NARAYANA ENGINEERING COLLEGE :: GUDUR

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR B.Tech w.e.f A.Y 2020-21

SEMESTER I

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
HS	English	2	0	0	2	2
BS	Algebra & Calculus	3	1	0	4	4
BS	Chemistry for Mechanical Engineering	3	0	0	3	3
ES	Problem Solving & Programming	3	0	0	3	3
ES	Engineering Drawing	0	1	4	5	3
BS	Chemistry for Mechanical Engineering Lab	0	0	3	3	1.5
HS	English Language Lab	0	0	3	3	1.5
ES	Problem Solving & Programming Lab	0	0	3	3	1.5
MC	Mandatory course I: Induction Program	--				
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester (20 points)				
	Total	**11**	**2**	**16**	**29**	**19.5**

SEMESTER II

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
BS	Vector calculus, Complex variables &Transforms	3	1	0	4	4
BS	Physics for Mechanical Engineering	3	0	0	3	3
ES	Basic Electrical & Electronics Engineering	3	0	0	3	3
ES	Material Science	3	0	0	3	3
BS	Physics for Mechanical Engineering Lab	0	0	3	3	1.5
ES	Basic Electrical & Electronics Engineering Lab	0	0	2	2	1
ES	Engineering & IT Workshop	0	0	4	4	2
ES	Material Science Lab	0	0	2	2	1
HS	Oral Communications Skills Lab	0	0	2	2	1
MC	Mandatory course II	2	0	0	2	0
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester(20 points				
	Total	**14**	**1**	**16**	**31**	**19.5**

SEMESTER III

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
BS	Probability, Statistics & Numerical methods	3	0	0	3	3
ES	Engineering Mechanics	2	1	0	3	3
ES	Thermodynamics	3	0	0	3	3
PC	Manufacturing Processes	3	0	0	3	3
PC	Fluid Mechanics & Hydraulic Machines	3	0	0	3	3
ES	Computer Aided Drafting and Modeling Lab	0	0	3	3	1.5
PC	Manufacturing Process Lab	0	0	3	3	1.5
PC	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	3	1.5
SC	Career competency Development I	0	0	2	2	1
SC	Value added course/Certificate course I	0	0	0	0	1
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester (20 points)				
	Total	14	1	14	29	21.5

SEMESTER IV

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
PC	Thermal Engineering	3	0	0	3	3
PC	Kinematics of Machinery	3	0	0	3	3
PC	Mechanics of Materials	2	1	0	3	3
PC	Metal Forming Processes	3	0	0	3	3
OE	Open Elective I	3	0	0	3	3
PC	IC Engines Lab	0	0	3	3	1.5
PC	Mechanics of Materials Lab	0	0	3	3	1.5
PC	Computer Aided Machine Drawing	0	0	3	3	1.5
SC	Career competency Development II	0	0	2	2	1
SC	Value added course/Certificate course II	0	0	0	0	1
MC	Mandatory course III	2	0	0	2	0
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester(20 points				
	Total	16	1	14	31	21.5

SEMESTER V

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
PC	Thermal Power Systems	3	0	0	3	3
PC	Design of Machine Elements	3	0	0	3	3
PC	Metal Cutting & Machine Tools	3	0	0	3	3
PE	Professional Elective I	3	0	0	3	3
OE	Open Elective II	3	0	0	3	3
PC	Design Thinking & Product Innovation Lab	0	0	3	3	1.5
PC	Metal Cutting & Machine Tools Lab	0	0	3	3	1.5
SC	Career competency Development III	0	0	2	2	1
SC	Value added course/Certificate course III	0	0	0	0	1
PR	Internship I/on job training/Com Ser Project	0	0	0	0	1.5
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester (20 points				
	Total	15	0	11	26	21.5

SEMESTER VI

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
PC	Dynamics of Machinery	3	0	0	3	3
PC	Design of Transmission Systems	3	0	0	3	3
PC	Heat and Mass Transfer	2	0	0	2	2
PC	Computer Integrated Manufacturing	3	0	0	3	3
PE	Professional Elective II	3	0	0	3	3
OE	Open Elective III	3	0	0	3	3
PC	Heat Transfer Lab	0	0	2	2	1
PC	CAD/CAM Lab	0	0	3	3	1.5
SC	Career competency Development IV	0	0	2	2	1
SC	Value added course/Certificate course IV	0	0	0	0	1
MC	Mandatory course IV	2	0	0	2	0
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester(20 points				
	Total	19	0	10	29	21.5

SEMESTER VII

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
PC	Metrology & Instrumentation	3	0	0	3	3
HE	Humanities and Social Science Elective	2	0	0	2	**2**
PE	Professional elective III	3	0	0	3	3
PE	Professional elective IV	3	0	0	3	3
PE	Professional elective V	3	0	0	3	3
OE	Open Elective IV	3	0	0	3	**3**
PC	Metrology & Instrumentation Lab	0	0	3	3	1.5
ES	Software Tools Lab	0	0	2	2	1
SC	Career competency Development V	0	0	2	2	1
SC	Skill development Training	0	0	2	2	1
PR	Internship II/on job training/Com Ser Project	0	0	0	0	1.5
	Counselling/Mentoring	0	0	1	1	0
	Sports/Hobby Clubs/Activities	0	0	2	2	0
	Activity Point Programme	During the Semester(20 points				
	Total	17	0	12	29	23

SEMESTER VIII

Category	Course Title	Contact Periods per week				Credits
		L	T	P	Total	
PR	Project work, seminar and internship	0	0	0	0	12
	Activity Point Programme	During the Semester(20 points)				
		0	**0**	**0**	**0**	**12**

SUBJECTS FOR OPEN ELECTIVES (OE)

S.No	SUBJECTS
1	Engineering Optimization
2	Mechatronics
3	Industrial Engineering and Management
4	Automobile Engineering
5	Basics of Mechanical Engineering
6	Automation &Robotics
7	Engineering materials
8	Total Quality Management
9	Industrial Safety and Hazard Management

PROFESSIONAL ELECTIVE (PE)

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

ELECTIVE / TRACK/GROUP	Professional Elective-1 (V SEM)	Professional Elective-2(VI SEM)	Professional Elective-3(VII SEM)	Professional Elective-4(VII SEM)	Professional Elective-5(VII SEM)
Design Engineering	Product Design & Development	Design Of Rotating Elements	**Finite Element Methods**	Computational Fluid Dynamics	Design of Heat Exchangers
Thermal Engineering	Gas turbines and jet propulsion	Power plant Engineering	Refrigeration & Air Conditioning	Hydraulic & Pneumatics Systems	**Automobile Engineering**
Production Engineering	Design for Manufacturing	Modern Manufacturing Methods	Automation In Manufacturing	Surface Engineering	Manufacturing & Inspection Of Gears
Industrial Engineering	**Management Science**	**Engineering Optimization**	Industrial Engineering	Production & Operation Management	Industrial Management
CAD/CAM	Flexible Manufacturing Systems	Mechatronics	Intelligent Manufacturing Systems	**Automation &Robotics**	Computer Aided Process Planning
Materials Engineering	Principles of Metal Extraction & Refining	Metallurgy	Composite Materials	Nano materials	Smart Materials

SUBJECTS FOR HONORS DEGREE

S.NO.	COURSE NAME	L-T-P	CR	OFFERED TO
1	Industrial Tribology	3-1-0	4	ME
2	Non Destructive Testing	3-1-0	4	ME
3	Supply Chain Management	3-1-0	4	ME
4	Reverse Engineering and Rapid Prototyping	3-1-0	4	ME
1	Robotics: Modelling, Analysis and Control	3-1-0	4	ME
2	Mechanical Handling Systems	3-1-0	4	ME
3	Theory and Design of Control Systems	3-1-0	4	ME
4	Smart Materials for Mechatronic Applications	3-1-0	4	ME
1	Automobile Engine Design	3-1-0	4	ME
2	Automotive Transmission	3-1-0	4	ME
3	Autotronics & Safety	3-1-0	4	ME
4	Alternative Energy Sources for Automobiles	3-1-0	4	
1	Advanced Thermodynamics	3-1-0	4	ME
2	Advanced IC Engines	3-1-0	4	ME
3	Jet Propulsion and rocket Engineering	3-1-0	4	ME
4	Computational Fluid Dynamics	3-1-0	4	ME

SUBJECTS FOR MINOR DEGREE

S.No	Subject	L-T-P	Credit
1	Engineering Mechanics	**3-1-0**	**4**
2	Thermal Engineering	**3-1-0**	**4**
3	Production Technology	**3-1-0**	**4**
4	Fundamentals of Engineering Design	**3-1-0**	**4**
5	Production Planning and control	**3-1-0**	**4**
6	Materials Technology	**3-1-0**	**4**
7	CAD/CAM	**3-1-0**	**4**
8	Renewable Energy Sources	**3-1-0**	**4**

HUMANITIES AND SOCIAL SCIENCES (HS)

SEMESTER	SUBJECT	CREDITS
I SEM	English	2
	English Language Lab	1.5
II SEM	Oral Communications Skills Lab	1
VII Sem	Humanities and Social Science Elective	2
	TOTAL	**6.5**

BASIC SCIENCES (BS)

SEMESTER	SUBJECT	CREDITS
I SEM	Algebra & Calculus	4
	Chemistry for mechanical engineering	3
	Chemistry for mechanical engineering lab	1.5
II SEM	Vector calculus, Complex variables &Transforms	4
	Physics for Mechanical Engineering	3
	Physics for Mechanical Engineering Lab	1.5
III SEM	Probability, Statistics & Numerical methods	3
	TOTAL	**20**

ENGINEERING SCIENCES (ES)

SEMESTER	SUBJECT	CREDITS
I SEM	Problem Solving & Programming	3
	Engineering Drawing	3
	Problem Solving & Programming Lab	1.5
II SEM	Material Science	3
	Basic Electrical &Electronic Engineering	3
	Engineering & IT Workshop Lab	2
	Material Science Lab	1
	Basic Electrical and Electronic & Engineering Lab	1
III SEM	Engineering Mechanics	3
	Thermodynamics	3
	Computer Aided Drafting and Modelling Lab	1.5
VII SEM	Software Tools Lab	1
	TOTAL	**26**

PROFESSIONAL CORE (PC)

SEMESTER	SUBJECT			CREDITS
III	Manufacturing Processes			3
	Fluid Mechanics & Hydraulic Machines			3
	Manufacturing Processes Lab			1.5
	Fluid Mechanics & Hydraulic Machines Lab	**(2+2)**	**9**	1.5
IV	Thermal Engineering			3
	Kinematics of Machinery			3
	Mechanics of Materials			3
	Metal Forming Processes			3
	IC EnginesLab			1.5
	Computer Aided Machine Drawing Lab			1.5
	Mechanics of Materials Lab	**(4+3)**	**16.5**	1.5
V	Thermal Power Systems			3
	Design of Machine Elements			3
	Metal Cutting & Machine Tools			3
	Design Thinking & Product Innovation Lab			1.5
	Metal Cutting & Machine Tools	**(3+2)**	**12**	1.5
VI	Dynamics of Machinery			3
	Design of Transmission Systems			3
	Heat & Mass Transfer			2
	Computer Integrated Manufacturing			3
	Heat Transfer Lab			1
	CAD/CAM Lab	**(4+2)**	**13.5**	1.5
VII	Metrology & Instrumentation			3
	Metrology & Instrumentation Lab	(1+1)	4.5	1.5
			TOTAL	**55.5**

Professional Core: Theory Subjects: 14 Labs:10

PROFESSIONAL ELECTIVES (PE)

SEMESTER	SUBJECT	CREDITS
V Sem	Professional elective 1	3
VI Sem	Professional elective 2	3
VII Sem	Professional elective 3	3
VII Sem	Professional elective 4	3
VII Sem	Professional elective 5	3
	TOTAL	**15**

OPEN ELECTIVES (OE)

SEMESTER	SUBJECT	CREDITS
IV Sem	Open Elective 1	3
V Sem	Open Elective 2	3
VI Sem	Open Elective 3	3
VII Sem	Open Elective 4	3
	TOTAL	**12**

SKILLED ORIENTED COURSES (SC)

SEMESTER	SUBJECT	CREDITS
III Sem	Career Competency Development I	1
	Value added course/Certificate course I	1
IV Sem	Career Competency Development II	1
	Value added course/Certificate course II	1
V Sem	Career Competency Development III	1
	Value added course/Certificate course III	1
VI Sem	Career Competency Development IV	1
	Value added course/Certificate course IV	1
VII Sem	Career Competency Development V	1
	skill development Training	1
	TOTAL	**10**

PROJECTS (PR)

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

SL NO	SUBJECT AREA	CREDITS PER SEMESTER								Credits NECN
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3.5	1							6.5
2	BS	8.5	8.5	3						20
3	ES	7.5	10	7.5				1		26
4	PC			9	16.5	12	13.5	4.5		55.5
5	PE					3	3	9		15
6	OE				3	3	3	3		12
7	SC			2	2	2	2	2		10
8	PR					1.5		1.5	12	15
9	MC									No credit
	TOTAL	19.5	19.5	21.5	21.5	21.5	21.5	23	12	160

SUBJECTS & SYLLABUS APPROVED BY BOS MEETING FROM DEPARTMENT OF MECHANICAL HELD ON 08-01-2021:

S.No	Name of the Subject	Sem/Branch	Category
OTHER BRANCHES			
1	Engineering Graphics	I Sem Civil & CSE and II Sem ECE & EEE	ES
2	Engineering and IT Workshop (BoS: Mech & CSE)	I Sem EEE, Mech, CSE & ECE and II Sem Civil	ES
3	Engineering Mechanics	III Sem Civil & Mechanical	ES
MECHANICAL BRANCH			
4	Engineering Drawing	I Sem Mechanical	ES
5	Material Science	II Sem Mechanical	ES
6	Material Science Lab	II Sem Mechanical	ES
7	Thermodynamics	III Sem Mechanical	ES
8	Manufacturing Processes	III Sem Mechanical	PC
9	Fluid Mechanics & Hydraulic Machines	III Sem Mechanical	PC
10	Computer Aided Drafting and Modeling Lab	III Sem Mechanical	ES
11	Manufacturing Process Lab	III Sem Mechanical	PC
12	Fluid Mechanics & Hydraulic Machines Lab	III Sem Mechanical	PC
13	Thermal Engineering	IV Sem Mechanical	PC
14	Kinematics of Machinery	IV Sem Mechanical	PC
15	Mechanics of Materials	IV Sem Mechanical	PC
16	Metal Forming Processes	IV Sem Mechanical	PC
17	IC Engines Lab	IV Sem Mechanical	PC
18	Mechanics of Materials Lab	IV Sem Mechanical	PC
19	Computer Aided Machine Drawing	IV Sem Mechanical	PC
OPEN ELECTIVES			
20	Engineering Optimization	NA	OE
21	Mechatronics	NA	OE
22	Industrial Engineering and Management	NA	OE
23	Automobile Engineering	NA	OE
24	Basics of Mechanical Engineering	NA	OE
25	Automation & Robotics	NA	OE
26	Engineering Materials	NA	OE
27	Total Quality Management	NA	OE
28	Industrial Safety and Hazard Management	NA	OE

HONORS SUBJECTS			
29	Industrial Tribology	IV Sem Mechanical	
30	Non Destructive Testing	IV Sem Mechanical	
31	Supply Chain Management	IV Sem Mechanical	
32	Reverse Engineering and Rapid Prototyping	IV Sem Mechanical	
MINORS SUBJECTS			
33	Engineering Mechanics	NA	
34	Thermal Engineering	NA	
35	Production Technology	NA	
36	Fundamentals of Engineering Design	NA	
37	Production Planning and control	NA	
38	Materials Technology	NA	
39	CAD/CAM	NA	
40	Renewable Energy Sources	NA	

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OTHER BRANCHES

NARAYANA ENGINEERING COLLEGE:GUDUR								
	ENGINEERING GRAPHICS							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	1	4	75	3	40	60	100

COURSE CONTENT

Part-A Manual Drawing

TASK– 1	Introduction and Conic sections	10 H

Introduction to Engineering graphics:

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

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

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

TASK–-2	Orthographic Projections	10 H

Objectives and Principle of projection,

Methods of projections, Comparisionbetween firstangle and third angleprojection.

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

TASK–3	Projections of Solids	12 H

Types of solids ; Polyhedra, Solids of revolution,

Projections of regular solids(Prisms, Pyramids, Cylinders and Cone),with itsaxis perpendicular to one plane and parallel to other plane, Axis inclined to one plane and parallel to other plane.

TASK–4	Isometric and Orthographic views	10H

Isometric Projections : Principles, Isometric scale, Isometric views ,Conventions, Isometric views of lines, planes, simple solids (Cube, Cylinder, Cone), Conversion of Isometric views to Orthographicviews.

Part B Computer Aided Drafting

TASK–5	Introduction to AutoCAD	15 H

Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions. Dimensioning principles and conventional representations.

TASK–6	Orthographic and Isometric Projections	18 H

Transformation of Isometric Projections into orthographic projections such as simple solids such as cylinder, cone, square prism, pentagonal pyramid Draw 3D model of mechanical components such as Stepped block, Bush bearing,	
Total H:	**75 H**

Text Book(s):

1. Bhatt N.D. "Elementary Engineering Drawing", CharotarPublishers,2014.
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009
3. K.L.Narayana&P.Kannaiah,EngineeringDrawing,3/e,ScitechPublishers,Chennai , 2012.
4. Engineering Drawing by Dr AVS Sridhar Kumar, Dr Krishnaiah , T P Vara Prasad. ,Spectrum education, Sun techno Publications,2019

Reference Book(s):

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

NARAYANA ENGINEERING COLLEGE:GUDUR								
	ENGINEERING & IT WORK 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

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 300 x 40 x 25 mm soft wood stock

a) Half – Lap joint.

b) Mortise and Tenon joint

Trade-2 Fitting (6 H)

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

a) V-fit b) Dovetail fit

ii) Bicycle tire puncture and change of two wheeler tire

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 c)Brazing

Trade - 4 Electrical House Wiring (6 H)

Familiarities with different types of basic electrical circuits and make thefollowing electricalconnections

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 - Plumbing (Demo) (2 H)

1. Introduction of tools, joints, couplings and valves etc.
2. PVC Pipe thread cutting and making single joint with coupling and tap connection.
3. Water shower connection with reducer coupling

Trade-6 Plastic Moulding (Demo) (4 H)

1. Injection moulding of plastic cap (demo)

Trade-6 Soldering & Brazing (Demo) (2H)

1.a)Soldering of Electric wire

b) Brazing of copper wire

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., Scitechpublications
   i. Pvt.Ltd.,Hyderabad,2008.

Reference Book(s):

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

COURSE CONTENT FOR IT WORKSHOP
Task-1 Learn about Computer (4H)
Identify the internal parts of a computer and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.
Task -2 Assembling a Computer (4H)
Disassemble and assemble the PC back to working condition. Troubleshoot the computer and identify working and non-working parts. Identify the problem correctly by various methods available (eg: beeps). Record the process of assembling and trouble-shooting a computer.
Task-3 Install Operating system (4H)
Install Linux, any other operating system (including proprietary software) and make the system dual boot or multi boot. Record the entire installation process.
TASK-4 Operating system features (4H)
Record various features that are supported by the operating system(s) installed. Submit a report on it. Access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Install new application software and record the installation process.
TASK-5 Word Processor (4H)
Create documents using the word processor tool. Tasks to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Submit a report of the word processor considered. Create documents using the word processor tool. Mail Merge in word processor for creating appointment orders for 10 employee records in excel.
TASK-6 Spreadsheet (4H)
To create, open, save the spreadsheet and format them as per the requirement. Some of the tasks to be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells, working with pivot tables and charts.Submit a report of the Spreadsheet application considered.
TASK-7 Presentations (4H)
To create, open, save and run the presentations, Select the style for slides, format the slides with different fonts, colors, create charts and tables, insert and delete text, graphics and animations, bulleting and numbering, hyperlink, set the time for slide show,Record slide show. Submit a report of the Presentation tool considered.
TASK-8 Wired network & Wireless network (4H)
Select a LAN cable, Identify the wires in the cable, Define the purpose of each wire, Study the RJ45 connecter, Use crimping tool to fix the cable to the connecter, Test the cable using LAN tester, Connect two or more computers using cross and straight cables, Configure the computers, share the data between the computers.

Additional Experiments:
TASK -1 IoT
Raspberry Pi Study the architecture of Raspberry pi, configure software, Install SD card, Connect the cables, Install Raspbian (or any other) operating system, Configure Wi-Fi, Remotely connect to your Raspberry Pi.
TASK -2 OUTLOOK, MACROS
Practice the following tasks and submit report A. Configure outlook and accessmails. B. Create Macros in word and spreadsheettools

Text Book(s):

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

Reference Book(s):

1. Rusen, "Networking your computers and devices",PHI
2. Bigelows, "Trouble shooting, Maintaining & Repairing PCs",TMH.

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	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

COURSE CONTENT

MODULE – 1	System of Forces	8 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	08 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	08 H

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

MODULE-4	Centroid	8 H

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

MODULE-5	Moment Of Inertia	8 H

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

MODULE-6	Kinematics & Kinetics	8 H

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

Total h:	48 h

Text Book(s):

1. S SBhavikatti, "Engineering Mechanics", 4th edition, New Age International,2008.
2. R.K. Bansal, "A text book of Engineering Mechanics", LaxmiPublications,2010
3. IrvingShames,GKMRao,"EngineeringMechanics:Statics andDynamics", 4thedition, Pearson, 2009.

Reference Book(s):

1. BasudebBhattacharya.,"EngineeringMechanics",2ndedition,OxfordUniversityPress (India),2015.

2. K L Kumar, VeenuKumar, "Engineering Mechanics", 4th edition, Tata McGrawHill,2010.

3. Engineering Mechanics , R.S.Khurmi,S.Chand,2012.

NARAYANA ENGINEERING COLLEGE :: GUDUR

AUTONOMOUS

MECHANICAL ENGINEERING SUBJECTS

NARAYANA ENGINEERING COLLEGE: GUDUR								
	ENGINEERING DRAWING							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	0	1	4	75	3	40	60	100

COURSE CONTENT

TASK – 1	Introduction & Conic sections	12 Hours

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..

TASK -2	**Orthographic** Projections	12 Hours

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

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

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

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

TASK-3	Projections of Solids	15 Hours

Types of solids; Polyhedra, Solids of revolution,

Projections of regular solids (Prisms, Pyramids, Cylinder and Cone),with its axis perpendicular to one plane and parallel to other plane, Axis inclined to one plane and parallel to other plane.

TASK-4	Sections of Solids and Development of Surfaces	12 Hours

Sections of Solids: Types of sectional views of solids, cutting planes, Sections of Prism, Pyramids, Cylinder and Cone

Development of surfaces: Development of Surfaces of right regular Solids-Prism, Cylinder, Pyramid, Cone

TASK-5	Isometric and Orthographic Projections	12Hours

Isometric Projections: Principles, Isometric scale, Isometric views, Conventions, Isometric views of lines, planes, simple solids (Cube, Cylinder, Cone),

Conversion of Isometric views in to Orthographic views.

TASK-6	Perspective Projections	12 Hours

Perspective Projections: Perspective views of Line, Planes (square, circular, pentagon) and Simple solids (Square prism, Triangular pyramid, Cone) by using Visual Ray Method only

Total hours:	**75 hours**

Text Book(s):

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

Reference Book(s):

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

NARAYANA ENGINEERING COLLEGE::GUDUR								
	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

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,

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.

MODULE-3	Metals & Alloys	8 H

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

Non-ferrous Metals and Alloys :

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

MODULE-4	Heat treatment of Alloys	8 H

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

MODULE-5	Ceramic & Plastic Materials	8 H

Ceramic materials: Crystalline ceramics, glasses, cermets, abrasive materials, - definition, properties and application

Plastics:Thermo set plastics & Thermo plastics- applications

MODULE-6	Composite Materials	8 H

Composite Materials: Classification of composites, various methods of component mafacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures.

Total h:	48 h

Text Book(s):

1. Introduction to Physical Metallurgy / Sidney H.Avener. 2017
2. A Text of Essential of Materials science and engineering/ DonaldR.Askeland/Thomson.2013
.3.Material Science and Metallurgy/ Dr.V.D.Kodgire,2011

Reference Book(s):

1. Science of Engineering Materials / B.K.Agarwal,2017.
2. Engineering materials and metallurgy/R. K. Rajput/S.Chand,2015.
3. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / JaicoBooks 1995

NARAYANA ENGINEERING COLLEGE: GUDUR								
	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

COURSE CONTENT
Task-1 (2hrs)
Study of general procedure for specimen preparation and Metallurgical Microscope.
Task -2 (2 hrs)
Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
Task -3 (2 hrs)
Preparation and study of the Microstructure of Mild steels.
Task -4 (2 hrs)
Preparation and study of the Microstructure of low carbon steel.
Task -5 (2 hrs)
Preparation and study of the Microstructure of high carbon steels.
TASK-6 (2 hrs)
Study of microstructures of Cast Iron.
TASK-7
Study of microstructures of Nonferrous alloys. **(2 hrs)**
TASK-8(2 hrs)
Study of microstructures of Heat-treated steels.
TASK-9(2 hrs)
Metallographic study and analysis of Brass
TASK-10 (2 hrs)
Metallographic study and analysis of Bronze.
TASK-11(3hrs)
Hardenability of steel by Jominy End Quench Test.
TASK-12(4hrs)
Find out the hardness of various treated and untreated steels.
TASK-13 (2 hrs)
Study of crystal structure of BCC, FCC and HCP crystals.
TASK -14(2 hrs)
Demonstration of microstructure characteristic by Image Analyzer.

Text Book(s):

1. Introduction to Physical Metallurgy / Sidney H.Avener. 2017
2. A Text of Essential of Materials science and engineering/ DonaldR.Askeland/Thomson.2013
3. Material Science and Metallurgy/ Dr.V.D.Kodgire,2011

Reference Book(s):

1. Science of Engineering Materials/Agarwal
2. Engineering materials and metallurgy/R. K.Rajput/S.Chand.
3. Engineering Materials and Ther Applications – R. A Flinn and P K Trojan /JaicoBooks

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT		
MODULE – 1	**WORK AND HEAT TRANSFER**	08 Hours

Fundamental Concepts and Definitions: Concept of continuum, microscopic and macroscopic approach, system, control volume, dimensions and units, force, weight, State, path, process, isolated system, adiabatic system, thermodynamicequilibrium.

Work And Heat Transfer: Thermodynamic definition of work, different forms of work, path function,Heat, temperature and zeroth law of thermodynamics.

MODULE -2	**FIRST LAW OF THERMODYNAMICS**	08 Hours

First Law of Thermodynamics: First law applied to a system undergoing a cyclic process and a change of state, concept of energy, nature of energy, pure substance, two property rule. First law applied to a control volume, general energy equation, steady flow energy equation on unit mass and time basis,
application of SFEE for devices such as boiler, turbine, heat exchangers, pumps, nozzles, etc.

MODULE-3	**SECOND LAW OF THERMODYNAMICS**	08 Hours

Second Law of Thermodynamics: Limitations of the first law, definition of a heat engine, heat pump, refrigerator, thermal efficiency and the coefficient of performance. Kelvin-Planck and Clausius statements of the second law, their equivalence, reversible heat engine, Carnot theorems and corollaries. PMMI and PMMII, Reversible process, irreversible process, factors responsible for making a process irreversible. Carnot cycle, thermodynamic temperature scale. Entropy, Clausius theorem, Clausius inequality, Principle of increase of entropy, available and unavailable energy, irreversibility. Third lawof
thermodynamics, absolute entropy.

MODULE-4	**IDEAL GAS MIXTURES**	08 Hours

Ideal Gas Mixtures: Gravimetric and volumetric analysis, Dalton's law, Amagat's law, mole fraction, volume fraction, evaluation of properties of gas mixtures, adiabatic mixing of gases at different temperatures and pressures, non-adiabatic mixing, mixing of gases in steady flow.

MODULE-5	**IDEAL GAS AND REAL GAS**	08 Hours

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

MODULE-6	**PURE SUBSTANCE**	08 Hours

PURE SUBSTANCE: Behavior of pure substance (steam) with reference to T-v, P-T, P-V, P-h & T-s diagrams, Triple and critical points, properties of steam, Quality of steam, its determination using throttling and separating-throttling calorimeters. Steam processes; expressions for the change in internal energy, enthalpy, work, heat, entropy in various processes, Mollier chart, Carnot cycle, Rankine cycle, modified Rankine cycle.

MODELLING OF BASIC ENERGY CONVERSION CYCLES:

Air standard assumptions, Overview of reciprocating engines, Air standard cycles for reciprocating engines – Otto, Diesel &dual, Derivation for efficiency, Mean effective pressure(MEP) & Carnot efficiency ,calculation of Heat transfer at mean temperature.

Total hours:	**48 hours**

Text Book(s):

1. P.K.Nag, Engineering Thermodynamics, TMH, New Delhi,2013
2. G.J.Vanwylen and R.E.Sonntag, Fundamentals of Classical Thermodynamics, Wiley Eastern,New Delhi,2008.
3. Yonus A Cengel and Michale A Boles, Thermodynamics: An Engineering Approach, McGraw Hill, 2002.
4. Principles of engineering thermodynamics by morani 8^{TH}edition ,SIversion.

Reference Book(s):

1. Thermal engineering by R.K Rajput 6^{th}edition.
2. R. K. Rajput (2010), A text book of Engineering Thermodynamics, Fourth Edition,Laxmi Publications, New Delhi,India.
3. Engineering thermodynamics by RK rajput,5^{TH} edition, Laxmi Publications, New Delhi,India.
4. Engineering thermodynamics, work and heat transfer by Gordon rogers 4^{TH} edition,person educationindia2002.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT

MODULE – 1	**CASTING PROCESSES**	8 h

Introduction : Importance and selection of manufacturing processes.
Casting Processes: Introduction to casting process, process steps; Sand Casting – Sand Molds - Types of 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**	8h

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

MODULE-3	**METAL JOINING PROCESSES - WELDING**	8h

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

MODULE-4	**GAS WELDING**	8h

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

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

MODULE-5	**SURFACE ENGINEERING & POWDER METALLURGY**	8 h

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

MODULE-6	**ADDITIVE MANUFACTURING**	8h

Introduction, Prototyping fundamentals, Historical development, Advantages of AMT, Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, Classification of AMT process, Applications to various fields

Total hours:	48 hours

Text Book(s):

1. Rao P.N.,"ManufacturingTechnology–VolumeI", 5thedition, McGraw-HillEducation, 2018.
2. KalpakjainSandSchmidS.R.,"ManufacturingEngineeringandTechnology",7th edition, Pearson,2018
3. Production Technology by R.K. Jain and S.C. Gupta, Khanna Publishers, 17th edition,2012
4. Ian Gibson, Davin Rosen, Brent Stucker "Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

Reference Book(s):

1. Manufacturing Technology, R.K. Rajput, Laxmi Publications
2. ProductionTechnologybyR.K.JainandS.C.Gupta,KhannaPublishers,17thedition,2012
3. Production Technology, K.L Narayana, I.K. International Pub, 3rdEdition,2013
4.Manufacturing Process Vol. I, H.S.ShahPearson,2013,
4. Principles of Metal Castings, Rosenthal, Tata Mc Graw Hill ,2ndEdition,2001
6.Workshop Technology–B.S.RaghuVamshi–Vol I.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT		
MODULE – 1	**PROPERTIES OF FLUIDS**	**8 Hrs**
Definition of fluid and concept of continuum Dimensions and units, physical properties of fluids–density. specific weight, specific gravity, surface tension– vapor pressure and their influence on fluid motion–Newton's Law Of Viscosity, Newtonian and Non Newtonian fluids. **Fluid Statics**-Atmospheric, Gauge and Vacuum pressure–measurement of pressure–Piezometer, manometers- simple, U-tube manometers, U-tube differential manometers..		
MODULE -2	**FLUID KINEMATICS & DYNAMICS**	**8 Hrs**
FLUID KINEMATICS : stream line, path line and streak lines and steam tube, classification of flows-steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows-equation of continuity for one dimensional flow. FLUID DYNAMICS: surface and body forces – Euler's and Bernoulli's equations for flowing stream line, momentum equation and its application on force on pipe bend		
MODULE-3	**FLOW THROUGH PIPES**	**8 Hrs**
FLOW THROGH PIPES : Reynolds's Number , Reynolds experiment ,Critical Reynold's Number–,,Darcy Weisbach equation–Minor losses in pipes–pipes in series and pipes in parallel–total energy line-hydraulic gradient line. Measurement of flow: PitotTube, Venturi Meter and Orifice Meter- horizontal position only. **DIMENSIONAL ANALYSIS**- dimensional homogeneity- methods of dimensional analysis- Rayleigh's method-Buckingham theorem.		
MODULE-4	**IMPACT OF JETS**	**10 Hrs**
IMPACTOFJETS:IntroductiontoHydrodynamicThrustofjetonfixedandmovingsurfaces (flatand curved), series of flat vanes and series of radial curved vanes -velocity diagrams, work done and efficiency.		
MODULE-5	**HYDRAULIC TURBINES**	**8 Hrs**
HYDRAULIC TURBINES: Classification of turbines, Impulse and Reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube- theory- functions and efficiency.		
MODULE-6	**HYDRAULIC PUMPS**	**6 Hrs**
CENTRIFUGAL PUMPS :Introduction, components parts and working of centrifugal pumps, Classification- work done – manometric head–loss efficiencies–specific speed–pumps in series and parallel–performance characteristic curves and NPSH		
	Total Hrs:	**48 Hrs**

Text Book(s):

1. Hydraulic and Fluid Mechanics including Hydraulic Machines by Modi &Seth, Standard bookhouse
2. A Text of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., NewDelhi,2010.
3. Dr D S Kumar, "Fluid Mechanics and Fluid Power Engineering" S K Katariua&Sons,2014.

Reference Book(s):

1. Fluid mechanics and fluid machines by Rajput, S.Chand &Co.
2. Mechanics of Fluids by Potter, Wiggert, Ramadan, M.M.M.SARCAR, Cengage Publishers.
3. Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, UniversitiesPress.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	Computer Aided Drafting and Modelling 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

COURSE CONTENT
Task -1 (6 hrs)
Study capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
Task -2 (4 hrs)
Draw Title Block with necessary text and projection symbol.
Task -3 (4 hrs)
Draw curves like parabola, spiral, involutes.
TASK-4 (4 hrs)
Draw front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
TASK-5 (6 hrs)
Draw front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
TASK-6 (6 hrs)
Draw a simple steel truss.
TASK-7 (4 hrs)
Draw sectional views of prism, pyramid, cylinder, cone, etc,
TASK-8 (6 hrs)
Draw isometric projection of simple objects.
TASK-9 (4 hrs)
Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Text Book(s):

1. Ibrahim Zeid, “CAD / CAM - Theory and Practice 2E”, Tata Mcgraw-Hill, NewDelhi,2010.
2. P. Radhakrishnan, S. Subramanyan, V. Raju “CAD/CAM/CIM”, New Age International,2015.
3. M.M.M. Sarcar, K. Mallikarjuna Rao, K. Lalit Narayan “computer aided design and manufacturing”, prentice hall of India,2008.

Reference Book(s):

1. Mikell.P.Groover, “CAD/CAM: Computer-Aided Design and Manufacturing”, Prentice hallof India Pvt. Ltd.,NewDelhi.2008
2. Chriss McMahon and Jimmie Browne, “CAD/CAM”, Addision Wesley, New York,2000.
3. Tien-chienchang, Richard A wysk, Hsu-pin wang, “Computer-Aided Manufacturing", Pearson Edition,2009.

NARAYANA ENGINEERING COLLEGE::GUDUR								
	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

COURSE CONTENT
Task 1 - [3 hrs]
Pattern Design and making on lathe machine
Task 2 - [3hrs]
Sand Properties Testing – Exercise for Strength and Permeability
Task -3 [3 hrs]
Gating Design and pouring time and solidification time calculations
TASK -4 [3 hrs]
Molding, Melting and Casting for ferrous/ non ferrous materials
TASK -5 [3 hrs]
Gas welding: - butt welding and lap welding of 5 mm M.S. plates
TASK-6 Brazing**[3 hrs]**
Brazing on copper pipes- 6mm pipe
TASK -7 [3 hrs]
Spot Welding on M.S PLATE- 2mm size
TASK -8 [3 hrs]
Arc Welding: Lap & Butt Joint of M.S. plates -5mm
TASK -9 [6 hrs]
Hydraulic Press: Deep drawing Press Tool: Blanking and Piercing operation with Simple dies
TASK -10 [3 hrs]
Additive manufacturing-3D printing

Text Book(s):

1.W. A. J. Chapman, Workshop Technology Part I, ELBS & Edward Arnold Publishers.

2 Acharkan. N., Machine Tool Design Vol. 1 to 4, MIR Publication.

3 HMT, Production Technology, Tata McGraw Hill.

Reference Book(s):

1 .HajraChoudary, Elements of workshop technology, Vol I & II, MediaPublishers,

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

3 .PoulDeGarmo, J.T.Black,R.A.Kosher, MaterialsandProcesses inManufacturing, PrenticeHallof India Pvt.Ltd.,1997.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT
Task 1 - Calibration of Venturi Meter (3 hrs)
calibrate the coefficient of Discharge of a Venturi Meter.
Task -2 Calibration of Orifice Meter (3 hrs)
calibrate the coefficient of Discharge of an Orifice Meter.
Task -3 Small Orifice (3 hrs)
calibrate the coefficient of Discharge of small Orifice**.**
TASK-4 External Mouth Piece(3 hrs)
calibrate the coefficient of Discharge of external mouth piece.
TASK-5 Rectangular Notch (3hrs)
calibrate the coefficient of Discharge of Rectangular Notch.
TASK-6 Triangular Notch (3 hrs)
calibrate the coefficient of Discharge of Triangular Notch.
TASK-7 Minor Losses (3 hrs)
find the loss of head due to sudden contraction.
TASK-8 Major Losses (3 hrs)
find the friction factor of pipes having different diameters and same material.
TASK-9 Verification of Bernoulli's Theorem. (4 hrs)
prove that the total energy remains constant by using Bernoulli's tube with different cross section.
TASK -10 Impact of jet on vanes (4 hrs)
measure the co efficient of impact of jet on flat and curved vanes.
TASK-11 Pelton wheel turbine (4 hrs)
conduct performance test on Pelton Wheel and find it's efficiency.
TASK-12 Single stage centrifugal pump. (4 hrs)
calculate the efficiency of a single stage centrifugal pump with constant speed.
TASK-13 Multi stage centrifugal pump. (4 hrs)
calculate the efficiency of a Multi stage centrifugal pump with constant speed.
TASK-14 Reciprocating pump. (4 hrs)
calculate the efficiency of a Reciprocating pump with constant speed.

Text Book(s):

1. Hydraulic and Fluid Mechanics including Hydraulic Machines by Modi &Seth, Standard book house
2. A Text of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., NewDelhi.

Reference Book(s):

1. Fluid mechanics and fluid machines by Rajput, S.Chand&Co.
2. Mechanics of Fluids by Potter, Wiggert, Ramadan, M.M.M.SARCAR, CengagePublishers.
3. Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, UniversitiesPress.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT		
MODULE – 1	**INTRODUCTION TO IC ENGINES**	08 Hours
IC ENGINES: Classification, Working principles, Valve and Port Timing Diagrams. Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction.		
MODULE -2	**COMBUSTION IN IC ENGINES**	08 Hours
COMBUSTION IN IC ENGINES: Combustion in SI Engines Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Type of Abnormal combustion, pre-ignition and knocking (explanation of) Fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types. Combustion in C.I. Engines: Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Need for air movement, open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.		
MODULE-3	**TESTING AND PERFORMANCE OF IC ENGINES**	08 Hours
TESTING AND PERFORMANCE OF IC ENGINES: Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power, Determination of frictional losses and indicated power, Performance test, Heat balance sheet.		
MODULE-4	**COMPRESSORS**	08 Hours
RECIPROCATING COMPRESSORS: Classification of compressors, Principle of operation of reciprocatingcompressors, work required, Isothermal efficiency volumetric efficiency and effect of clearance, multistage compression, under cooling, saving of work, minimum work condition for multi-stage compression. **CENTRIFUGAL COMPRESSORS**: Mechanical details, principle of operation, velocity and pressure variation, impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient, velocity diagrams, power required.		
MODULE-5	**REFRIGERATION SYSTEM**	08 Hours
Refrigeration System Components: Compressors, expansion devices, condensers, evaporators. **Vapour Absorption Refrigeration**: Water vapour refrigeration systems, steam jet refrigeration; vapour absorption refrigeration systems, single effect and double effect vapour absorption systems.		

MODULE-6	Air Conditioning	08 Hours
Air Conditioning: Psychometric properties of air, psychometric processes, comfort charts, air conditioning load calculations, types of air conditioning systems. Demonstration of HVAC software related to psychometric processes & HVAC systems.		
	Total hours:	**48 Hours**

Text Book(s):

1. V. Ganesan (2011), I.C. Engines, 3rd edition, Tata McGraw-Hill, New Delhi,India.
2. B.JohnHeywood(2011), internalcombustionenginefundamentals,2ndedition, TataMcGraw-Hill, NewDelhi.
3. Refrigeration and Air Conditioning, by Arora,McGraw-Hill education,3rd edition,2008.
4..Refrigeration and Air Conditioning, by RS khurmi,JK GUPTHA,SCHAND Publications, Revised Edition 2015.

Reference Book(s):

1. Mathur, Sharma (2008), IC Engines, 3rd edition, Dhanpat Rai & Sons, New Delhi,India.
2. R. K. Rajput (2011), Thermal Engineering, 18th edition, Lakshmi Publications, NewDelhi, India.
3. Pulkrabek (2008), Engineering fundamentals of IC Engines, 2nd edition, Pearson Education.

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

COURSE CONTENT		
MODULE – 1	**Introduction**	**8 Hours**
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.		
MODULE -2	**Mechanisms with Lower Pairs**	**08 Hours**
Quick return motion mechanisms – drag link mechanism, straight line motion mechanisms – Peaucellier's mechanism and Robert's mechanism, intermittent motion mechanisms – Geneva mechanism and ratchet and pawl mechanism, pantograph. Steering Mechanism:Condition for perfect steering, Steering gear mechanisms, Davis and Ackermann–Hooke's Joint.		
MODULE-3	**Velocity and Acceleration of Mechanisms**	**09 Hours**
Determination of velocity and acceleration of a point/link in simple mechanisms by relative velocity method (graphical) – Coriolis component of acceleration. Instantaneous centre – Centrodes – Kennedy's theorem – To determine linear velocity and angular velocity of links of simple mechanisms by instantaneous center method. Klein's Construction for velocity and acceleration of slider crank mechanism.		
MODULE-4	**Toothed Gearing**	**08 Hours**
Classification of toothed wheels – Gear terminology –Law of gearing –Velocity of sliding – Length of path of contact, Arc of contact – Contact ratio – Interference in involute gears, Methods of avoiding interference – Minimum number of teeth to avoid interference on pinion meshing with gear and on pinion meshing with rack. Characteristics of involutes action, Comparison of involute and cycloidal teeth profiles. Numerical problems.		
MODULE-5	**Gear Trains**	**07 Hours**
Velocity ratio & Train value, Types of gear trains– Simple, Compound, Reverted & Epicyclic gear trains. Algebraic/Tabular method of finding Train value of Epicyclic gear trains, Bevel gear Differential of an automobile.		
MODULE-6	**Cams**	**8 Hours**
Types of cams, types of followers, displacement, velocity and acceleration time curves for cam profiles, disc cam with reciprocating follower having knife-edge, roller and flat faced follower, disc cam with oscillating roller follower. Follower motions including, SHM, uniform velocity, uniform acceleration and retardation and cycloidal motion.		
	Total hours:	**48 hours**

Text Book(s):

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

Reference Book(s):

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

NARAYANA ENGINEERING COLLEGE:GUDUR								
	Mechanics of Materials							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	2	1	0	48	3	40	60	100

COURSE CONTENT		
MODULE – 1	**SIMPLE STRESSES AND STRAINS**	08 hours
Types of Stresses, Strains, Hooke's law, Stress–Strain diagram for various materials, Working Stress, Factor of safety, Lateral strain, Poisson's ratio, Volumetric strain, relation between three elastic moduli, Bars of Varying section, Composite bars, Temperature stresses, Strainenergy.		
MODULE -2	**SHEAR FORCE AND BENDING MOMENT**	08 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 combination of 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	**TORSIONAL SHEAR AND DEFLECTION OF BEAMS**	10 hours
Theory of pure torsion, Torsion Equation, transmission of power in solid and hollow circular shafts, comparison of strengths of solid and hollow shafts, shafts in series and parallel, combined bending and torsion. Relationship between curvature, slope and deflection, Slope and deflection of cantilever and simply supported beams by Double Integration method and Macaulay'smethod.		
MODULE-5	**PRESSURE VESSELS**	06 hours
Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses, Volumetric strain, Thin spherical shells, Thick cylinders under internal and external pressure		
MODULE-6	**PRINCIPLE STRESSES & STRAINS**	06 hours
Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle		
	Total hours:	**48 hours**

Text Book(s):

1. F.P. Beer, E.R. Johnston, Jr&John.T. DeWolf, "Mechanics of Materials", 7th edition, Tata McGraw-Hill,2016.
2. SS Rattan, Strength of materials, 3rd edition, Tata McGraw-Hill,2016.
3. Strength of Materials by R.K. Bansal, Laxmi Publishers, 5thEdition,2012.
4. Mechanics of Materials,AndrewsPytel,JaanKiusallaas&M.M.M.Sarcar (Second Edition),Cengage Learning Publishers.

Reference Book(s):

1. Timoshenko, "Strength of Materials Part-I&II", 3rd edition, CBS Publishers,2004.
2. Popov, "Mechanics of Solids", 2nd edition, New Pearson Education,2015
3. R.K.Rajput, *Strength of materials*, S.Chand Publications, Revised Edition,2006.
4. Strength of Materials by M.Chakraborti, S.K.Kataria&Sons, 2ndEdition,2011.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT		
MODULE – 1	**INTRODUCTION TO METAL FORMING**	**8h**
Stress, strain, Two dimensional stress analysis and three dimensional stress analysis, relation between engineering stress and true stress, relation between engineering strain and true strain ,yield criteria, yield locus, theory of plasticity, Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts		
MODULE -2	**ROLLING & FORGING**	**8h**
Introduction to bulk and sheet metal forming, Economics of bulk forming ROLLING :principles and theory of rolling, Process description of Rolling. Forces in rolling and power requirements, applications and, limitations, defects in rolled products – Numerical problems on Rolling. FORGING PROCESSES: Principles of forging – Process description of Forging -Types Forging – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects, Forces in forging of strip, disc and power requirements, applications, Equipment and their selection		
MODULE-3	**EXTRUSION PROCESSES**	**8h**
EXTRUSION PROCESSES: Basic extrusion process and its characteristics. Mechanics of hot and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion, forces in extrusion of cylindrical and non cylindrical components – characteristics and defects in extruded parts.		
MODULE-4	**SHEET METAL WORKING**	**8h**
Sheet Metal Working – Economical Considerations - Stamping, forming and other cold working processes: Blanking and piercing – Bending and forming – Drawing and its types – Cup drawing and Tube drawing – coining – Hot and cold spinning. Force and power requirement in sheet metal operations, defects in sheet metal products – Equipment, tooling and their characteristics		
MODULE-5	**WIRE DRAWING**	**8h**
Wire Drawing: Process Mechanics and its characteristics, determination of degree of drawing, drawing force, power, and number of stages-defects in products, Numerical problems on drawing		
MODULE-6	**PROCESSING OF PLASTICS**	**8h**
Processing of plastics, injection and blow moulding, calendaring, thermo forming, compression moulding, transfer moulding, High energy rate forming methods		
	Total hours:	48 hours

Text Book(s):

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

Reference Book(s):

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

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT
Task 1[6 Hrs] Performance test on Spark Ignition engine and Compression Ignition using the alternate fuels.
Task-2 [3Hrs] Valve Timing Diagram of an 4 stroke diesel engine .2hrs
Task-3[3 Hrs] Port Timing Diagram of an 2-Stroke Petrol engine. 2hrs
TASK-4[3 Hrs] Performance Test on a 4 -Stroke Diesel Engines. 2hrs
TASK-5[3 Hrs] Performance Test on 2-Stroke Petrol engine. 2hrs
TASK-6[3 Hrs] Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine. 3hrs
TASK-7[3 Hrs] Retardation and motoring test on 4- stroke engine. 2hrs
TASK-8[3 Hrs] Heat Balance of an I.C. Engine. 2hrs
TASK-9[3 Hrs] /Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
TASK-10[3 Hrs] Performance Test on Variable Compression Ratio Engines for CI Engines.
TASK -11[6 Hrs] Performance Test on Reciprocating Air – CompressorUnit.
TASK -12[3 Hrs] Study of Boilers.
TASK-13[6 Hrs] Engine Emission Measurement for SI & CI Engines.

Additional Experiments:	
TASK-14. Dismantling / Assembly of Engines to identify the parts and their position in an engine.	CO1

Text Book(s):

1. Vasandani V.P. and Kumar, D.S., Treatise on HeatEngineering, Chand&Co Publishers, New Delhi,2011.
2.Ganesan, V., Gas Turbines 3rd Edition, Tata McGraw Hill Book Company,New Delhi,2010.
3. Internal Combustion Engines / V. Ganesan- TMH, 4thEdition,2012
4. Thermal Engineering / Rajput / Lakshmi Publications, 9thEdition,2013

Reference Book(s):

1.I.C. Engines fundamentals, Heywood, McGrawHIll, 1st Edition,2011
2. IC Engines – Mathur& Sharma – DhanpathRai& Sons,,2010
3. Engineering fundamentals of IC Engines – Pulkrabek, Pearson, PHI, 2ndEdition,2009
4. Thermal Engineering, Rudramoorthy – TMH, 10thEdition,2010

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

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

Additional Experiments:	
TASK -11 Deflection.[4hrs]	
Determine the deflection in leaf spring with a single leaf and multiple leafs.	C05

Text Book(s):

1. F.P.Beer,E.R.Johnston,Jr&John.T.DeWolf,"Mechanics ofMaterials",7thedition,TataMcGraw-Hill,2016.
2. SS Rattan, Strength of materials, 3rd edition, Tata McGraw-Hill,2016.
3. Strength of Materials by R.K. Bansal , Laxmi Publishers, 5thEdition,2012.
4. Mechanics of Materials, Andrews Pytel,JaanKiusallaas&M.M.M.Sarcar (SecondEdition),Cengage LearningPublishers.

Reference Book(s):

1. Timoshenko, "Strength of Materials Part-I& II", 3rd edition, CBS Publishers,2004.
2. Popov, "Mechanics of Solids", 2nd edition, New Pearson Education,2015
3. R.K.Rajput, *Strength of materials*, S.Chand Publications, Revised Edition,2006.
4. Strength of Materials by M.Chakraborti, S.K.Kataria& Sons, 2ndEdition,2011.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	Computer Aided Machine Drawing 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

COURSE CONTENT
PART-A(Manually)
Task 1 Conventional representation [4hrs]
1. Conventional representation ofmaterials. 2. Conventional representation of machinecomponents.
Task 2 Conventional representation[4hrs]
1. Conventional representation of dimensioning on the drawings. 2. Conventional representation sectional views.
Task -3 Foundation bolts [4hrs]
1. Bolted joints-Hexagonal bolt and nut, Square bolt andnut. 2. Foundation bolts- Eye, Bent, Rag foundationbolts.
TASK -4 KEYS [4hrs]
1. Keys-Saddle key, Sunk key, Woodruff key, Kennedykey. 2. Locking arrangements for nuts-Locking by split pin, castle nut.
TASK -5 Assembled views [4hrs]
Drawing of assembled views for the part drawings of the following, using conventions and easy drawing proportions. 1. Stuffing box 2.Screw jack
TASK-6 Assembled views [4hrs]
Preparation of part drawing representing limits, fits and tolerances and surface finish indications. 1. Petrol Engine connecting rod 2.Single tool post
PART-B
The following contents are to be done by any 2D software package Conventional representation of materials and components ::
TASK -7Riveted joints- & Keys[6hrs]
Drawing of rivet, lap joint, butt joint with single strap, single riveted, double Riveted joints. Taper key, sunk taper key, round key, saddle key, feather key, woodruff key.
TASK -8 Detachable joints &Welded joints[6hrs]
Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts., Lap joint and T joint with fillet, butt joint with conventions.
PART-C
The following contents to be done by any 3D software package:
TASK -9 Assembly drawings [6hrs]
Lathe tool post, tool head of shaping machine, tail stock, machine vice, gate valve, carburettor, Piston
TASK -10 Assembly drawings [6hrs]
screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling, connecting rod, eccentric.

Additional Experiments:
TASK -11 Manufacturing drawing
Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Text Book(s):

1.K.L. Narayana, P. Kannaiah, "A text book on Engineering Drawing", SciTech Publications, 2014

2. N.D.Bhatt, "Machine Drawing", Charotar, 50th edition, 2014.

3"Software tools/packages", Auto CAD, Solid works or equalent.

4.Machine Drawing With AutoCAD, GoutamPohit, GoutamGhosh, Pearson Publications

Reference Book(s):

1. CecilJensen, JayHelselandDonaldD.Voisinet, "ComputerAidedEngineeringDrawing",Tata McGraw-Hill, NY,2000.

2. James Barclay, Brain Griffiths, "Engineering Drawing for Manufacture", Kogan PageScience,2003.

3. K.L. Narayana, "Production Drawing", NewAge International Publishers, 3rdedition,2014

4.P I Varghese and K C John, Machine Drawing, VIP Publishers,2011

NARAYANA ENGINEERING COLLEGE :: GUDUR

AUTONOMOUS

OPEN ELECTIVES

NARAYANA ENGINEERING COLLEGE:GUDUR								
	ENGINEERING OPTIMIZATION							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 CONTENT

MODULE – 1	LINEAR PROGRAMMING PROBLEM	8h

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

MODULE -2	TRANSPORTATION PROBLEM	8h

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution- North-West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Testing. Unbalanced Transportation Problem, Degenerate Problem; Assignment Problem – Formulation; Optimal Solution -Traveling Salesman problem.

Sequencing -Assumptions-n-jobs-2 Machines model, n-jobs-3-machines models & n jobs – m Machines models

MODULE-3	PERT & CPM:	8h

Introduction to Project Management, Activities, Events, Predecessor Relationships, AOA Diagram, Early Start, Early Finish, Late Start & Late Finish Times, Earliest Occurrence and Latest Occurrence of the Event, Total Float, Free Float, Independent Float CPM- Deterministic Model- Critical Path,Optimal Project Duration, Least Possible Project Duration PERT- Probabilistic Model- Various types of Activity Time Estimates, Standard Deviation and Variance of the Activities and Projects, and Probability of Completing the Project within scheduled time

MODULE-4	DYNAMIC PROGRAMMING & REPLACEMENT MODELS	8h

Dynamic Programming : Introduction – Bellman"s Principle of Optimality – Applications of Dynamic Programming- Capital Budgeting Problem – Shortest Path Problem – Solution of Linear Programming Problem by DP, cargo-loading problem, employment Smoothing

Replacement Models: Introduction –Types of Replacement Problem, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model

MODULE-5	OPTIMIZATION TECHNIQUES	8h

Introduction to Optimization: Engineering application of Optimization – Statement of an Optimization problem - Optimal Problem formulation - Classification of Optimization problem.

Optimum design concepts: Definition of Global and Local optima, Optimality criteria Optimization algorithms for solving unconstrained optimization problems – Gradient based method: Cauchy's steepest descent method, Newton's method, Conjugate gradient method.

MODULE-6	**HEURISTIC METHODS**	8h

Heuristic Programming – Greedy Heuristic, Meta Heuristic – Tabu Search Algorithm, Simulated Annealing Algorithm, Genetic Algorithm, Application of Metaheuristics to Integer Linear Programs, Constraint Programming.

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Total hours:	**48 hours**

Text Book(s):

1. 1. Operation Research, J.K.Sharma,MacMilan, 5th edition, 2013.
2. Engineering application of Optimization, AVICHANDRAN, k.M.RAGSDELL, G.V.REKLAITIS
3. Engineering of Optimization BY SS RAO

.

Reference Book(s):

1. 1. Operations Research by R Panneerselvam, PHI, 2nd edition, 2012.
2. Operations Research, Wagner, PHI Publications , 2nd edition.
3. Prem Kumar Gupta "Introduction to Operations Research" S.Chand, 2012
4. Operations Research S.D Sharma 5nd edition, 2012

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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 CONTENT

MODULE – 1	INTRODUCTION TO MECHATRONICS	7 Hours

Definition and key elements of mechatronic systems, needs and benefits of mechatronics in manufacturing, Static and Dynamic characteristics of Measurement system. Open and Closed loop control system, Concept of transfer function, Block diagram reduction

MODULE -2	SENSORS	10 Hours

Position/Displacement Measurement :- Potentiometer, Optical Encoders, LVDT, Capacitive element, Force/Pressure Measurement : Strain Gauged Element, Pressure switch, Load Cell, Piezoelectric sensor, Tactile Sensor Proximity sensors: - Inductive, Capacitive, Eddy-Current, pneumatic sensor, Hall Effect Sensor.

MODULE-3	TRANSDUCERS	09 Hours

. Temperature Measurement: Bimetallic strips, RTDs, thermistors, thermocouples, Light Sensors: Photo-diode, photo-transistor, photo-resistor, Photo-sensitive. Electromagnetic Sensor: Solenoids, Relays, Reed Switch, Micro switch.

MODULE-4	DATA ACQUISITION SYSTEM	07 Hours

Interfacing of Sensors / Actuators to DAQ system, Bit width, Sampling theorem, Aliasing, Sample and hold circuit, Sampling frequency, Binary Weighted DACs, DAC (R2R), ADC (Successive Approximation), Current and Voltage Amplifier.

MODULE-5	FUNDAMENTALS OF PLC & ROBOTICS	08 Hours

Introduction, Architecture, Ladder Logic programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming, Introduction of SCADA system; Robot definition, robot components, robot configuration, manipulators.

MODULE-6	PNEUMATIC AND HYDRAULIC SYSTEMS	08 Hours

Components of pneumatic and hydraulic systems, pumps, compressor, filter, control valves, pressure regulation, relief valves, accumulator, Electro-Hydraulics systems and Electro-pneumatic systems,

Total hours:	48 hours

Text Book(s):

1. Mechatronic System Control Logic and Data Acquisition by Robert H. Bishop
2. A textbook of Mechatronics by R.K. Rajput,S.Chand Publications
3. Mechatronics : integrated mechanical electronic systems, K.P.Ramachandran, G.K.Vijayaraghavan, John Wiley & Sons

Reference Book(s):

1. Mechatronics : Principles, Concepts and Applications by Nitaigour Mahalik

NARAYANA ENGINEERING COLLEGE:GUDUR								
	INDUSTRIAL ENGINEERING & MANAGEMENT							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 CONTENT		
MODULE – 1	PRINCIPLES OF MANAGEMENT	8h
PRINCIPLES OF MANAGEMENT :Concepts of Management and Organization - Evolution ofmanagement thought, Taylor's scientific Management, Fayol'sprinciples of Management; Managerial Skills, levels ofManagement, Systems approach to management, Functions ofmanagement, Theory of Motivation - McGregor Theory X andY; Hierarchy of Needs - Maslow's Theory of Human Needs;Corporate planning process, SWOT Analysis, Corporate SocialResponsibility.		
MODULE -2	FACILITIES PLANNING AND MAINTENANCE	8h
Types of production, Plant location – definition, factors affectingthe plant location, comparison of rural and urban sites; Plantlayout – definition, Objectives, Types of plant layout; PlantMaintenance - objectives, functions, Types and Advantagesof Plant Maintenance; Types of maintenance, Concepts ofReliability – Definition, MTBF, Series, Parallel and Series-Paralleldevice configurations; Redundancy.		
MODULE-3	Work Study	8h
Work Study – Definition, Objectives, Method Study – Steps Involved ,Analysis of work methods using different types of process chart and flow diagrams- Principles of motion economy Work measurement-Performance rating.-Determination of allowances and standard time.Job evaluation and merit rating - Objectives and principles		
MODULE-4	Materials Management	8h
MATERIALS MANAGEMENT :Objectives of Materials Management, Stores management and stores records, Purchase management, Value Analysis,Inventory Models- Deterministic models- EOQ Models – With and Without Shortages Models; Inventory Models with Price Breaks Industrial relations-Psychological attitudes to work and working conditions - fatigue- Methods of eliminating fatigue.		
MODULE-5	Production planning and control	8h
Production planning and control- Importance of planning - Introduction and need for a new product life cycle. Industrial safety: General Safety Rules, Duties of Plant SafetyInspector, Investigation and analysis of Accidents, IndianFactories Act, Workmen Compensation Act, Industrial DisputesAct.		
MODULE-6	Quality control	8h
QUALITY CONTROL :Quality control and Inspection- Destructive and non-destructive testing methods- process capability- Statistical quality control – causes of variation in quality- control charts for X and R. Introduction to concepts of TQM, ISO, Six Sigma and Quality circles (Brief description only).		
	Total hours:	**48 hours**

Text Book(s):

1. Industrial Engineering & Production Management, Dhanpat Rai, 2005 T3 MartandTelsang,
2. MartandTelsang, Industrial Engineering and Production Management, S.Chand, 2nd Edition, 2006.
3.Industrial Engineering and Management, Dhanpat Rai, 2010 R1 E. S. Buffa
4. Industrial Engineering and Management, Dr. C.Nadamuni Reddy, New Age International Publishers, 1st edition, 2011.

Reference Book(s):

1. Manufacturing Organization and Management, T.Amrine/ Pearson, 2nd Edition, 2004
2. O.P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publications, 17th Edition, 2014.
3.Modern Production management, John Wiley, 1983 R2 Grant and Ieven Worth, Statistical Quality Control, McGraw Hill, 2000
4. Work Study by ILO(International Labour Organization)

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

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.		
MODULE -2	**TRANSMISSION SYSTEM**	8h
Clutches- Principle- Types: Cone Clutch, Single Plate Clutch, Multi Plate Clutch, Magnetic and Centrifugal Clutches, Fluid Fly Wheel – Gear – Box Types: Sliding Mesh, Constant Mesh, Synchromesh, Epi-Cyclic, Over Drive, Torque Converter, Automatic transmission system, Propeller Shaft – Hotch – Kiss Drive, Torque Tube Drive, Universal Joint, Differential, Rear Axles.		
MODULE-3	**STEERING SYSTEM**	8h
Requirements and functions of steering system, Layout of steering system, Steering Geometry – Camber, Castor, King Pin Rake, Combined Angle Toe-In, Center Point Steering. Types Of Steering Mechanism – Ackerman Steering Mechanism, Davis Steering Mechanism, Steering Gears – Types, Steering Linkages, Power steering.		
MODULE-4	**SUSPENSION SYSTEM**	8h
Objects of Suspension Systems – Rigid Axle Suspension System, Torsion Bar, Shock Absorber, Independent Suspension System. Braking System: Mechanical Brake System, Hydraulic Brake System, Pneumatic and Vacuum Brake Systems.		
MODULE-5	**EMISSIONS FROM AUTOMOBILES**	8h
National and International Pollution Standards – Pollution Control–Modern Techniques in automobiles – Multipoint Fuel Injection for SI Engines – Common Rail Diesel Injection, Emissions from Alternative Energy Sources– Hydrogen, Biomass, Alcohols, LPG, CNG – Their Merits And Demerits.		
MODULE-6	**ELECTRICAL SYSTEM**	8h
Charging Circuit, Generator, Current – Voltage Regulator – Starting System, Bendix Drive, Mechanism of Solenoid Switch, Lighting Systems, Horn, Wiper, Fuel Gauge – Oil Pressure Gauge, Engine Temperature Indicator.		
	Total hours:	**48 hours**

Text Book(s):

1. Automobile Engineering - Vol.1 & Vol.2, Kirpal Singh, Standard Publishers distributor.
2. Automobile Engineering, R.K.Rajput, Lakshmi Publication.

Reference Book(s):

1. Automobile Engineering, Joseph Hidner.
2. Automobile Engineering, William Crouse, TMH, 10th edition, 2006.
3. Automobile Engineering, K.K.Ramalingam/Scitech Publication.
4. Automotive engines, Newton, Steeds & Garret.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

COURSE CONTENT		
MODULE – 1	**Properties of Steam**	**8 Hours**
.Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters		
MODULE -2	**Power Plant Engineering**	**8 Hours**
Introduction – Energy Renewable and Non – Renewable Energy Sources – Classification of Power Plants based on Sources of Energy – Thermal Power Plant or Steam Power Plant – Hydro Electric Power Nuclear Power Plant – Diesel Power Plant – Gas Turbine Power Plant		
MODULE-3	**Pumps & Turbines**	**8Hours**
Pumps – Classification of Pumps, Centrifugal Pump, Applications of Centrifugal Pump, Priming, Reciprocating Pumps, Single Acting Reciprocating Pump, , –Hydraulic Turbine – Classification of Hydraulic Turbines, Impulse Turbine, Reaction Turbine, Difference between Impulse and Reaction Turbine.		
MODULE-4	**Design & Manufacturing**	**8 Hours**
General considerations of design, design process. Selection of Engineering Materials - properties – Manufacturing considerations in the design. Types of manufacturing processes -casting, arc welding & gas welding and its applications		
MODULE-5	**I.C Engine**	**8 Hours**
. Heat Engine – Types of Heat Engine – External Combustion Engine, IC Engine (Internal Combustion), Classification of I.C. Engine, Two Stroke Petrol Engine, Four Stroke Engine, Valve Timing Diagram, Port Timing Diagram, Comparison of Two Stroke and Four Stroke Engines, Comparison of Petrol Engine and Diesel Engine, Fuel System of a Petrol Engine, Ignition Systems.		
MODULE-6	**Refrigeration and Air Conditioning**	**8 Hours**
Introduction – Terminology of Refrigeration and Air Conditioning – Properties of Refrigerants – List of Commonly used Refrigerants – Types of Refrigerating System –Air Conditioning – Application of Air Conditioning – Psychrometry – Window Air Conditioning.		
	Total hours:	**48 hours**

Text Book(s):

1. Power Plant Engineering by PK Nag, 3rd edition McGraw Hill Publication.
2. Elements of Mechanical Engineering Fourth Edition S Trymbaka Murthy, University Press.
3. Basic Civil and Mechanical Engineering, by Prof.V.Vijayan, Prof.M.Prabhakaran and Er.R.Viashnavi, S.Chand Publication.

Reference Book(s):

1. Refrigeration and Air Conditioning by CP Arora, 3rd edition McGraw Hill Publication.
2. Internal Combustion Engines by VGanesa, 4th Edition, McGraw Hill Publication.
3. Basic Mechanical Engineering by DK Chavan and G K Pathak ,Standard Book House, 2016 edition.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	AUTOMATION & 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

COURSE CONTENT		
MODULE – 1	**INTRODUCTION TO AUTOMATION**	08 Hours
Introduction to Automation: Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation. Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.		
MODULE -2	**AUTOMATED FLOW LINES**	08 Hours
Automated flow lines: Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.		
MODULE-3	**INDUSTRIAL ROBOTICS**	08 Hours
Introduction to Industrial Robotics: Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers. Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.		
MODULE-4	**KINEMATIC ANALYSIS**	08 Hours
Manipulator Kinematics: Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics..		
MODULE-5	**ACTUATORS**	08 Hours
Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.		
MODULE-6	**DYNAMIC ANALYSIS**	08 Hours
Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton - Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.		
	Total hours:	**48 Hours**

Text Book(s):

1. Automation , Production systems and CIM,M.P. Groover/Pearson Edu.
2. Industrial Robotics - M.P. Groover, TMH.
3. Robotics, Fundamental Concepts and analysis :Ashitave Ghosal, Oxford Press, 1st ed., 2006.

Reference Book(s):

1. Robotics and Control :R.K.Mittal and I J. Nagarath, McGraw Hill, 2015
2.Robotics : Fu K S, R.C. Gonazalez and C.S.G Lee, McGraw Hill, 2008
3.Introduction to Robotics, Mechanics and Control: John J.Craig, Pearson Education, 3rd ed., 2009.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	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

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.

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$Fe-Fe_3C$.

MODULE-3	Metals & Alloys	8 Hours

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

Non-ferrous Metals and Alloys :

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

MODULE-4	Heat treatment of Alloys	8 Hours

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

MODULE-5	CRYSTAL STRUCTURE & ATOMIC PACKING	8 Hours

Common crystal structure of metals, Calculation of atomic packing factor for simple cubic, BCC, FCC and HCP crystal structures.

Defects in crystals, point, line, surface and volume defects. Mechanisms of plastic deformation: slip and twinning, Effect of dislocations on plastic deformation, Critical resolved shear stress, Hall– Petch equation, cold working and hot working, strain Hardening and Bauchinger effect. Recovery, Recrystallisation, Grain growth and its effect on mechanical properties of metals.

MODULE-6	Composite Materials	8 Hours

Fracture: Type of fracture in metals, Ductile and brittle fracture, Griffith theory of brittle fracture, modes of fracture, ductile-brittle transition.

Fatigue: Types of fatigue loading, Experimental determination of fatigue strength (RR– Moore Test),S–N Curve, Structure of fatigue fractured specimen, Effect of metallurgical variables on fatigue of metal, Low cycle fatigue, Cumulative fatigue damage, Factors to be considered for the improvement for the fatigue life.

Creep: Creep Test, Creep curve, Creep strength, Creep deformation mechanisms, difference between creep curve and stress-rupture curve.

Diffusion: Fick's laws of diffusion, Application of diffusion theory in Mechanical Engineering.

Total hours:	**48 hours**

Text Book(s):

1. Introduction to Physical Metallurgy / Sidney H.Avener.
2. A Text of Essential of Materials science and engineering/ DonaldR.Askeland/Thomson.
3. Dr Material Science andMetallurgy/kodgire
4. V. Raghavan, "Material Science and Engineering", 4th Edition, Prentice Hall of India Ltd.,1994.

Reference Book(s):

1. F Science of Engineering Materials /Agarwal
2. Engineering materials and metallurgy/R. K. Rajput/S.Chand.
3. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / JaicoBooks
4. William F Smith, Javad Hashemi, Ravi Prakash, "Material Science and Engineering", 5th Edition, McGraw Hill Education,2014.

	TOTAL QUALITY MANAGEMENT							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 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		
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,		
MODULE-3	**Failure Analysis**	8h
System failure analysis approach – flow chart – fault tree analysis – failure mode assessment and assignment matrix – organizing failure mode analysis – pedigree analysis. Quality circles – organization – focus team approach – statistical process control – process chart – Ishikawa diagram – preparing and using control charts.		
MODULE-4	**Quality Function Development**	8h
Quality Function Development (QFD) – elements of QFD – benchmarking-Types- Advantages & limitations of benchmarking – Taguchi Analysis – loss function - Taguchi design of experiments. Poka-yoke, Kaizen, Deming cycle. Total Productive Maintenance (TPM) - Concept, Improvement Needs,		
MODULE-5	**Lean Management**	8h
. Lean Management, philosophy and creation of lean enterprise, JIT concepts-Kanban System-Elements of total quality management,		
MODULE-6	**TQM Approaches**	8h
Value improvement elements – value improvement assault – supplier teaming. Business process reengineering & elements of Supply chain management. Six sigma approach – application of six sigma approach to various industrial situations		
	Total hours:	**48 hours**

Text Book(s):

1. Besterfield D.H. et al., Total qualityManagement, 3rd ed., Pearson Education Asia, 2006.
2Total Quality Management, D.R.Kiran, BS Publications, 2016
3. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006.
4. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

Reference Book(s):

1. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012

2.Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.

3.Oakland.J.S. "Total Quality Management Butterworth - Hcinemann Ltd., Oxford. 1989.

4.Narayana V. and Sreenivasan, N.S. Quality Management - Concepts and Tasks, New AgeInternational 1996.

5.Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991

NARAYANA ENGINEERING COLLEGE:GUDUR								
	INDUSTRIAL SAFETY AND HAZARD MANAGEMENT							R2020
Seme	Hours / Week			Total	Credit	Max Marks		
ster	L	T	P	hrs	C	CIE	SEE	TOTAL
OE	3	0	0	48	3	40	60	100

COURSE CONTENT		
MODULE – 1	**Introduction**	**8 Hours**

Safety Programs, Engineering Ethics, Accident and Loss Statistics, Acceptable Risk, Public Perceptions, Nature of the Accident Process, Inherent Safety, Seven Significant Disasters.

Toxicology: Effect of Toxicants on Biological Organisms, Toxicological Studies, Dose versus Response, Models for Dose and Response Curves, Relative Toxicity, Threshold Limit Values, National Fire Protection Association (NFPA) Diamond.

MODULE -2	**Industrial Hygiene**	**10 Hours**

Government Laws and Regulations, OSHA: Process Safety Management, EPA: Risk Management Plan, DHS: Chemical Facility Anti-Terrorism Standards (CFATS) Industrial Hygiene: Anticipation and Identification, Evaluation, Control.
Source Models: Introduction to Source Models, Flow of Liquid through Holes, and Pipes, Flow of Gases or Vapors through Holes and Pipes, Flashing Liquids, Liquid Pool Evaporation or Boiling, Conservative Analysis.

MODULE-3	**Fires and Explosions**	**08 Hours**

The Fire Triangle, Distinction between Fires and Explosions, Definitions, Flammability Characteristics of Liquids and Vapors, Limiting Oxygen Concentration and Inerting, Flammability Diagram, Ignition Energy , Autoignition , Auto-Oxidation , Adiabatic Compression, Ignition Sources, Sprays and Mists, Explosions Concepts to Prevent Fires and Explosions: Inerting, Static Electricity and its Control, Explosion-Proof Equipment and Instruments, Ventilation, Sprinkler Systems, Miscellaneous Concepts for Preventing Fires and Explosions.

MODULE-4	**Introduction to Reliefs**	**08 Hours**

Relief Concepts, Definitions, Location of Reliefs, Relief Types and Characteristics, Relief Scenarios, Data for Sizing Reliefs, Relief Systems. Relief Sizing : Conventional Spring-Operated Reliefs in Liquid and in Vapor or Gas Services, Rupture Disc Reliefs in Liquid in Vapor or Gas Services, Two-Phase Flow during Runaway Reaction Relief , Pilot-Operated and Bucking-Pin Reliefs, Deflagration Venting for Dust and Vapor Explosions, Venting for Fires External to Process Vessels, Reliefs for Thermal Expansion of Process Fluids.

MODULE-5	**Hazards Identification**	**06 Hours**

Process Hazards Checklists, Hazards Surveys, Hazards and Operability Studies, Safety Reviews, Other Methods, Risk Assessment: Review of Probability Theory, Event Trees, Fault Trees, QRA and LOPA

MODULE-6	**LEAKS AND LEAKAGES**	**08 Hours**

Spill and leakage of liquids, vapors, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation measures for leaks and releases.

CASE STUDIES : Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil-storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards

Total hours:	**48 hours**

Text Book(s):

1. Industrial Safety Management: Hazard Identification and Risk Control**,L.M.Deshmukh,** 2005 McGraw Hill Education (India) Private Limited.
1. Chemical Process Safety: Fundamentals with Applications, Daniel A. Crowl, Joseph F. Louvar, 3rd Edition, Prentice Hall, 2011.
2. D.A. Crowl and J.F. Louvar, Chemical Process Safety (Fundamentals with Applications), Prentice Hall, 2011.

Reference Book(s):

1. R.K. Sinnott, Coulson & Richardson's, Chemical Engineering, Vol. 6, Elsevier India, 2006.
2. Fawcett H.H. and W.S.Wood, Safety and accident prevention in Chemical operations 2ndediton John Wiley and Sons Inc. (1982).
3. Guidelines For Process Safety: Fundamentals in General Plant Operations, Center for Chemical Process Safety of the American Institute of Chemical Engineers, 1995. ILO – OSH 2001.
4. A. K. Rohatgi, "Safety handling of Hazardous Chemicals", J. K. Enterprises, Mumbai, 1986

SYLLABUS FOR HONORS DEGREE

NARAYANA ENGINEERING COLLEGE: GUDUR								
	INDUSTRIAL TRIBOLOGY							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION	12 H

Historical background, practical importance, and subsequent use in the field. Lubricants: Types and specific field of applications. Properties of lubricants,viscosity, its measurement, effect of temperature and pressure on viscosity, lubrication types, standard grades of lubricants, and selection of lubricants..

MODULE -2	FRICTION	10 H

Origin, friction theories, measurement methods, friction of metals and non-metals.

Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a fixed/pivoted shoe bearing,center of pressure, numerical examples.

MODULE-3	WEAR	12H

Wear -Types of wear – Simple theory of Sliding Wear Mechanism of sliding wear of metals – Abrasive wear – Materials for Adhesive and Abrasive wear situations – Corrosive wear – Surface Fatigue wear situations – Brittle Fracture – wear – Wear of Ceramics and Polymers – Wear Measurements.

MODULE-4	LUBRICANTS	10 H

Types and properties of Lubricants – Testing methods – Hydrodynamic Lubrication – Elasto-hydrodynamic lubrication- Boundary Lubrication – Solid Lubrication- Hydrostatic Lubrication.

MODULE-5	BEARING MATERIALS	10H

Commonly used bearings materials, and properties of typical bearing materials. Advantages and disadvantages of bearing materials.

MODULE-6	INTRODUCTION TO SURFACE ENGINEERING:	10 H

Concept and scope of surface engineering. Surface modification – transformation hardening, surface melting, thermo chemical processes. Surface Coating – plating,fusion processes, vapor phase processes. Selection of coating for wear and corrosion resistance.

Total h:	64h

Text Book(s):

1. A. Harnoy. Bearing Design in Machinery Marcel Dekker Inc, New York, 2003
2. “Introduction to Tribology in bearings”, B. C. Majumdar, Wheeler Publishing.
3. “Tribology, Friction and Wear of Engineering Material”, I. M.Hutchings, Edward Arnold, London,1992.

Reference Book(s):

1. Cameron, Basic Lubrication theory, Longman, U.K.., 1981.
2. E. P. Bowden and Tabor.D., Friction and Lubrication , Heinemann Educational Books Ltd., 1974.
3. M. M. Khonsari and E. R. Booser, Applied Tribology, John Willey &Sons, New York, 2001.
4. M. J. Neale (Editor), Tribology Handbook, Newnes. Butterworth-Heinemann, U.K., 1995.

NARAYANA ENGINEERING COLLEGE: GUDUR								
	NON DESTRUCTIVE TESTING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION	12 H

Introduction to various non-destructive methods, Comparison of Destructive and Non-destructive Tests, Codes, standards, specification and procedures. Visual Inspection, Optical aids used for visual inspection, Applications

MODULE -2	PENETRANT TESTING	10 H

Physical principles & procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods-water washable, Post – Emulsification methods, Advantages and Limitations, Applications. Case studies by taking various manufacturing defects.

MODULE-3	EDDY CURRENT TESTING & ACOUSTIC EMISSION	12H

Principles, Instrumentation for ECT, Absolute, differential probes, Techniques – High sensitivity techniques, Phased array ECT, Advantages and Limitations, Applications. Principle of AET, Procedure, Instrumentation, Advantages and Limitations, Applications. Case studies on both ECT and AE.

MODULE-4	MAGNETIC PARTICLE TESTING & THERMOGRAPHY	10 H

Principle of MPT, procedure used for testing a component, Equipment used for MPT, Magnetizing techniques, Advantages and Limitations, Applications. Principle of Thermography, Infrared Radiometry, Active thermography measurements, Advantages and Limitations, Applications, Case studies based on MPT and Thermography.

MODULE-5	ULTRASONIC TESTING	10H

Principle, Ultrasonic transducers, Ultrasonic Flaw detection Equipment, Modes of display A- scan, BScan, C- Scan, Applications, Inspection Methods - Normal Incident Pulse-Echo Inspection, Normal Incident Through-transmission Testing, Angle Beam Pulse-Echo testing, Advantages and Limitations, Applications, Case studies.

MODULE-6	RADIOGRAPHY	10 H

Principle of Radiography, Types, Effect of radiation on Film, Radiographic imaging, Inspection Techniques – Single wall single image, Double wall Penetration, Multiwall Penetration technique, Real Time Radiography, Advantages and Limitations, Applications. Case studies.

Total h:	64h

Text Book(s):

1. Baldev Raj, Jeyakumar,T., Thavasimuthu,M., “Practical Non Destructive Testing” Narosa publishing house, New Delhi, 2006.
2. Krautkramer. J., “Ultra Sonic Testing of Materials”, 1st Edition, Springer – Verlag Publication, New York, 1996.

Reference Book(s):

1. Peter J. Shull “Non Destructive Evaluation: Theory, Techniques and Application” Marcel Dekker, Inc., New York, 2002.

NARAYANA ENGINEERING COLLEGE: GUDUR								
	REVERSE ENGINEERING & RAPID PROTOTYPING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	BASIC CONCEPTS OF REVERSE ENGINEERING	12 H

Need of reverse engineering, Methodologies for Reverse Engineering, understanding of Reverse Engineering through example, reasons for reverse engineering, process for Reverse Engineering, Phases of Reverse Engineering, conceptual System Reasons for Reverse Engineering, Difficulties in Reverse Engineering, Levels of abstraction: Application level, Functional level, Structural level

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MODULE -2	METHODOLOGY	10 H

Dissemble the existing selectedproduct/ component/ process/ system to study technical aspects and design detail, Reverse engineering in various computer software/ application,

MODULE-3	SOFTWARE REVERSE ENGINEERING	12H

Reverse engineering of software, Binary reverse engineering, Binary software techniques, Software classification, Source code, number of UML tools, Reverse engineering of Protocols

MODULE-4	INTRODUCTION TO RAPID PROTOTYPING	10 H

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Classification of Rapid Manufacturing Processes: Additive, Subtractive, Formative, Generic RP process.

MODULE-5	STEREO LITHOGRAPHY SYSTEMS	10H

Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems. Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application.

MODULE-6	SELECTIVE LASER SINTERING & FUSION DEPOSITION MODELLING	10 H

Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications. Fusion Deposition Modelling: Principle, Process parameter, Path generation, Applications.

Total h:	64h

Text Book(s):

4. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific.
5. Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer.
6. Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons.

Reference Book(s):

5. .Liou W L, Liou F W, Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press.
6. Kamrani A K, Nasr E A, Rapid Prototyping: Theory and practice, Springer

NARAYANA ENGINEERING COLLEGE: GUDUR								
	SUPPLY CHAIN MANAGEMENT							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
IV	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION	12 H

Introduction -Supply Chain – Fundamentals –Evolution- Role in Economy -Importance - Decision Phases - Supplier- Manufacturer-Customer chain. - Enablers/Drivers of Supply Chain Performance.

MODULE -2	ROLE OF DISTRIBUTION IN VALUE DISCOVERY:	10 H

Designing a distribution logistics system – Outsourcing of distribution logistics – Distinction between distribution logistics and supply chain management.

MODULE-3	SUPPLY CHAIN NETWORK	12H

Outsourcing – Make Vs buy - Identifying core processes -Market Vs Hierarchy - Make Vs buy continuum -Sourcing strategy - Supplier Selection and Contract Negotiation. Creating a world class supply base- Supplier Development - World Wide Sourcing.

MODULE-4	. SUPPLY CHAIN NETWORK -	10 H

Distribution Network Design – Role – Factors Influencing Options, Value Addition – Distribution Strategies - Models for Facility Location and Capacity allocation. Distribution Center Location Models. Supply Chain Network optimization models. Impact of uncertainty on Network Design – Network Design decisions using Decision trees.

MODULE-5	PLANNING DEMAND, INVENTORY AND SUPPLY	10H

Managing supply chain cycle inventory. Uncertainty in the supply chain –- Analysing impact of supply chain redesign on the inventory - Risk Pooling - Managing inventory for short life – cycle products - multiple item -multiple location inventory management. Pricing and Revenue Management

MODULE-6	. CURRENT TRENDS	10 H

Supply Chain Integration - Building partnership and trust in SC Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain. . SC Restructuring - SC Mapping -SC process restructuring, Postpone the point of differentiation.

Total h:	64h

Text Book(s):

1. D K Agrawal, Textbook of Logistics and Supply Chain Management, MacMillan 2003, 1st Edition.
2. G Raghuram♣ & N Rangaraj, Logistics and Supply Chain Management - Cases and Concepts. Mac Millan.
3. Supply chain Logistics Management, Bowersox, Closs, Cooper, 2/e,TMH.

Reference Book(s):

1.Supply chain management concepts and cases, Rhaul V. Altekar, PHI.

2.Principles of Supply Chain Management – A balanced approach, Wisner, Leong, Tan,♣ Cengage.

3.Exploring Supply Chain – theory and practice, Upendra Kachru, excel.

4.Supply Chain Management,R.P. Mohanty and S.G. Deshmukh, Jaico .

SYLLABUS FOR MINOR DEGREE

NARAYANA ENGINEERING COLLEGE: GUDUR								
	ENGINEERING MECHANICS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION	12 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	10 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	10 H

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

MODULE-4	CENTROID	10 H

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

MODULE-5	MOMENT OF INERTIA	12 H

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

MODULE-6	KINETICS &KINEMATICS	10 H

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

Total h:	64 h

Text Book(s):

1. S S Bhavikatti, "Engineering Mechanics", 4th edition, New Age International,2008.
2. R.K. Bansal, "A text book of Engineering Mechanics", LaxmiPublications,2010
3. IrvingShames, GKMRao, "EngineeringMechanics:Statics andDynamics", 4thedition, Pearson, 2009.

Reference Book(s):

1. BasudebBhattacharya.,"EngineeringMechanics",2ndedition,OxfordUniversityPress (India),2015.
2. K L Kumar, VeenuKumar, "Engineering Mechanics", 4th edition, Tata McGrawHill,2010.
3. Engineering Mechanics , R.S.Khurmi,S.Chand,2012.

NARAYANA ENGINEERING COLLEGE:GUDUR								
	THERMAL ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT		
MODULE – 1	**INTRODUCTION TO IC ENGINES**	10 Hours

IC ENGINES: Classification, Working principles, Valve and Port Timing Diagrams. Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction.

MODULE -2	**COMBUSTION IN IC ENGINES**	13 Hours

Combustion in SI Engines Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Type of Abnormal combustion, pre-ignition and knocking (explanation of) Fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types. Combustion in C.I. Engines: Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Need for air movement, open
and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

MODULE-3	**PERFORMANCE OF IC ENGINES**	10 Hours

Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power, Determination of frictional losses and indicated power, Performance test, Heat balance sheet.

MODULE-4	**COMPRESSORS**	11 Hours

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

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

MODULE-5	**REFRIGERATION SYSTEM**	10 Hours

Refrigeration System Components: Compressors, expansion devices, condensers, evaporators.
Vapour Absorption Refrigeration: Water vapour refrigeration systems, steam jet refrigeration; vapour absorption refrigeration systems, single effect and double effect vapour absorption systems.

MODULE-6	Air Conditioning	10 Hours
Air Conditioning: Psychometric properties of air, psychometric processes, comfort charts, air conditioning load calculations, types of air conditioning systems. Demonstration of HVAC software related to psychometric processes & HVAC systems.		
	Total hours:	**64 Hours**

Text Book(s):

1. V. Ganesan (2011), I.C. Engines, 3rd edition, Tata McGraw-Hill, New Delhi,India.
2. B.JohnHeywood(2011), internalcombustionenginefundamentals,2ndedition, TataMcGraw-Hill, NewDelhi.
3. Refrigeration and Air Conditioning, by Arora,McGraw-Hill education,3rd edition,2008.
4..Refrigeration and Air Conditioning, by RS khurmi,JK GUPTHA,SCHAND Publications, Revised Edition

2015.

Reference Book(s):

1. Mathur, Sharma (2008), IC Engines, 3rd edition, Dhanpat Rai & Sons, New Delhi,India.
2. R. K. Rajput (2011), Thermal Engineering, 18th edition, Lakshmi Publications, NewDelhi,India.
3. 3 Pulkrabek (2008), Engineering fundamentals of IC Engines, 2nd edition, Pearson Education.

NARAYANA ENGINEERING COLLEGE: GUDUR								
	PRODUCTION TECHNOLOGY							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	CASTING	12 H

:Steps involved in making a casting - Advantage of casting and its applications. - Patterns and Pattern making - Types of patterns - Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems

MODULE -2	CASTING PROCESS	10 H

Methods of melting and types of furnaces, Solidification of castings, Solidification of pure metals and alloys, short & long freezing range alloys. Risers - Types, function and design, casting design considerations, Basic principles and applications of Centrifugal casting, Die casting and Investment casting.

MODULE-3	WELDING	10 H

Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy - Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, Sub merged arc welding, Inert Gas welding- TIG & MIG welding.

MODULE-4	FRICTION WELDING	10 H

Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma welding, Laser welding, electron beam welding, Soldering & Brazing.. Heat affected zones in welding; pre & post heating, Weldability of metals, welding defects - causes and remedies - destructive and nondestructive testing of welds, Design of welded joints.

MODULE-5	SHEET METAL FORMING	12 H

- Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Springback and its remedies, Coining, Spinning, Types of presses and press tools

MODULE-6	PROCESSING OF PLASTICS:	10 H

Types of Plastics, Properties, Applications and their processing methods, Blow and Injection molding.

Total h:	64 h

Text Book(s):

1. . Manufacturing Processes for Engineering Materials - Kalpakjian S and Steven R Schmid- Pearson Publ , 5th Edn.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH
3. . Fundamentals of Modern Manufacturing - Mikell P Groover- Wiley publ - 3 rd Edition..

Reference Book(s):

1. Manufacturing Science - A.Ghosh & A.K.Malik - East West Press Pvt. Ltd.
2. Process and materials of manufacture- Lindberg- PHI
3. Production Technology- R.K. Jain- Khanna 4. Production Technology-P C Sharma-S. Chand

NARAYANA ENGINEERING COLLEGE: GUDUR								
	FUNDAMENTALS OF ENGINEERING DESIGN							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION	12 H

Design Conceptualization and Philosophy, Original, Adaptive, Variant and Re-Design, Evolution of Concept, Need for Systematic design Past methods of and design. Product life cycle, Innovation, Types of innovation

MODULE -2	ANALYSIS OF ENGINEERING DESIGN	10 H

Needs and opportunities, Vision and Mission of a concept, Type of needs, Technology S - curve, Need analysis, market analysis and competitive analysis, Kano Diagrams, SWOT analysis

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MODULE-3	PRODUCT DESIGN & DEVELOPMENT	10 H

Systematic approach to product development: Design Thinking, Innovation, Empathize Design Thinking as a systematic approach to Innovation, brainstorming, visual thinking, design challenges, innovation, art of Innovation, strategies for idea generation, creativity, teams for innovation. Solution finding methods: Conventional, intuitive, discursive, methods for combining solution, decision making for new design

MODULE-4	OPTIMIZATION OF DESIGN	10 H

Concepts screening, Concept testing - exploratory tests, Assessment tests , Validation tests Comparison tests – Organization of design concept and design methods

MODULE-5	REVERS ENGINEERING	12 H

Reverse engineering in product development: Reversing engineering methods , importance of ergonomics in product development, environmental considerations in design, safety considerations in design.

MODULE-6	RECENT TRENDS IN DESIGN	10 H

Study of Product Development- Agriculture, development of machines for separation of corn seeds, peeling of groundnut shells, husk removing from paddy. Electrical: Design of burglar alarm, speedometer, water level indicator, smart gates, smart lights. Design of electrical vehicles, unmanned vehicles, design principles in drones.

Total h:	64 h

Text Book(s):

1. Otto. K and Wood, K, Product Design, Pearson Education, 2001.
2. Pahl. G and Beitz. G, Engineering Design, Springer, 1996
3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.

Reference Book(s):

4. Fundamentals of Engineering Design, Barry I. Hyman Prentice Hall/Pearson Education, 2002
5. Concepts in Engineering Design 1st Edition 2017 by Atif Aziz, New Age International (P) Ltd Publishers

NARAYANA ENGINEERING COLLEGE: GUDUR								
	PRODUCTION PLANNING CONTROL							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	INTRODUCTION	12 H

Objectives and benefits of planning and control-Functions of production control-Types of production-job-batch and continuous-Product development and design-Marketing aspect – Functional aspects-Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration-Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

MODULE -2	WORK STUDY	10 H

Method study, basic procedure-Selection-Recording of process – Critical analysis, Development – Implementation – Micro motion and memo motion study – work measurement – Techniques of work measurement – Time study – Production study – Work sampling – Synthesis from standard data – Predetermined motion time standards.

MODULE-3	PRODUCT PLANNING	10 H

Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-

MODULE-4	PROCESS PLANNING	10 H

. Process planning and routing-Pre requisite information needed for process planning- Steps in process planning-Quantity determination in batch production-Machine capacity, balancing- Analysis of process capabilities in a multi product system.

MODULE-5	INVENTORY CONTROL	12 H

Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system – Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis – Recorder procedure

MODULE-6	RECENT TRENDS IN PPC	10 H

-Introduction to computer integrated production planning systems- elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

Total h:	64 h

Text Book(s):

3. Chary. S.N., Theory and Problems in Production and Operations Management, Tata McGraw Hill, 1995.
4. Elwood S.Buffa, and Rakesh K.Sarin, Modern Production / Operations Management, 8th Edition John Wiley and Sons, 2000.
3. Jain. K.C. and Aggarwal. L.N., Production Planning Control and Industrial Management, Khanna Publishers, 1990.

Reference Book(s):

1. James. B. Dilworth, Operations management – Design, Planning and Control for manufacturing and services Mcgraw Hill International edition 1992.
2. Martand Telsang, Industrial Engineering and Production Management, First edition, S. Chand and Company, 2000.

NARAYANA ENGINEERING COLLEGE::GUDUR								
	MATERIALS TECHNOLOGY							R2020
Semester	H / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	STRUCTURE OF METALS	10 H

Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

Constitution of Alloys : Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

MODULE -2	EQUILIBRIUM OF DIAGRAMS	12 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. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn andFe-Fe3C.

MODULE-3	METALS & ALLOYS	10 H

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

Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium andits alloys.

MODULE-4	HEAT TREATMENT OF ALLOYS	10 H

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

MODULE-5	CERAMIC MATERIALS	10 H

Ceramic materials: Crystalline ceramics, glasses, cermets, abrasive materials, -definition, properties and application of the above.

MODULE-6	COMPOSITE MATERIALS	12 H

Composite Materials: Classification of composites, various methods of component mafacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and Carbon – Carbon composites.

Total h:	64 h

Text Book(s):

1. Introduction to Physical Metallurgy / Sidney H.Avener. 2017
2. A Text of Essential of Materials science and engineering/ DonaldR.Askeland/Thomson.2013
3. .Material Science and Metallurgy/ Dr.V.D.Kodgire,2011

Reference Book(s):

1. Science of Engineering Materials / B.K.Agarwal,2017.
2. Engineering materials and metallurgy/R. K. Rajput/S.Chand,2015.
3. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / JaicoBooks 1995

NARAYANA ENGINEERING COLLEGE: GUDUR								
	CAD/CAM							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	Over view of CAD/CAM	12 H

Product cycle, CAD, CAM and CIM. CAD Tools, CAM Tools, Utilization in an Industrial Environment, Evaluation criteria. CAD standards, CAD data structure, Data base management systems. Computer Graphics: Co-ordinate systems, Graphics package functions, 2D and 3D transformations, homogeneous transformations, clipping, hidden line / surface removal colour, shading.

MODULE -2	GEOMETRIC MODELING	10 H

Representation techniques, Parametric and non parametric representation, various construction methods, wire frame modeling, synthetic curves and their representations, surface modeling, synthetics surfaces and their representations

MODULE-3	SOLID MODELING	10 H

,solid representation, fundamentals, introduction to boundary representations, constructive solid geometry, analytical solid modeling.

MODULE-4	CNC SYSTEMS	10 H

, CNC systems,. Adaptive control machining systems, types of adaptive control. CNC Part Programming: Fundamentals, NC word, NC Codes, canned cycles, cutter radius compensation, length compensation, computed assisted part programming using APT: Geometry statements, motion statements, post process statements, auxiliary statements, macro statement program for simple components.

MODULE-5	GROUP TECHNOLOGY & FMS	12 H

: Part Family, Classification and Coding, advantages & limitations, Group technology machine cells, benefits. FMS: Introduction, components of FMS, material handling systems, Computer control systems, advantages. Computer Aided Quality Control: Terminology in Quality control, Inspection and testing, Contact inspection methods - optical and non optical, integration of CAQC with CAD and CIM

MODULE-6	COMPUTER AIDED PROCESSES PLANNING	10 H

Retrieval type and Generative type, benefits, Machinability data systems, Computer generated time standards. Computer integrated production planning: Capacity planning, shop floor control, MRP-I, MRP-II, CIMS benefits. Trends in Manufacturing systems: Concepts of Reconfigurable manufacturing, Sustainable manufacturing and lean manufacturing.

Total h:	64 h

Text Book(s):

1. CAD/CAM, A Zimmers&P.Groover, PE, PHI
2. CAD/CAM-Principles and applications, P.N. Rao, TMH, 3rd edition, 2010

Reference Book(s):

1. Computer Aided Design & Manufacturing, Lalit Narayan/Mallikarjuna Rao/M.M.M.Sarcar.PHI(2015)
2. Automation, Production systems & Computer integrated Manufacturing ,Groover, P.E
3. CAD/CAM/CIM, Radhakrishnan and Subramaniah, New Age, 3rd edition, 2008
4. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson

NARAYANA ENGINEERING COLLEGE: GUDUR								
	RENEWABLE ENERGY SOURCES							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
	3	1	0	64	4	40	60	100

COURSE CONTENT

MODULE – 1	**SOLAR ENERGY**	12 H

Classification and potential of energy sources, Importance of renewable. energy sources and energy chain, Principles of energy conservation.

Solar constant and solar radiation geometry, Solar time and day length, Estimation of monthly average daily total radiation on horizontal surface and tilted surface, Measurement of solar radiation - Pyranometer, Pyrheliometer and Sunshine recorder.

MODULE -2	**SOLAR COLLECTORS**	**10 H**

Liquid flat- Plate collector - Air heater and concentrating collector and Different methods of storage system- Sensible, latent heat and stratified storage, solar ponds.

Methods of storing solar energy, Solar water heating, Impact of conventional energy sources on environment, Applications of solar thermal energy: Solar Refrigeration, Solar thermal power generation, Solar distillation, Solar space heating and Space cooling. and photovoltaic energy conversion

MODULE-3	**WIND ENERGY & BIOMASS ENERGY**	**10 H**

Origin of wind, application of wind power, components and working of horizontal axis wind turbine - Betz limit, Types of blades, upwind and downwind turbines, vertical axis Wind turbines- Savonius type, Darrieus type.Photosynthesis process, Classification of biogas plants, Types of Digesters – KVIC

MODULE-4	**GEOTHERMAL ENERGY & OCEAN ENERGY**	**10 H**

Introduction, geothermal sources - Hydro thermal resources, geopressurized resources, hot dry rocks, Power generation through liquid dominated system, vapour dominated system and hot dry rocks, applications of geothermal energy, environmental consideration.

Ocean thermal Energy conversion - Lambert's law, OTEC. conversion technologies- Claude cycle and Anderson cycle; Tidal energy conversion - Introduction, tidal energy conversion - single basin and double basin systems.

MODULE-5	**DIRECT ENERGY CONVERSION**	**12 H**

Need for DEC, Carnot cycle, limitations, and principles of DEC.

Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator,

MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday"s law"s, thermodynamic aspects, selection of fuels and operating conditions.

MODULE-6	**ENVIRONMENTAL IMPACT OF ENERGY CONVERSION**	**10 H**

ozone layer depletion, global warming, greenhouse effect, loss of biodiversity, eutrophication, acid rain, air and water pollution, land degradation, thermal pollution, Sustainable energy, promising technologies, development pathways.

Total h:	**64 h**

Text Book(s):

1. Non-Conventional Energy Sources /G.D. Rai
2. Energy Resources Utilization and Technologies, Anjaneyulu Yerramilli, Francis Tuluri, BS Publications, 2012
3. Sukhatme S.P. and J.K.Nayak, Solar Energy - Principles of Thermal Collection and Storage, Tata McGraw Hill, New Delhi, 2008.

Reference Book(s):

1. Renewable Energy Sources/ Twidell & Weir
2. Non Conventional Energy Resources, B.H.Khan, McGrawHIll, 2015
3. Non-Conventional Energy/ Ashok V Desai/ Wiley Eastern
4. J.A. Duffie and W.A. Beckman, Solar Energy - Thermal Processes, John Wiley, 2001