CO6	1													

1: Low, 2-Medium, 3- High

COURSE CONTENT

NARAYANA ENGINEERING COLLEGE:NELLORE								
	PRODUCTION AND OPERATIONS MANAGEMENT							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Course Objectives:

1. To Understand the concepts of operations management and types of production systems.
2. To Acquire the knowledge of forecasting techniques
3. To Understand the importance of value engineering and plant layout
4. To Gain knowledge of Aggregate Planning and MRP
5. To Determine the exact scheduling which will be followed in production

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

CO 1	Illustrate the operation management and concept in product development
CO 2	Explain forecasting techniques and errors in forecasting
CO 3	Summarize the value engineering and plant layout
CO 4	Determine various aggregate planning and MRP
CO 5	Explain the different types of scheduling

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1		1	1							1	1	1	
CO2		1		1				1						1
CO3	1		1	1	1							1	1	
CO4	1		1	1	1								1	
CO5		2	1	1				1				1	1	
CO6	1		1		1								1	

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	REFRIGERATION & AIR CONDITIONING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100

Course Objectives:

1. To define basic of Refrigeration and need of craft Refrigeration.
2. To understand Simple Vapour Refrigeration System
3. To learn about Simple Vapour Absorption System
4. To understand the basic of Air conditioning and processes on psychometric charts.
5 To study of various Air Conditioning Equipment-operating principles

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

CO 1	Determine the COP of Refrigeration System and Bell-Coleman Cycle. (BTL-3)
CO 2	Analyze the vapour compression cycle and interpret the usage of refrigerants (BTL-4)
CO 3	Explain the working of vapour absorption system. (BTL-2)
CO 4	Classify the different types of psychometric processes. (BTL-4).
CO 5	Identify various types of air conditioning equipment used. (BTL-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	1	2										3	
CO2	3		2				1						3	
CO3	3	1	2										3	
CO4	3	1	2										3	
CO5	3	1	2										3	

1: Low, 2-Medium, 3- High

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Basics of Mechanical Engineering							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Pre-Requisite: Basic Mathematics and Physical Science.

Course Objectives:

1. To study working of different power plants..
2. To understand about concepts of pumps and turbines.
3. To learn about working of IC Engines.
4. To study about concepts of different types of Boilers.
5 To understand concepts of Refrigeration and Air conditioning.

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

CO 1	Learn about Properties of gases and steam. (BTL-1)
CO 2	Understand about working of different power plants. (BTL-2)
CO 3	Understand concepts of pumps and turbines. (BTL-2)
CO 4	Learn about the concepts of IC Engines. (BTL-1)
CO 5	Learn about concepts of different types of Boilers. (BTL-1)
CO 6	Understand various refrigeration systems. (BTL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1												2	1
CO2		1		2								1		1
CO3														
CO4	1	1											1	1
CO5			2									1		
CO6	1													

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	**Properties of Steam**	**8 Hours**

NARAYANA ENGINEERING COLLEGE:NELLORE								
	AUTOMOBILE ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Pre-requisite: Basic concepts in Thermodynamics and Internal Combustion engines

Course Objectives:

1. To learn the various components of automobile.
2. To understand the principles of transmission system.
3. To learn the concept of steering mechanism.
4. To Impart knowledge on suspension system and brakes.
5. To address the underlying concepts and methods behind automobile pollution and control.
6. To explore practically about the components present in an Automotive electrical system.

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

CO 1	Demonstrate the knowledge on working of various components of an automobile.[BT-2]
CO 2	Identify and analyze the various systems and sub systems suitable for an automobile.[BT-2]
CO 3	Explain the probable solution in the design of steering systems..[BT-3]
CO 4	Analyze the complex issues in suspension and braking system.[BT-4]
CO 5	Apply the techniques to estimate pollution from the emissions of automobiles. [BT-3]
CO 6	Identify the components present in an Automotive electrical system.[BT-2]

CO-PO Mapping

CO	PO												PSO	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	1				2	3	2	3	3	2	2	2	2
CO2	3	2	2		2	2	2		3	1	2	1	2	1
CO3	1	3	1	3					1	2			1	1
CO4	3	1			1								1	1
CO5	1	1		1	3					2	1	1	2	1
CO6	1	1		3		3	1	2				1	3	1

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	**Basics of an Automobile**	8h

Classification of automobiles, Components of a four wheeler automobile, Chassis and body, Power unit, Rear wheel drive, Front wheel drive, Four wheel drive, Engine construction, Types of automobile engines, Turbo charging, Super charging, Crank case ventilation, Oil filters, Oil pumps.

NARAYANA ENGINEERING COLLEGE:NELLORE								
	ROBOTICS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge of CAD/CAM,CNC Machines.

Course Objectives:

1. To introduce the history, constructional features and other basic information on robotics
2. To introduce to the sensors used in robotics
3. To teach robot programming of a typical robot as also the concepts of path planning and applications.
4. To learn the concepts of Robotics, kinematics of robot, principles of robot drives and controls, sensors used in robots and programming methods.

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

CO 1	Understand the knowledge about the importance of robotics in today and future and robot configuration and subsystems (BL-2)
CO 2	Explain the working of robot accessories such as sensors,grippers.(BL-3)
CO 3	Explain robot programming languages which may adopt in different applications of robot(BL-3)
CO 4	understand the applications of various types of end effectors, and sensor devices(BL-2)
CO 5	Apply the Design and implementation programming of robot systems (BL-3)
CO 6	use the techniques, skills, and modern engineering tools necessary for engineering practice. (BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2										2	2	
CO2	2	2	2										2	
CO3	2	3											2	
CO4	2	2										1	2	
CO5	3	2	2										2	
CO6	2	2		2									2	

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1	INTRODUCTION	08 Hours

Definition of robot, necessity, advantages and disadvantages of robots, basic components of a robotic systems, robot joints, degrees of freedom, configurations of robots –cartesian, cylindrical, spherical, articulated, SCARA, work volume, specification of a robot- load carrying capacity (pay load), reach, stroke, speed of motion, speed of response, stability, repeatability, resolution and Accuracy.

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

1. Understand the manufacturing, maintenance, research of nuclear power plants and many other areas(BL-2)
2. Understand the degrees of freedom.(BL-2)

NARAYANA ENGINEERING COLLEGE:NELLORE								
	Engineering Materials							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	0	0	48	3	40	60	100

Pre-Requisite: No Pre requisite is required.

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 & Composite materials.

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

CO 1	Learn about bonds, crystallization of metals and determination of grain sizes of metals and alloys and constitution of alloys. (BT-1)
CO 2	Understand about construction of equilibrium diagrams and to study about phase diagrams.(BT-2)
CO 3	Understand properties and structures of various ferrous and non-ferrous metals and alloys. (BT-2)
CO 4	Know and apply the concepts of heat treatment of alloys. (BT-3)
CO 5	Learn about common crystal structure of metals. (BT-1)
CO 6	Learn about various composite materials. (BT-1)

CO-PO Mapping														
CO	**PO**												**PSO**	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	2											1	1
CO2				1								1		2
CO3													1	1
CO4	1		2		1									
CO5												2		
CO6													1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	**Structure of Metals**	**8 Hours**

Construction and interpretation of Thermal equilibrium diagram of binary nonferrous alloys, Gibb's phase rule, Study of Eutectic, Eutectoid, Peritectic, Peritectoid and monotectic reactions. Lever rule. Iron– Iron Carbide Equilibrium diagram, Study and interpretation.

Plain Carbon Steels: types, properties and applications

Cast Irons: types, properties and applications.

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

1. Acquire knowledge about various bonds in solids.
2. learn about grains and determination of grain sizes.
3. understand the concepts of constitution of alloys.

.

MODULE -2	**Equilibrium of Diagrams**	**8 Hours**

Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu- Sn and Fe-Fe_3C.

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

7. Learn about construction of equilibrium diagrams.
8. Understand eutectic and eutectoid systems.
9. Learn about phase rule and to study important binary phase diagrams.

Pre-requisite: Basic Concept of Statistics and Fundamental Knowledge of Mathematics; Principles of Management; Understanding of different functional areas of management

Course Objectives:

1.To provide students an insight into the concept of quality, cost of quality, international quality standards.

2.To learn the principles of Total quality management, techniques for problem solving.

3.To learn about various tools of quality management used in various industrial applications.

4. To familiarize the students with principles of Quality Function Development (QFD)
5. To Impart knowledge on ISO 9000:2000 Quality System

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

CO 1	Understanding the concepts and principles of TQM.[BT-2]
CO 2	Analyze various quality problems and contribute towards continuous improvement in the system .[BT-3]
CO 3	formulate quality circles to find solutions to problems in industry.[BT-6
CO 4	use Quality Function Development (QFD) technique in manufacturing and service sectors.[BT-3]
CO 5	Identify the Need of ISO 9000:2000 Quality System and its Elements .[BT-3]
CO 6	apply six sigma approach to various industrial situations.[BT-3]

COURSE CONTENT

MODULE – 1	**Basic concepts of Total Quality Management**	8h

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Barriers to TQM Implementation. Quality standards – Need of standardization - Institutions – bodies of standardization, ISO 9000 series – ISO 14000 series

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

1. understand the different phases involved in Total Quality Management.[BT-2]
2. Identify suitable Barriers to implement Total Quality Management . [BT-3]
3. Explain the tools and applications of Total Quality Management.[BT-2]

MODULE -2	**Quality measurement systems**	8h

Process management- Quality measurement systems (QMS) – developing and implementing QMS – nonconformance database- TQM tools & techniques- 7 QC tools- 7 New QC tools.

Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention,