GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC 'A+' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
***

Structure, Syllabus,

BOS Minutes & Regulations

GR-17

MECHANICAL ENGINEERING

Godavari institute of Engg & Technology

Approved By AICTE NAAC 'A+' Grade Recognized by UGC,U/Sec.2(f) & 12(B) Permanent affiliation by JNTUK

GIET Campus, Chaitanya Knowledge city,NH-16,Rajahmundry,East Godavari, A.P. Tel:+91-883-2484828-31 www.giet.ac.in

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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COURSE STRUCTURE

DETAILED SYLLABUS

ACADEMIC REGULATIONS

BOS MEETING MINUTES AND AGENDA

MECHANICAL ENGINEERING

FOR

B. TECH FOUR YEAR DEGREE COURESE

(APPLICABLE FOR THE BATCHES ADMITTED FROM 2017-18)

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

***

w.e.f. Academic Year: 2017-2018

I YEAR I SEMESTER

S. No.	Subject codes	Subject	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P/D		Int.	Ext.	Total
1	17198101	English – I	3	1	-	3	40	60	100
2	17198102	Mathematics - I	3	1	-	3	40	60	100
3	17198103	Engineering Physics	3	1	-	3	40	60	100
4	17195104	Computer Programming	3	1	-	3	40	60	100
5	17193175	Engineering Drawing	-	-	4	3	40	60	100
6	17198106	Environmental Studies	3	1	-	3	40	60	100
7	17198111	English Communication Skills Lab. -1	-	-	3	2	50	50	100
8	17198112	Engineering Physics Lab.	-	-	3	2	50	50	100
9	17195113	Computer Programming Lab.	-	-	3	2	50	50	100
		Total	**15**	**5**	**13**	**24**	**390**	**510**	**900**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

****

w.e.f. Academic Year: 2017-2018

I YEAR **II SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P/D		Int.	Ext.	Total
1	17198201	English – II	3	1	-	3	40	60	100
2	17198202	Mathematics – II	3	1	-	3	40	60	100
3	17198203	Mathematics – III	3	1	-	3	40	60	100
4	17198204	Engineering Chemistry	3	1	-	3	40	60	100
5	17193205	Engineering Mechanics	3	1	-	3	40	60	100
6	17198206	Professional Ethics and Human Values*	2	1	-	1	40	60	100
7	17198211	English Communication Skills Lab. -2	-	-	3	2	50	50	100
8	17198212	Engineering Chemistry Lab	-	-	3	2	50	50	100
9	17198281	Engineering Workshop & IT Workshop	-	-	3	2	50	50	100
		Total	**17**	**6**	**9**	**22**	**390**	**510**	**900**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

***

w.e.f. Academic Year: 2017-2018

II YEAR **I SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Internal	External	Total
			L	T	P/D				
1	17139301	Managerial Economics & Financial Analysis	3	1	-	3	40	60	100
2	17132302	Basic Electrical & Electronics Engineering	3	1	-	3	40	60	100
3	17130303	Metallurgy & Materials Science	3	1	-	3	40	60	100
4	17130304	Mechanics of Solids	3	1	-	3	40	60	100
5	17130305	Thermodynamics	3	1	-	3	40	60	100
6	17130376	Computer Aided Engineering Drawing Practice	-	-	4	3	40	60	100
7	17132311	Basic Electrical & Electronics Engineering Lab	-	-	3	2	50	50	100
8	17130312	Mechanics of Solids & Metallurgy lab	-	-	3	2	50	50	100
		Total	**15**	**5**	**10**	**22**	**340**	**460**	**800**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

***

w.e.f. Academic Year: 2017-2018

II YEAR **II SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Internal	External	Total
			L	T	P/D				
1	17130401	Kinematics of Machinery	3	1		3	40	60	100
2	17130402	Thermal Engineering -I	3	1	-	3	40	60	100
3	17130403	Production Technology	3	1	-	3	40	60	100
4	17130404	Fluid Mechanics & Hydraulic Machinery	3	1	-	3	40	60	100
5	17130405	Industrial Engineering & Management	3	1	-	3	40	60	100
6	17130476	Machine Drawing	-	-	4	3	40	60	100
7	17139407	Soft Skills -1	1	-	2	1	40	60	100
8	17130411	Fluid Mechanics & Hydraulic Machinery Lab.	-		3	2	50	50	100
9	17130412	Production Technology Lab.	-		3	2	50	50	100
10	17130413	Thermal Engineering Lab.	-		3	2	50	50	100
		Total	**16**	**5**	**15**	**25**	**430**	**570**	**1000**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

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w.e.f. Academic Year: 2017-2018

III YEAR **I SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Internal	External	Total
			L	T	P/D				
1	17130501	Dynamics of Machinery	3	1	-	3	40	60	100
2	17130502	Operations Research	3	1	-	3	40	60	100
3	17130503	Design of Machine Members–I	3	1	-	3	40	60	100
4	17130504	Instrumentation & Control Systems	3	1	-	3	40	60	100
5	17130505	Thermal Engineering -II	3	1	-	3	40	60	100
6	17130506	Metal Cutting & Machine Tools	3	1	-	3	40	60	100
7	17130511	Machine Tools Lab.	-	-	3	2	50	50	100
8	17130512	Theory of Machines Lab.	-	-	3	2	50	50	100
9	17130521	Mini Project-1	-	-	-	2	100	-	100
		Total	**18**	**6**	**6**	**24**	**440**	**460**	**900**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

* Student should carry **Mini Project** during summer vacation after II B.Tech. II Sem. Course work and it will be evaluated during III B.Tech. I Sem.

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

***

w.e.f. Academic Year: 2017-2018

III YEAR **II SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Internal	External	Total
			L	T	P/D				
1	17130601	Finite Element Methods	3	1	-	3	40	60	100
2	17130602	CAD/CAM	3	1	-	3	40	60	100
3	17130603	Design of Machine Members– II	3	1	-	3	40	60	100
4	17130604	**Open Elective:** a. Building Technology b. Hybrid Vehicles c. Principles of Management d. Internet of Things e. Social Networking f. Environmental Pollution Control	3	1	-	3	40	60	100
5	17130605	Heat Transfer	3	1	-	3	40	60	100
6	17130606	**Departmental Elective – I** a. Automobile Engineering b. Experimental Stress Analysis c. Industrial Hydraulics & Pneumatics d. Methods Engineering and Work Design	3	1	-	3	40	60	100
7	17139607	Soft Skills - 2	1	-	2	1	40	60	100
8	17130611	Heat Transfer Lab.	-	-	3	2	50	50	100
9	17130612	Simulation Lab.	-	-	3	2	50	50	100
		Total	**19**	**6**	**8**	**23**	**380**	**520**	**900**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

***

w.e.f. Academic Year: 2017-2018

IV YEAR **I SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Internal	External	Total
			L	T	P/D				
1	17130701	Power Plant Engineering	3	**1**		3	40	60	100
2	17130702	Metrology	3	1	-	3	40	60	100
3	17130703	Refrigeration & Air-Conditioning	3	1	-	3	40	60	100
4	17130704	Unconventional Machining Processes	3	1	-	3	40	60	100
5	17130705	Robotics	3	1	-	3	40	60	100
6	17130766A 17130766B 17130766C 17130766D	**Departmental Elective – II** a. Metal Forming Theory and Practice b. Mechatronics c. Computational Fluid Dynamics d. Automation in Manufacturing	3	1	-	3	40	60	100
7	17139707	IPR & Patents	2	-	-	1	40	60	100
8	17130711	Metrology & Instrumentation Lab.	-	-	3	2	50	50	100
9	17130731	Fabrication Project/Term paper	-	-	3	2	50	50	100
10	17130722	Mini project-2	-	-	-	2	100	-	100
		Total	**20**	**6**	**6**	**25**	**480**	**520**	**1000**

L-Lecture T-Tutorial P-Practical D-Drawing Int.-Internal Ext.-External

** Student should carry **Summer Internship** during summer vacation after III B.Tech. II Sem. Course work and it will be evaluated during IV B.Tech. I Sem.

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

***

w.e.f. Academic Year: 2017-2018

IV YEAR **II SEMESTER**

S. No.	Subject codes	Subject	Periods per week			C	Internal	External	Total
			L	T	P/D				
1	17130801	**Departmental Elective – III** a. Non Destructive Testing b. Condition Monitoring c. Gas Dynamics & Jet Propulsion d. Advanced Optimization Techniques e. Management Information Systems	3	1	-	3	40	60	100
2	17130802	**Departmental Elective – IV** a. Digital Manufacturing b. Design for Manufacture c. Pressure Vessels and Piping d. Product Life Cycle Management e. Renewable Energy Sources	3	1	-	3	40	60	100
3	17130841	Project Work	0	0	18	9	60	140	200
		Total	**6**	**2**	**18**	**15**	**140**	**260**	**400**

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**ENGLISH-I (17198101)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading, writing, listening and Spe				

Unit-I
Detailed Text: Human Resources: From English for Engineers and Technologists
Non-Detailed Text: 'An Ideal Family' by Katherine Mansfield

Unit-II
Detailed Text: Transport: Problems and Solutions
Non-Detailed Text: War by Luigi Pirandello from 'Panorama: A Course on Reading

Unit-III
Detailed Text: Evaluating Technology from English for Engineers and Technologists.
Non-Detailed Text: 'The Verger' by Somerset Maugham from Panorama: A Course on Reading.

Unit–IV
Detailed Text: Alternative Sources of Energy from English for Engineers and Technologists.
Poetry: The Scarecrow by Satyajit Ray from Panorama: A Course on Reading Frost

Unit – V
Detailed Text: Our Living Environment from English for Engineers and Technologists.
Non-Detailed Text: A Village Host to Nation from Panorama: A Course on Reading

Course Outcomes:
After completion of the course, students will be able to:
CO-1.develop their knowledge different fields and serve the society accordingly.
CO-2. Identifying safety measures against different varieties of accidents at home and in the workplace.
CO-3. The lesson creates an awareness in the reader as to the usefulness of animals for the humansociety.
CO-4. Enable the learner to imbibe high standard of living

TEXTBOOK:
English for Engineers and Technologists, Published by Orient BlackswanPvt Ltd
NON-DETAILED TEXTBOOK:
PANORAMA: A COURSE ON READING, Published by Oxford University Press India.
Web Links:
www.nptel.com

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**MATHEMATICS-I (17198102)**	3	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Basic knowledge of algebra, trigonometry, differentiation and integration**.**				

UNIT I:
Laplace transforms:
Application of Laplace Transform to Solution of IVP and Evaluation of Integrals, Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals Unit step function –Dirac's delta function- Inverse Laplace transforms Convolution theorem (without proof).
Applications: Solutions of ordinary differential equations using Laplace transforms
UNIT II:
Differential equations of first order and first degree Solution of First order and First degree ODE with applications Linear Bernoulli Exact Reducible to exact.
Applications: Newton's Law of cooling-Law of natural growth and decay orthogonal trajectories.
UNIT III:
Linear differential equations of higher order Solution of Higher order Linear ODE with applications.
Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e *ax*, Sin ax, cos ax, polynomials in x, e *ax*V(x), xV(x).
Applications: LCR circuit, Simple Harmonic motion.
UNIT IV:
Partial differentiation
Mean Value Theorems and their applications and to find Maxima and Minima Introduction, Total derivative Chain rule Generalized Mean Value theorem for single variable (without proof) Taylors and Mc Laurent's series for two variables Functional dependence Jacobian.
Applications: Maxima and Minima of functions of two variables with constraints and without constraints.
UNIT V:
First order & Higher order Partial differential equations Objective:
Formation, Solution& application of First & Higher order PDE Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Classification of II order PDE Method of separation of Variables
Applications: One dimensional Wave and Heat equations, two-dimensional Laplace Equations.

Course Outcomes:
After completion of this course, a successful student will be able to:
CO-1: Solve linear differential equations of first, second and higher order.
CO-2: Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
CO-3: Calculate total derivative, Jocobian and minima of functions of two variables
Text Books:
1. UM. Swamy, P.Vijaya Lakshmi, R.V.G.Ravi Kumar, M.Phani Krishna Kishore, Engineering Mathematics 1st Edition, Anurag Jain for Excel Books

2. Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad, 1st Edition, S.Chand Publication.
3. B.S.GREWAL, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers

Reference Books:

1. ERWIN KREYSZIG, Advanced Engineering Mathematics, 9th Edition, Wiley-India
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.
3. GREENBERG, Advanced Engineering Mathematics, 2nd edition, Pearson edn
4. DEAN G. DUFFY, Advanced engineering mathematics with MATLAB, CRC Press
5. PETER O'NEIL advanced Engineering Mathematics, Cengage Learning.

Weblinks:
www.NPTEL.com

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DEPARTMENT OF MECHANICAL ENGINEERING
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**ENGINEERING PHYSICS (17198103)**	3	1	-	3
Teaching	**Total contact hours - 65**				
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 level. Application of Physics theory and calculations to required course.				

Unit-I
INTERFERENCE: Principle of Superposition–Coherence – Interference in thin films (reflection geometry) – Newton's rings - Applications (wavelength, refractive index of the material.
DIFFRACTION: Fraunhofer diffraction double slit, N-slits -(Qualitative treatment only)-Grating spectrum – Rayleigh's criterion, Resolving power of a grating.

Unit-II
POLARIZATION: Types of Polarization – Malu's law- Brewester's law- double refraction - Nicol Prism.
LASERS: Properties of lasers-absorption, spontaneous and stimulated emissions-Einsteins coeffecients, Population inversion-Solid state laser: Ruby laser, Gas laser: He-Ne laser, Applications of Lasers

Unit-III
MAGNETIC PROPERTIES
Basic definitions, B,H,I relation-Classification of magnetic materials-origin of magnetic moment - Weiss theory of Ferromagnetism-Hysteresis-Soft and Hard magnetic materials.
ACOUSTICS: Reverberation time-Sabine's formula- Measurement of absorption coefficient-Factors affecting the acoustically good hall and their remedies.

Unit-IV
CRYSTALLOGRAPHY & X-RAY DIFFRACTION: Basis and lattice-Bravais systems- Symmetry elements-Unit cell-packing fraction–coordination number-Miller indices-Separation between successive (hkl) planes-Bragg's law.
ELECTROMAGNETIC FIELDS: Introduction-Gauss and Stokes theorems (qualitative)-Fundamental laws of electromagnetism-Maxwell's equations of EM wave.

Unit–V
BAND THEORY OF SOLIDS: Bloch's theorem (qualitative)–Kronig Penney model (qualitative)–energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.
SEMICONDUCTOR PHYSICS: Introduction-Density of carriers in Intrinsic and Extrinsic Semiconductors-Drift & Diffusion-relevance of Einstein's equation-Hall effect in semiconductors.

Course Outcomes:
After completion of this course, a successful student will be able to:
CO-1. Construction and working details of instruments,
CO-2. Interferometer, Diffract meter and Polarimeterarelearnt.
CO-3. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Text books:

1. A Text book of Engineering Physics – byP.K.Palanisamy, Scitech publications.
2. Engineering Physics by Dr. M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand& Company Ltd., (2014).
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

Reference Books:

1. Solid State Physics by A.J.Dekker, Mc Millan Publishers (2011).
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014).

Web links:

1. www.physics org.com,
2. www.optics.net,
3. www.nptel.com,
4. Free online courses and education.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**COMPUTER PROGRAMMING (17195104)**	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Basic knowledge about Computer, Algorithm and Flowchart				

Unit-I
Introduction to Computers: Introduction to computer programming, Algorithm, flow chart, Program development steps.
Computer languages: Machine level, Assembly level and High-level language.
Number System: Conversions- decimal, binary, octal, hexadecimal.
'C' Fundamentals: Structure of a C-program, C-character set, C Tokens- constants, variables and identifiers, keywords, data types and sizes, Operators and operation Bit-Operators.

Unit-II
I/O Functions: Header files, Standard I/O library functions-formatted I/O functions.
Decision making statements: simple if, if-else, nested if-else, else-if ladder, switch-case statements and sample programs.
Iterative: while, do-while, for statements, jump statements- goto, break, continue.

Unit-III
Arrays: Declaration, initialization, accessing and storing elements of 1-D, 2-D and multi-dimensional arrays, applications- addition, multiplication, transpose, symmetry of a matrix.
Pointer: Introduction to pointers, defining a pointer variable, Pointer to Pointer, Examples of pointer, Using pointers in Expressions, Pointers and Arrays.

Unit-IV
Strings: declaration, initialization, reading and writing characters and strings, string operations, character and string manipulation functions.

Unit-V
Functions: Declaration, definition, prototype, function call, return statement, types of functions, parameter passing methods, and function recursion.
Pre-processor: #define, #include Statement, #ifdef, #endif, and storage classes.

Course Outcomes
After successful completion of this course, a successful student will be able to
CO-1: Obtain the knowledge about different languages used in computer programming and also about the number systems which will be very useful for bitwise operations and basic terminology used in the computer programming.
CO-2: Obtain knowledge about algorithm, flow chart, and structure of C program and different C tokens used inside C program and develop program by using Control structure, different looping and Jump statement.
CO-3: Obtain knowledge about the application and implementation of 2-dimentional Array and string inside the program.
CO-4: Obtain knowledge about different functionalities of Preprocessors and also to develop the program by using different type of function calls.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Text Books

1. "Programming in C" by Ashok N. Kamthane, 2/e Pearson, 2013.
2. "The C – Programming language" B.W. Kernighan, Dennis M. Ritchie.PHI.
3. *"Let Us C", 12th Edition* by Yashavant P. Kanetkar online in India.

Reference Books

1. "Programming in C" *by Ajay Mittal, Pearson.*
2. Programming with C, Bichkar, Universities press.
3. Programming in C, ReemaThareja, OXFORD.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**Engineering Drawing (17193175)**	-	-	4	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Aptitude to learn& basic geometry				

Course Objectives: Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

UNIT I

Introduction to drawing Instruments and uses. Lettering.

Polygons: Construction of regular polygons using given length of a side; Curves used in Engineering Practice, conic sections, construction of conics by different methods, cycloidal curves, epi and hypo-cycloids. Involutes.

UNIT II

Scales: Vernier and Diagonal scales.

Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane. Projections of straight lines inclined to both the planes, determination of true lengths and angle of inclinations and traces.

UNIT III

Projections of planes: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT V

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

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Course Outcomes:

1. To understand the concepts and use of drawing Instruments and Curves used in Engineering Practice.
2. To understand the concepts of Vernier and Diagonal scales and concepts of orthographic projections.
3. To understand the concepts of Projections of isometric views to orthographic views.

TEXT BOOKS:

1. Engineering Graphics by PI Varghese, McGrawHill Publishers
2. Engineering Drawing by N.D. Butt, Chariot Publications
3. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.

REFERENCE BOOKS:

1. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers
2. Engineering Drawing by Shah & Rana, Pearson Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age Publishers

Useful Web-links : http://nptel.ac.in/courses.php

http://mit.espe.edu.ec/courses/mechanical-engineering/

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**ENVIRONMENTAL STUDIES (17198106)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Knowledge to conserve Natural Recourses and to control Environmental Pollution.				

Unit-I

Multi disciplinary nature of Environmental Studies: Definition, Scope and Importance-Stockholm and Rio Summit–Global Environmental Challenges**:** Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of Information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, Consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

Unit-II.

Natural Resources: Natural resources and associated problems Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water-Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of Modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced Landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit-III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity**:** habitat loss, man-wildlife conflicts. - Endangered and endemic species of India. Conservation of biodiversity**:**In situ, Ex situ conservation.

Unit-IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution. Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Unit- V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism The student should submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Course Outcomes:

After completion of this course, a successful student will be able to:

CO-1. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources

CO-2. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO-3. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

Text Books:

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A.Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

1. Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh: Acme Learning, New Delhi.

Web Links:

1. www.NPTEL.com
2. www.the-ies.org
3. www.mhhe.com/biosci/pae/environmentalscience

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	ENGLISH - COMMUNICATION SKILLS LAB- I (17198111)	-	-	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading, Writing, Listening and Speaking				

UNIT 1:
1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks Practice work.

UNIT 2:
1. Responding to Requests and asking for Directions Practice work.

UNIT 3:
1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologizing, Advising, Suggesting, Agreeing and Disagreeing Practice work.

UNIT 4:
1. Letters and Sounds Practice work.

UNIT 5:
1. The Sounds of English
2. Pronunciation
3 Stress and Intonation

UNIT 6:
Movie Reviews

Course Outcomes:
A study of the communicative items in the laboratory will help the students become successful in the competitive world.

PRESCRIBED LAB MANUAL FOR SEMESTER I:
INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd.

Reference Books:
1. Strengthen your communication skills by Dr M Hari Prasad, DrSalivendra Raju and Dr G SuvarnaLakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press.
4. A Practical Course in effective english speaking skills, PHI.
5. Word power made handy, Drshaliniverma, Schand Company.
6. Professional Communication, ArunaKoneru, Mc Grawhill Education.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**Engineering Physics Lab (17198112)**	-	-	3	2
Teaching	**Total contact hours - 45**				
Prerequisite (s)	Basic knowledge of Engineering Physics Applications				

List of Experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings –Radius of Curvature of Plano Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume resonator.
9. L C R Series Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode
11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p-n junction.
15. Hall Effect for semiconductor.

Course Outcomes:

Physicslabcurriculumgivesfundamentalunderstandingofdesignofaninstrumentwithtargetedaccuracyforphysical measurements

Web links:

Virtual Lab: www.vlab.co.in

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/I	L	T	P	C
Course/ Code	**COMPUTER PROGRAMMING LAB Common to (CE, EEE, ME, ECE, CSE, AME, MIN) (17195113)**	-	-	3	2
Teaching	**Total contact hours - 50**				
Prerequisite (s)	Basic knowledge about Computer, Algorithm and Flowchart.				

1. Write a C Program to
   a) Calculate the area of triangle using the formula
   Area = (s (s-a) (s-b) (s-c)) 1/2, where s= (a+b+c)/2
   b) To find the largest of three numbers using ternary operator.
   c) To swap two numbers without using a temporary variable.
2. Write a C program that uses functions to perform the following operations using Structure:

   a) Reading a complex number
   b) Writing a complex number
   c) Addition of two complex numbers
3. Write a C program to

   a) 2"s complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2"s complement of 11100 is 00100. Write a C program to find the 2"s complement of a binary number.
   b) Find the roots of a quadratic equation.
   c) Take two integer operands and one operator form the user, Performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
4. Write a C Program to

   a) Check whether the given number is Armstrong number or not.
   b) Check whether the given number is palindrome or not.
5. Write a C program to

   a) Find the sum of individual digits of a positive integer and find the reverse of the given number.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
   c) Generate all the prime numbers between 1 and n, where n is a value supplied by the user.
6. Write a C Program to

   a) Print the multiplication table of a given number n up to a given value, where n is entered by the user.
   b) Enter a decimal number, and calculate and display the binary equivalent of that number.
   c) Enter a binary number, and calculate the decimal equivalent of that number.
7. Write a C program to

   a) Interchange the largest and smallest numbers in the array.

b) Implement a liner search.
c) Implement binary search.

8. Write a C program to

a) Examples which explore the use of structures, union and other user defined variables.
b) Declare a structure for calculating the percentage achieved by 3 students, by considering the structure elements as name, pin no, mark1, mark2, mark3.

9. Write C Programs

a)For the following string operations without using the built in functions i. to reverse strings
ii. to append a string to another string
iii. to compare two strings.

b) Write C Programs for the following string operations without using the built in functions
i. to find the length of a string
ii. To find whether the given string "MADAM" is palindrome or not.

10. Write a C program

a) Use functions to perform the following operations:
i. To insert a sub-string in to given main string from a given position.
ii. To delete n Characters from a given position in a given string.

b) To replace a character of string either from beginning or ending or at a specified location

11. Write C Programs for the following string operations with and without using the built in functions

a) Write C Program to reverse a string using pointers.
b) Write a C program to concatenate two strings by using pointer.

12. Write C programs that use both recursive and non-recursive functions for the following

a) To find the factorial of a given integer.
b) To find the GCD of two given integers.
c) To find Fibonacci sequence.

13. Write C programs to

a) Find the area of triangle by using call by value and call by reference concepts.
b) Pointer based function to exchange value of two integers using passing by address.
c) Compare two strings by using call by address.
d) Separate the even and odd elements of an array into two different arrays by using call by value.

Course Outcomes:

After successful completion of this course, a successful student will be able to:
CO-1: To know the structure and syntax of a programming language.
CO-2: To develop code for simple mathematical problems.
CO-3: To write the programs using arrays, structures and pointers

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**ENGLISH-II (17198201)**	3	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	**Learner should possess the primary communicative ab suitable for global exposure**				

UNIT 1:
Detailed Text: "The Greatest Resource"- Education from English Encounters.
Non-Detailed Text: "A P J Abdul Kalam" from The Great Indian Scientists.
.
UNIT 2:
Detailed Text: "A Dilemma" from English Encounters
Non-Detailed Text: "C V Raman" from The Great Indian Scientists.
.
UNIT 3:
Detailed Text: Cultural Shock: Adjustments to new Cultural Environments from English Encounters.
Non-Detailed Text: "Homi Jehangir Bhabha" from The Great Indian Scientists.
UNIT 4:
Detailed Text: "The Lottery" from English Encounters.
Non-Detailed Text: "Jagadish Chandra Bose" from The Great Indian Scientists.
UNIT 5:
Detailed Text : "The Health Threats of Climate Change" from English Encounters.
Non-Detailed Text: "'Prafulla Chandra Ray" from The Great Indian Scientists.
Course Outcomes:
After completion of this course, a successful student will be able to:
CO-1 The lesson underscores that the ultimate aim of Education is to enhance wisdom.
CO-2 The lesson enables the students to promote peaceful co-existence and universal Harm on among people and society
CO-3 To identify the Achievements of CV Raman are inspiring and exemplary to the readers and all scientists.
TEXT BOOKS:
Detailed Textbook: English Encounters Published by Maruthi Publishers.
Detailed Non-Detail: The Great Indian Scientists Published by Cenguage learning.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**MATHEMATICS-II (17198202)**	3	1	-	3
Teaching	**Total contact hours - 65**				
Prerequisite (s)	Basic knowledge of Algebra, Trigonometry, Differentiation Integration and Complex numbers				

UNIT I
Solution of Algebraic and Transcendental Equations: Numerical Methods: Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method
UNIT II
Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula
UNIT III
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method- Runge-Kutta Methods
UNIT-IV
Functions of a complex variable: Complex function , Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function**,** $C-R$ equations in polar form, Harmonic functions, Milne-Thomson method.
UNIT V
Fourier Series & Transforms: Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series application: Amplitude, spectrum of a periodic function Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms
Course Outcomes:
After completion of this course, a successful student will be able to:
CO-1. Calculate root of algebraic and transcendental equations. Explain relation between the finite difference operators.
CO-2. Compute interpolating polynomial for the given data.
CO-3. Solve ordinary differential equations numerically using Euler's and RK method.
Text Books:
1. Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad, 1st Edition, S.Chand Publication
2. UM. Swamy, P.Vijaya Lakshmi, R.V.G.Ravi Kumar, M.Phani Krishna Kishore Engineering Mathematics 1st Edition, Anurag Jain for Excel Books
3. B.S. GREWAL, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.

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Reference books:

1. N.P.Bali, Engineering Mathematics, Lakshmi Publications.
2. V.RAVINDRANATH and P. VIJAYALAXMI, Mathematical Methods, Himalaya Publishing House.
3. ERWYN KREYSZIG, Advanced Engineering Mathematics, 9th Edition, Wiley-India.
4. DEAN G. DUFFY, Advanced Engineering Mathematics with MATLAB, CRC Press.

Weblinks:

www.NPTEL.com

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**MATHEMATICS-III (17198203)**	3	1	-	3
Teaching	**Total contact hours - 65**				
Prerequisite (s)	Basic knowledge ofAlgebra,Trigonometry,Differentiation, Integration and Complex numbers				

UNIT I
Linear systems of equations:
Rank-Echelon form, Normal form–Solution of Linear Systems-Direct Methods-Gauss Elimination-Gauss Jordon and Gauss Seidal Methods.
Application: Finding the current in a electrical circuit.

UNIT II
Eigen values - Eigen vectors and Quadratic forms:
Eigen values - Eigen vectors– Properties – Cayley-Hamilton Theorem – without proof Inverse and powers of a Matrix by using Cayley-Hamilton theorem- Quadratic forms- Reduction of quadratic form to Canonical form – Rank - Positive, negative definite - semi definite - index – signature.
Application: Free vibration of a two-mass system

UNIT III
Multiple integrals:
Review concepts of Curve tracing (Cartesian - Polar and Parametric curves)- **No question from this part**
Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple integrals - double and triple integrals – change of variables – Change of order of Integration Application: Moments of inertia

UNIT IV
Special functions:
Objective: Beta and Gamma functions- Properties - Relation between Beta and Gamma Functions-Evaluation of improper integrals
Application: Evaluation of integrals

UNIT V
Vector Differentiation & Integration:
Gradient- Divergence-Curl - Laplacian and second order operators -Vector identities (without proof)
Application: Equation of continuity, potential surfaces, Line integral – work done – Potential function – area-surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems .application: work done, Force

Course Outcomes:
After completion of this course, a successful student will be able to:
CO-1. Determine rank, Eigenvalues and Eigen vectors ofa given matrixand solve simultaneous linear equations.
CO-2. Solve simultaneous linear equations numericallyusingvarious matrixmethods.
CO-3. Determine doubleintegraloveraregion and tripleintegral over a volume.

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Text Books:

1. **UM. Swamy, P.Vijaya Lakshmi, R.V.G.Ravi Kumar, M.Phani Krishna Kishore,** Engineering Mathematics 1st Edition, Anurag Jain for Excel Books
2. **Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad,** 1st Edition, S.Chand Publication
3. **B.S.GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers

Reference books:

1. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.
2. **GREENBERG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
3. **B.V. RAMANA,** Higher Engineering Mathematics, Tata McGraw-Hill
4. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
5. **PETER O'NEIL,** Advanced Engineering Mathematics, Cengage Learning

Weblinks :

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	ENGINEERING CHEMISTRY (17198204)	3	1	-	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of theoretical and experimental from +2 level, Application of Chemistry theory and calculations to required course				

Unit-I
Water technology:
Hard water-Estimation of hardness by hardness by EDTA method – Potable water – Sterilization and Disinfection – Boiler feed water – Boiler troubles – Priming and forming, scale formation, corrosion, caustic embrittlement, turbine deposits – Softening of water – Lime soda, Zeolite processes and Ion exchange process– Reverse osmosis – Electro Dialysis,

Unit-II
Electrochemistry & Corrosion:
Galvanic cells- Conductometic titrations–Elctrode potentials– Nernst equation – electrochemical series– Potentiometric titrations. Causes and effects of corrosion – theories of corrosion (dry, chemical and electrochemical corrosion) – Factors effecting corrosion – Corrosion control methods – Cathodic protection – Sacrificial Anodic, Impressed current methods – Surface coating – Methods of application on metals (Hot dipping, Galvanizing, tinning, Cladding, Electroplating, Electro less, plating,), Organic coatings-Paints.

Unit-III
High polymers:
Types of Polymerization – Stereo Polymers – Physical and mechanical properties of polymers – Plastics – Thermoplastics and thermo setting plastics – Compounding and Fabrication of plastics – preparation and properties of Polyethylene, PVC and Bakelite – Elastomers – Rubber and Vulcanization – Styrene butadiene rubber – Thiokol – applications.

Unit-IV
Fuels:
Coal – Proximate and ultimate analysis – Numerical problems based on analysis – Calorific value – HCV and LVC – Problems based calorific values; petroleum – Refining – Cracking – Petrol – Diesel knocking: Gaseous fuels – Natural gas – LPG, CNG – Combustion – Problems on air requirements.

Unit-V
Chemistry of advanced materials:
Nanomaterials– Properties of nanomaterials –Engineering applications) – Liquid crystals (Types – Application in LCD and Engineering Applications) – Fiber reinforced plastics – Biodegradable polymers – Conducting polymers –Green chemistry and Applications. Cement-Constituents, manufacturing, hardening and setting, deterioration of cement.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
***

Course Outcomes:

After completion of this course, a successful student will be able to:

CO-1. The advantages and limitations of plastic materials and their use in design would be understood.

CO-2. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano-materials and fullerenes and their uses. Similarly, liquid crystals and super conductors are understood.

CO-3. The importance of green synthesisis well understood and how they are different from conventional methods is also explained.

Text Books:

1. Jain and Jain (Latest Edition), Engineering Chemistry, DhanpatRai Publishing company Ltd.,
2. N. Y. S. Murthy, V. Anuradha, K. RamaRao, "A Text Book of Engineering Chemistry" Maruthi Publications.
3. C. Parameswara Murthy, C. V. Agarwal, Adhra Naidu (2006) Text Book of Engineering Chemistry, B. S. Publications.
4. B. Sivasankar (2010), Engineering Chemistry, McGraw-Hill companies.
5. Ch. VenkataRamana Reddy and Rama devi (2013), Engineering Chemistry, Cengage Learning.

Reference Books:

1. S. S. Dara (2013) Text Book of Engineering Chemistry, S. Chand Technical Series.
2. K. SeshaMaheswaeamma and MridulaChugh (2013), Engineering Chemistry, Pearson Publications.
3. R. Gopalan,D. Venkatappayya, Sulochana, Nagarajan (2011), Text Book of Engineering Chemistry, Vikas Publications.
4. B. Viswanathan and M. AuliceScibioh (2009), Fuel cells, Principals and applications.

Weblinks:

1. www.NPTEL.com
2. chem.tufts.edu
3. www.chem1.com

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**Engineering Mechanics (17198205)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering Physics				

Course Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces : Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT – III

Centroid : Centroids of simple figures (from basic principles) – Centroids of Composite Figures.

Centre of Gravity : Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, pappus theorem.

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. Mass Moment of Inertia : Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies

UNIT –I V

Kinematics : Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

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UNIT – V

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

Torsional vibration- The compound pendulum- General case of moment proportional to angle of rotation- D'Alembert's principle in rotation.

Course Outcomes:

1. To understand the concepts of forces and its resolution in different planes.
2. To understand the concepts of Equilibrium of Systems of Forces, law of Triangle of forces and converse of the law of polygon of forces.
3. To understand the concepts of Area moments of Inertia, Mass Moment of Inertia.
4. To understand the concepts of Equations for Translation, D'Alembert's principle in rotation.

TEXT BOOKS:

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics statics and dynamics:A Nelson , Mc Graw Hill publications
3. Engineering Mechanics: GS Sawhney, PHI Learning Pvt. Ltd.
4. Engineering Mechanics: Basudeb Bhattacharyya, Oxford University Press

REFERENCES:

1. Engineering Mechanics: statics and dynamics – I.H.Shames, – Pearson Publ.
2. Mechanics For Engineers, dynamics: - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
3. Engineering Mechanics: Fedinand . L. Singer , Harper – Collins
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Useful Web-links : http://nptel.ac.in/courses.php

http://mit.espe.edu.ec/courses/mechanical-engineering/

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**PROFESSIONAL ETHICS AND HUMAN VALUES (17198206)**	2	1	-	1
Teaching	**Total contact hours - 65**				
Prerequisite (s)	Knowledge of Economics, Demand analysis, Production Analysis, Fundamentals of Accounting and Ratio analysis.				

UNIT I:
Human values
Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue– Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II:
Engineering ethics:
The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy – Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics-Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma.

UNIT III:
Engineering as social experimentation:
Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering. Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics-computers as the Instrument of Unethical behavior-computers as the object of Unethical Acts-autonomous Computers-computer codes of Ethics-Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

UNIT IV:
Engineers' responsibility for safety and risk:
Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences – Expected Probability - Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk – Safety and the Engineer - Designing for Safety – Risk - Benefit Analysis-Accidents

UNIT V:
Engineer's responsibilities and rights:
Collegiality - Techniques for Achieving Collegiality –Two Senses of Loyalty-obligations of Loyalty – misguided – Loyalty - professionalism and Loyalty- Professional Rights –Professional Responsibilities – confidential and proprietary information-Conflict of Interest-solving conflict problems – Self Interest, Customs and Religion- Ethical egoism-Collective bargaining Confidentiality Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational in other companies-Occupational - price fixing-endangering lives- Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing.

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Course Outcomes:

After completion of this course, a successful student will be able to:

CO-1. To develop reasoning and analytical skills among engineering students.

CO-2. To make the engineering students aware of the safety measures, risk factors and risk analysis.

CO-3. To make the students to identify issues in engineering and management areas

TEXT BOOKS

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi - Publications
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications
4. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

Reference:

1. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.
2. "Engineering Ethics" byHarris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**ENGLISH - COMMUNICATION SKILLS LAB- II (17198211)**	-	-	3	2
Teaching	**Total contact hours - 48**				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading,Writing,Listening and Speaking				

OBJECTIVES:
To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

UNIT 1:
1. Debating - Practice work

UNIT 2:
1. Group Discussions - Practice work

UNIT 3:
1. Presentation Skills - Practice work

UNIT 4:
1. Interview Skills - Practice work

UNIT 5:
1. Email
2. Curriculum Vitae - Practice work

UNIT 6:
1. Idiomatic Expressions
2. Common Errors in English - Practice work

Course Outcomes:
A study of the communicative items in the laboratory will help the students become successful in the competitive world.

PRESCRIBED LAB MANUAL FOR SEMESTER II:
INTERACT: English Lab Manual for Undergraduate Students' Published by Orient BlackswanPvt Ltd.

Reference Books:
1. Strengthen your communication skills by Dr M Hari Prasad, DrSalivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Drshaliniverma, Schand Company

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**ENGINEERING CHEMISTRY LABORATORY (17198212)**	-	-	3	2
Teaching	**Total contact hours - 45**				
Prerequisite (s)	Basic knowledge of Engineering Chemistry Applications				

List of Experiments:

1. Introduction to chemistry laboratory - Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis etc.,
2. Trial experiment – Estimation of HCl using standard Na_2CO_3 solution.
3. Estimation of $KMnO_4$ using standard Oxalic acid solution.
4. Estimation of Ferric ion using standard $K_2Cr_2O_7$ solution.
5. Estimation of Copper using standard $K_2Cr_2O_7$ solution.
6. Estimation of Total Hardness water using standard EDTA solution
7. Estimation of Zinc using standard EDTA solution.
8. Estimation of pH of the given sample solution using pH meter.
9. Conductometric Titrations between strong acid and strong base.
10. Conductometric Titrations between strong acid and weak base.
11. conductometric Titrations between weak acid and strong base.
12. conductometric Titrations between weak acid and weak base.
13. Estimation of Vitamin – C

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/I/II	L	T	P	C
Course/ Code	**Engineering Workshop (17198283)**	-	-	3	2
Teaching	**Total contact hours -**				
Prerequisite (s)	Aptitude to learn				

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

Carpentry
1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

Fitting
1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black Smithy
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Tin Smithy
1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	**Managerial Economics & Financial Analysis (17139301)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)					

Unit- I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics and Scope – Managerial Economics and its relation with other subjects – Concepts of Demand – Types – Determinants, Law of Demand its Exception – Elasticity of Demand – Types and Measurement - Demand forecasting and its methods.

Unit-II

Production and Cost Analysis: Production function Isoquants and Isocosts – Law of Variable proportions – Cobb-Douglas Production function- Economies of Scale- Cost Concepts-Opportunity Cost-Fixed Vs Variable Costs– Explicit Cost Vs Implicit Costs – Out of Pocket Costs Vs Imputed Costs – Cost Volume Profit Analysis- Determination of Break-Even Point (Simple Problems)

Unit-III

Introduction to Markets, Theories of the Firm and Pricing Policies: Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price, Output Determination – Managerial Theories of firm: Maris and Williamson's models –Methods of Pricing: Limit Pricing, Market Skimming Pricing, And Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing.

Unit- IV

Types of Business Organizations and Business Cycles: Features and Evaluation of Sole trader – Partnership – Joint Stock Company – State / Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle. Capital, Capital Budgeting: Capital, Significance of Capital, Sources of Finance (Capital) - Meaning of Capital Budgeting Need for Capital Budgeting - Techniques of Capital Budgeting - Traditional and Modern Methods.

Unit- V

Introduction to Financial Accounts: Introduction to Double Entry Systems, Preparation of Journal – Subsidiary Books- Ledger-Cash Book-Trial Balance- Preparation of Financial Statements, Analysis of Financial Statements through Ratio Analysis (Simple Problems).

Course outcomes:

After completion of the course the students will be able to:

CO-1. Identify the nature of Competition, Characteristics of Pricing in the different market structure and significance of various pricing methods.)
CO-2. Analyze the concept of Production function, Input Output relationship, different Cost Concepts and Concept of Cost – Volume – Profit Analysis.)
CO-3. Preparation of Financial Statements and use Different tools for performance evaluation.

TEXT BOOKS:

1. Prof. J.V. Prabhakara Rao, Prof.P. Venkata Rao. "Managerial Economics and Financial

Analysis", Ravindra Publication.
2. Dr.A.R.Aryasri- Managerial Economics and Financial Analysis – TMH Publications.
3. Dr.N.Appa Rao, Dr.P. Vijay Kumar 'Managerial Economics and Financial Analysis", Cengage Publications New Delhi

Reference:

1. Dr.B. Kuberudu and Dr.T.V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House.

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	Basic Electrical & Electronics Engineering (17139302)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

Unit-I
Electrical Circuits:
Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits, star-delta and delta-star transformations

Unit-II
DC Machines:
Principle of operation of DC generator- emf equation, types, DC motor types, torque equation, applications, three point starter, swinburn's Test, speed control methods.

Unit-III
AC Machines:
Principle of operation of single phase transformers, e.m.f. equation, efficiency and regulation. Principle of operation of alternators, Principle of operation of 3-Phase induction motor- slip-torque characteristics, efficiency

Unit – IV
Rectifiers & Linear ICs:
PN junction diodes, diode applications - Half wave and bridge rectifiers. Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non inverting, integrator and differentiator).

Unit – V
Transistors:
PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

Course Outcomes
After successful completion of the course, a successful student will be able to
CO-1. Analyze the various electrical networks.
CO-2. Perform the operation of DC generators,3-point starter and conduct the Swinbume's Test.
CO-3. Analyze the performance of transformer, operation of 3-phase alternator and 3-phase Induction motors.
CO-4. Analyze the operation of half Wave, full wave rectifiers, op-amps and explain the single stage CE amplifier and concept of feedback amplifier.

Text Books:
1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group

Reference Books:
1. Basic Electrical Engineering by M.S.Naidu and S.Ka1nakshiah, TMH Publications

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2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2th edition
3. Basic Electrical Engineering by Nagsarlcar, Sukhija, Oxford Publications,2nd edition
4. Industrial Electronics by GK. Mittal, PHI

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	**Metallurgy & Materials Science (17130303)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering Physics and Engineering Chemistry				

Course Objective: To understand the basic fundamentals of Material science and Physical metallurgy. The basic concepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of the society.

UNIT – I

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

UNIT –II

Equilibrium Diagrams : 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, Cus-Sn and Fe-Fe3C.

UNIT –III

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.

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – IV

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

Introduction to powder metallurgy – Basic Principles.

UNIT – V

Ceramic and composite materials: Crystalline ceramics, glasses, cermets, abrasive materials nano-materials – definition, properties and applications of the above.

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Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

Course outcomes:

1. To enhance students' ability to understand the science and fundamentals of materials
2. To understand the basic requirements and improve the selection and utilization of materials
3. To understand the regions of stability of phases that occur in the systems

TEXT BOOKS:

1. Introduction to Physical Metallurgy - Sidney H. Avener - McGrawHill
2. Essential of Materials science and engineering - Donald R.Askeland -Thomson.

REFERENCES:

1. Material Science and Metallurgy – Dr. V.D.kodgire.
2. Materials Science and engineering - Callister & Baalasubrahmanyam
3. Material Science for Engineering students – Fischer – Elsevier Publishers
4. Material science and Engineering - V. Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press
6. Material Science and Metallurgy – A V K Suryanarayana – B S Publications
7. Material Science and Metallurgy – U. C. Jindal – Pearson Publications

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Useful Web-links : http://nptel.ac.in/courses.php

http://mit.espe.edu.ec/courses/mechanical-engineering/

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	**Mechanics of Solids (17130304)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering mechanics				

Objective: The students completing this course are expected to understand the basic terms like stress, strain, poisons ratio… etc. and different stress induced in beams, thin cylinders, thick cylinders and columns. Further the student shall be able to understand the shear stresses in circular shafts.

UNIT – I

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses.

Stresses on an inclined plane under different uniaxial and biaxial stress conditions. Principal planes and principal stresses – Concept of Mohr's circle limited to simple problems only.

UNIT – II

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

FLEXURAL STRESSES: Theory of simple bending – Assumptions – Derivation of bending equation: M/ I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T sections – Design of simple beam sections.

UNIT – III

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T sections.

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads & U.D.L. Mohr's theorems – Moment area method – application to simple cases including overhanging beams. Brief explanation of statistically indeterminate Beams and solution methods.

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DEPARTMENT OF MECHANICAL ENGINEERING
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UNIT – IV

THIN CYLINDERS & SPHERES: Thin cylindrical vessels subjected to internal pressure, longitudinal and circumferential stresses & strains, Volumetric strains – changes in dimensions of thin cylinders – Thin spherical shells.

THICK CYLINDERS – Stresses in a thick cylindrical shell, lame's equation – cylinders subjected to inside & outside pressures – streeses in compound thick cylinders.

UNIT – V

TORSION: Introduction- Derivation- Torsion of Circular shafts –Transmission of power by circular shafts, composite shafts.

COLUMNS & STRUTS: Buckling and stability, slenderness ratio, Failure of Columns & Struts, End conditions for long columns, effect of end conditions on column buckling, Expressions for crippling loads. Euler's theory of Columns, Rankine's Formula.

Course outcomes:

1. To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures

2. To study engineering properties of materials, force-deformation, and stress-strain relationship

3. To learn fundamental principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition in linear solids and structures

4. To analyze determinate and indeterminate axial members, torsional members, and beams to determine axial forces, torque, shear forces, and bending moments

TEXT BOOKS:

1. Strength of materials by R.K.Bansal , Laxmi Publications .

2. Strength of materials by Bhavikatti, Lakshmi publications.

3. Strength of materials by RK Rajput, S Chand publications.

3. Solid Mechanics, Schaum's Outline series

REFERENCES:

1. Analysis of structures by Vazirani and Ratwani.

2. Strength of Materials by S.Timshenko

3. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

Useful Web-links : http://nptel.ac.in/courses.php

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	**Thermodynamics (17130305)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering Physics and Engineering Chemistry				

Course Objectives: To Impart the Knowledge of Thermodynamics laws and principles so as to enable the students to prepare an energy audit of any mechanical System that exchange heat and work with the surroundings.

UNIT – I

Introduction: System, Control volume, Surrounding, Boundaries, Universe - Macroscopic and Microscopic approach of Thermodynamics, Concept of Continuum - Thermodynamic equilibrium - State, Property, Process, Cycle, Reversible process, irreversible process, quasi- static process, causes of irreversibility – Energy, Heat and Work - Point and Path functions - Ideal gas laws and Characteristic gas equation.

Zeroth law of Thermodynamics: Zeroth law of Thermodynamics, concept of temperature, principle of thermometry-Reference points-constant volume and constant pressure thermometer and Ideal gas temperature scale.

UNIT – II

First law of thermodynamics: Joule's Experiments - First law of Thermodynamics - corollaries of First law of Thermodynamics, PMM-I, First law applied to different non- flow processes, Specific heats, Enthalpy, Internal energy, Relation between C_p, C_v ,&R - $\int$p.dv work done for different processes – First law applied to flow processes – Steady Flow Energy Equation (SFEE) - SFEE applied to various mechanical components - Throttling and free expansion processes.

UNIT – III

Second law of Thermodynamics: Limitation of first law of thermodynamics - Thermal Energy Reservoirs, Second law of Thermodynamics, Kelvin Planck and claussius statements and their equivalence – Corollaries of second law of Thermodynamics - PMM-II - Differences between Direct and Reversed heat engines and their performance parameters, Carnot Theorem, Carnot cycle and its specialties, Sterling cycle, Ericcson cycle, Lenoir cycle, Atkinson cycle and their efficiencies, reversed carnot cycle and its coefficient of performance, Thermodynamic scale of temperature, Claussius inequality, Entropy, Principles of entropy increase, change in entropy for different thermodynamic process.

Availability and Irreversibility: Energy equation, Availability and Irreversibility -Thermodynamic potentials, Gibbs and Helmoltz functions, Maxwell relations - Elementary treatment of the Third law of thermodynamics.

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UNIT-IV

Deviations from perfect gas equation: Vander Waals equation of state-compressibility charts-variable specific heats-gas tables.

Pure Substance: Pure substance, P-V-T surface, T-s and H-s diagrams, Phase transformations -Triple point during change of phase, Dryness fraction - Clausius-Clapeyron equation - Property Tables and Mollier chart - Various Thermodynamic processes and energy transfer - Steam Calorimetry - Rankine Cycle - Vapour Compression Refrigeration Cycle.

UNIT V

Mixture of Perfect gases: Mole fraction, Mass function, Gravimetric and Volumetric Analysis –Dalton's law of partial pressure, Avagadro's law of additive volumes, Equivalent gas constant, Molecular internal energy, Enthalpy, Specific heats and Entropy of mixture of perfect gases and vapour, Atmospheric air - Psychrometric Properties - Dry bulb Temperature, Wet Bulb temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, Saturated air, Vapour pressure, Degree of saturation, Adiabatic saturation, Carrier's equation - Psychrometric Chart – Sensible Heat Factor.

Course outcomes:

1. Be able to have the basic concepts of thermal sciences and their application to informulating

the thermal engineering problems.

2. Have a good understanding of first and second laws of thermodynamics and will be in

3. A position to fully understand the analysis to be taught at the higher levels.

4. Be in a position to check the feasibility of proposed processes and cycles using the ideas of

second law of thermodynamics and entropy.

TEXT BOOKS :

1. Engineering Thermodynamics , PK Nag 4th Edn , TMH.

2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles, 7th Edn - McGrawHill

REFERENCES :

1. Engineering Thermodynamics – Jones & Dugan PHI

2. Thermodynamics – J.P.Holman , McGrawHill

3. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.

4. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	Computer Aided Engineering Drawing Practice (17130376)	-	-	4	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Basic Engineering Drawing				

Course Objective: To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

UNIT-I:

Projections Of Planes & Solids : Projections of Regular Solids inclined to both planes – Auxiliary Views. Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.
Development And Interpenetration Of Solids: Development of Surfaces of Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.
Interpenetration of Right Regular Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT-II:

Isometric Projections : Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.
Transformation of Projections: Conversion of Isometric Views to Orthographic Views – Conventions.

Perspective Projections: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods(General Method only).

In part B computer aided drafting is introduced.

UNIT III:
Introduction to Computer aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.
UNIT IV:

View points and view ports: view point coordinates and view(s) displayed, examples to exercise different options, restore, delete, joint, single option.
UNIT V:

Computer aided Solid Modeling: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

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Course outcomes:

1. To understand and appreciate the importance of Engineering Graphics.

2. To understand the basic principles of Technical/Engineering Drawing.

3. To understand the different steps in producing drawings according to BIS.

4. To learn basic engineering drawing formats.

TEXT BOOKS :

1. Engineering Graphics, K.C. john, PHI Publications
2. Engineering drawing by N.D Bhatt , Charotar publications.

REFERENCES:

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD , K.venkata reddy/B.S . publications.

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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	**Basic Electrical & Electronics Engineering Lab (17132311)**	-	-	3	2
Teaching	**Total contact hours - 48**				
Prerequisite (s)					

Any five experiments are to be conducted from each part.

PART -A

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. Shunt motor.

PART-B

1. PN junction Diode characteristics a). Forward bias b).Reverse bias. (Cut in voltage & Resistance calculations)
2. Transistor CE characteristics (Input and Output)
3. Full wave Rectifier with and without filters.
4. CE Amplifiers.
5. RC phase Shift Oscillator.
6. Class A power Amplifier.

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DEPARTMENT OF MECHANICAL ENGINEERING
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/I	L	T	P	C
Course/ Code	Mechanics of Solids & Metallurgy lab (17130312)	-	-	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)					

Objective: The students completing this course are expected to understand the testing methods to find the strength of different materials, microstructure of various materials.

Any 6 experiments from each section A and B.

(A) METALLURGY LAB:

1. To Study effect of carbon % on Micro Structure of different types of steels
2. To study the effects of heat treatment. (annealing, normalising, and hardening) on hardness and Microstructure of steels.
3. To Determine the grain size in given specimen of steels.
4. To Determine hardenability of steel specimen by Jominy End quench Test.
5. To Study the Micro structures of Non-Ferrous Alloy like Aluminum and brass.
6. To find out the hardness of various treated and untreated steels.

(B) MECHNICS OF SOLIDS LAB:

1. Tension test to determine the % elongation, % reduction in cross sectional area of the specimen.
2. Bending test
    a) Simple supported beam
    b) Cantilever beam
3. Torsion test
4. Hardness test
    a) Brinells hardness test
    b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Double shear test

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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Kinematics of Machinery (17130401)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering mechanics				

Objective: The students completing this course are expected to understand the nature and role of the kinematics of machinery, the mechanisms and machines. The course includes velocity and acceleration diagrams, analysis of mechanisms joints, Cams and their applications. It exposes the students to various kinds of power transmission devices like belt, rope, chain and gear drives and their working principles and their merits and demerits.

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .Gruebler's criteria , Grashoff's law , Degrees of freedom, Kutzbach criterian for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversions of quadric cycle chain – single and double slider crank chains.

UNIT – II

LOWER PAIR MECHANISM: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

UNIT – III

KINEMATICS: Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method - Four bar chain. Velocity and acceleration analysis of a given mechanism, Kleins construction - Determination of Corioli's component of acceleration.

Plane motion of body: Instantaneous center of rotation, centrodes and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

CAMS: Definitions of cam and followers – their uses – Types of followers and cams – Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

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Analysis of motion of followers: Roller follower – circular cam with straight, concave and convex flanks.

UNIT – V

Gears: Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

Gear Trains :

Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

Course outcomes:

1. Understanding the motion of the component and the basic geometry of the mechanisms.

2. The kinematics of machines deals with the motion of members of the mechanisms which

includes the determination of velocities and acceleration of the machine members.

3) Students become familiar with kinematic linkages their types, utility and shapes for various

applications.

4). To know about the degrees of freedom for a particular combination of linkages

TEXT BOOKS:

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of Machines – S. S Rattan- TMH
3. Theory of machines and Mechanisms – J.J Uicker, G.R.Pennock & J.E.Shigley – Oxford publishers.

REFERENCES:

1. Theory of Machines Sadhu Singh Pearsons Edn
2. Theory of machines and Machinery /Vickers /Oxford .
3. Theory of Mechanisms and machines – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd.

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DEPARTMENT OF MECHANICAL ENGINEERING
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Thermal Engineering -I (17130402)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Thermodynamics				

UNIT – I

I. C. ENGINES: Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine, principles of supercharging and turbo charging.

UNIT – II

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT – III

Combustion in S.I. 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, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

Measurement, Testing and Performance: 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 and chart.

UNIT – IV

COMPRESSORS – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, undercooling, saving of work, minimum work condition for stage compression.

UNIT V

Rotary Compressors (Positive displacement type) : Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

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Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

Course outcomes:

After taking this course the students should be able to

1. Classify various types of I.C. Engines and Cycles of operation.
2. Express the effect of various operating variables on engine performance
3. Discuss fuel metering and fuel supply systems for different types of engines
4. Distinguish normal and abnormal combustion phenomena in SI and CI engines

TEXT BOOKS:

1. I.C. Engines / V. GANESAN- TMH
2. Heat engines, vasandani & Kumar publications Thermal

REFERENCES:

1. IC Engines – M.L.Mathur &R.P.Sharma – Dhanpath Rai & Sons.
2. I.C.Engines–AppliedThermosciences–C.R.Ferguson&A.T.Kirkpatrick-2nd Edition-Wiley Publ
3. I.C. Engines - J.B.Heywood /McGrawHIll.
4. Thermal Engineering – R.S.Khurmi & J.S.Gupta- S.chand Publ

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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Production Technology (17130403)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Metallurgy and Materiel Science				

Course Objective:

To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, forming and powder metallurgy and their relevance in current manufacturing industry; To introduce processing methods of plastics.

UNIT – I

CASTING: 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

UNIT – II

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.

UNIT – III

Welding : 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.

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.

UNIT – IV

Plastic deformation in metals and alloys, Hot working and Cold working, Strain hardening and Annealing.

Bulk forming processes: Forging - Types Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces

in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

Introduction to powder metallurgy – compaction and sintering, advantages and applications

UNIT – V

Sheet metal forming - 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.

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

Course outcomes:

1. Understand the fundamentals of manufacturing process.
2. To gain knowledge in manufacturing techniques like casting, welding, forging etc.
3. Apply principles of production techniques and be able to fabricate basic parts.

TEXT BOOKS:

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 – 3rd Edition

REFERENCES :

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
5. Manufacturing Processes- H.S. Shaun- Pearson
6. Manufacturing Processes- J.P. Kaushish- PHI

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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Fluid Mechanics & Hydraulic Machinery (17130404)**	3	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering Mechanics				

UNIT I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT II

Fluid kinematics: stream line, path line and streak lines and stream 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 flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter.

Dimensional analysis and similitude: Dimensional homogeneity, Raleigh's Theorem and Buckingham's theorem, important dimensional numbers and their significance, geometric, Kinematic and dynamic similarity, model studies.

Boundary Layer Theory and Applications: Concepts of boundary layer, boundary layer thickness and equations, momentum integral equation, boundary layer separation and its control, cavitation. Circulation, Drag and lift on immersed bodies, Magnus effect.

UNIT IV

Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work don and efficiency, flow over radial vanes.

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.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

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DEPARTMENT OF MECHANICAL ENGINEERING
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UNIT V

Centrifugal pumps: classification, working, work done – manomertic head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH. Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

Reciprocating Pumps: Working, Discharge, slip, indicator diagrams.

Course outcomes:

1. Describe basic working of single and multi-stage centrifugal pumps and blowers.

2. Calculate performance and design of turbines

3. Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory

4. State and visualize fluid kinematics. predict and design a fluid dynamical system based on inviscid theory.

TEXT BOOKS:

1. Fluid Mechanics and Hydraulic Machines by Bansal.

2. Hydraulics, fluid mechanics and Hydraulic machinery by Modi and Seth.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.

2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.

3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

Useful Web-links : http://nptel.ac.in/courses.php

http://mit.espe.edu.ec/courses/mechanical-engineering/

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Industrial Engineering & Management (17130405)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Knowledge of Engineering, Production Technology, Basic Statistical Calculations, Reasoning Capability.				

Course Objective: To impart knowledge on Industrial Engineering and Scientific Principles of Management to improve productivity in manufacturing industries and to understand work culture in Industrial Units with emphasis on new methods and techniques.

UNIT – I
Introduction:
Industrial Engineering- Role of Industrial Engineer- IE Applications – Productivity – Scope of Industrial Engineering.
Management – Concepts, Origin, Importance, functions, Henry Fayol's Management Principles, F W Taylor's Scientific Management, Mc Gregor's theory- System's approach to Management – Human Resource Management.

UNIT – II
Plant - Facility Location & Lay-out
Factors governing plant location, Location Economics, Plant layout types of plant layout - computer aided layout design techniques.
Plant maintenance – Types - Preventive Maintenance – Reliability - Maintainability, and Availability concepts - Employee Health & Safety.

UNIT – III
Production & Work Study
Production –Types of Production- Advantages and disadvantages - Aggregate Production Planning.
Work study – Method Study and Motion Study – Work measurement - Procedure – micro-motion study - Concept of normal time; allowances. Work sampling - Technique of work measurement **- PMTS -** Role of work study in improving productivity – Introduction to Ergonomics, Therbligs – Flow process Charts – String Diagrams.

UNIT – IV
Quality Management:
Quality – DMAIC Cycle – Life cycle approach - Quality costs- Inspection - Control Charts – Numerical Examples on X Bar – R Charts, C Charts and P Charts - Seven QC tools.
TQM basic Concepts -Zero Defects – Quality Circles – ISO Quality Systems, 5S, Six Sigma, Quality Function Deployment, Kaizen.
Innovative Industrial Engineering Techniques
Materials Management - Inventory Management – Selective Inventory Control techniques –ABC-VED-FSN-Surplus Disposal.
MRP1 and MRPII, Supply Chain Management, ERP, Value Engineering – Value Analysis

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UNIT – V
Project Management

Introduction to Network Diagrams - CPM and PERT - Critical Path Analysis, Crashing - Activity times and floats, Project completion times.
PERT and three Time Estimates, critical path analysis of a PERT network, Probability of completion of project - Simple Numerical Examples on CPM & PERT.

Course outcomes:

1. Design and conduct experiments, analyze, interpret data andsynthesis valid conclusions.
2. Design a system, component, or process, and synthesis solutions toachieve desired needs.
3. Use the techniques, skills, and modern engineering tools necessary forengineering practice with appropriate considerations for public healthand safety, cultural, societal, and environmental constraints.
4. Function effectively within multi-disciplinary teams and understandthe fundamental precepts of effective project management.

Text Books:

1. Industrial Engineering and Management OP Khanna – Khanna Publishers
2. Industrial Engineering – Banga & Sharma.
3. Industrial Engineering and Production management – Martand Telsang – S Chand & Co New Delhi.
4. Production and Operations Management – Paneerselvem – PHI

References:

1. Introduction to Work Study, I.L.O., 3rd Revised Edn., 1986
2. Operations Management by J.G Monks, McGrawHill Publishers.
3. Production and operations management by K.C Arora.
4. Production Management by Buffa,
5. Industrial Engineering and Management: A New Perspective, Philip E. Hicks McGraw-Hill
6. Handbook of Industrial Engineering: Technology and Operations Management By Gavriel Salvendy – Institute of Industrial Engineers

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Machine Drawing (17130476)**	-	-	4	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Computer Aided Engineering Drawing Practice				

Course Objective: The student will acquire knowledge of fastening arrangements such as welding, riveting the different styles of attachment for shaft. The student also is enabled to prepare the assembly of various machine or engine components and miscellaneous machine components.

Machine Drawing Conventions:

Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

d) Title boxes, their size, location and details - common abbreviations & their liberal usage

e) Types of Drawings – working drawings for machine parts.

I. Drawing of Machine Elements and simple parts
Objective: To provide basic understanding and drawing practice of various joint, simple mechanical parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

b) Keys, cottered joints and knuckle joint.

c) Rivetted joints for plates

d) Shaft coupling, spigot and socket pipe joint.

e) Journal, pivot and collar and foot step bearings.

II. Assembly Drawings:
Objective: The student will be able to draw the assembly from the individual part drawing.

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.

b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.

c) Valves: Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

Course outcomes:

1. To develop the technical skills necessary to generate an engineering drawing and an engineering assembly using a modern CAD system
2. To introduce the elements of engineering communications; including graphical representation of Machines end its elements.
3. To model simple assembly drawings and prepare detailed part drawings with geometric dimensioning and tolerance

TEXT BOOKS:

1. Machine Drawing – Dhawan, S.Chand Publications
2. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

REFERENCES:

1. Machine Drawing – N.Siddeswar, K.Kannaiah & V.V.S.Sastry - TMH
2. Machine Drawing – P.S.Gill,
3. Machine Drawing – Luzzader
4. Machine Drawing – Rajput
5. Machine Drawing – N.D. Junnarkar, Pearson
6. Machine Drawing – Ajeeth Singh, McGraw Hill
7. Machine Drawing – KC John, PHI
8. Machine Drawing – B Battacharya, Oxford
9. Machine Drawing – Gowtham and Gowtham, Pearson

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	Soft Skills -1 (17139407)	1	-	2	1
Teaching	Total contact hours - 48				
Prerequisite (s)					

Title: Professional Communication-1
Course Objective:
To strengthen the four language skills of the learners and to prepare them for success in academics and the job market.

UNIT 1: PLACES	
Reading	Importance of reading skills. Scanning techniques
Writing	Punctuation marks, writing descriptive sentences, Writing positives and negatives about a place
Listening & Pronunciation	**Video: Living in Alaska** Predicting content through visuals, Listening for main ideas Distinguishing fact from opinion
Speaking	Organizing information for a presentation*;* Making a presentation about place
Grammar	Tense and aspect
Vocabulary	Vocabulary to describe places, suffixes and prefixes
UNIT 2: FESTIVALS AND CELEBRATIONS	
Reading	Recognizing text types, skimming and scanning
Writing	Organizing sentences into a paragraph*;* writing first draft; writing paragraph: descriptive, narrative etc.
Listening & Pronunciation	**Video: Chinese New Year** Listening and taking notes; listening for examples;Stressed words and unstressed sounds
Speaking	Giving a poster presentation, understanding intonation

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Grammar	Present tense question forms, Adjectives
Vocabulary	Vocabulary to describe festivals; Collocations
UNIT 3: SCHOOL AND EDUCATION	
Reading	Making inferences/Previewing techniques
Writing	Letter writing/Official letters
Listening & Pronunciation	**Video: Education around the world** following native accent and intonation
Speaking	Giving opinions in a debate*: /*agreeing and disagreeing, convincing
Grammar	Conjunctions, Subject pronouns
Vocabulary	Prepositional phrases, Basic verb patterns
UNIT 4: THE INTERNET AND TECHNOLOGY	
Reading	Understanding discourse
Writing	Essay writing
Listening & Pronunciation	**Video: Virtual Reality** Listening for reasons
Speaking	Presenting a new technology along with advantages and disadvantages
Grammar	Compound nouns, *prepositions*
Vocabulary	Vocabulary for Internet and technology
UNIT 5: LANGUAGE AND COMMUNICATION	
Reading	Scanning techniques, Observation of foreign languages
Writing	Information from flow charts
Listening &	**Video: Languages in South America**

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Pronunciation	Listening for genre; Listening for instructions;
Speaking	Sequencing words to organize instructions; Planning and giving a set of instructions
Grammar	Quantifiers: *some, many, a lot of, a few, a little;* Imperative clauses;
Vocabulary	Analogies and idiomatic distortions

Prescribed Text Books: UNLOCK SERIES from Cambridge University Press
Unlock Book-2: Reading and Writing
Listening and Speaking
Course Outcomes: At the end of the Semester the student will be able to

- **Understand the necessity to improve four language skills**
- **Acquire knowledge about public speaking ability**
- **Strengthen their grammatical skills in the language**
- **Improve necessary vocabulary**
- **Improve writing skills**

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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Fluid Mechanics & Hydraulic Machinery Lab (17130411)**	-	-	3	2
Teaching	**Total contact hours - 48**				
Prerequisite (s)					

Course Objective: To impart hands-on practical exposure on study of fluid flow and working of hydraulic machinery.

1. Impact of jets on Vanes.

2. Performance Test on Pelton Wheel.

3. Performance Test on Francis Turbine.

4. Performance Test on Kaplan Turbine.

5. Performance Test on Single Stage Centrifugal Pump.

6. Performance Test on Multi Stage Centrifugal Pump.

7. Performance Test on Reciprocating Pump.

8. Calibration of Venturimeter.

9. Calibration of Orifice meter.

10. Determination of friction factor for a given pipe line.

11. Determination of loss of head due to sudden contraction in a pipeline.

12. Turbine flow meter.

13.Determination of Reynolds number of fluid flow

14.verification of Bernoulli's theorem

15. External mouth piece

16. Calibration of Notch

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	**Production Technology Lab. (17130412)**	-	-	3	2
Teaching	**Total contact hours - 48**				
Prerequisite (s)					

Course Objective: To impart hands-on practical exposure on manufacturing processes and equipment.

Minimum of 12 Exercises need to be performed

I. METAL CASTING:

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - for strength and permeability
3. Mould preparation, Melting and Casting

II. WELDING:

1. Gas welding
2. Gas cutting
3. Manual metal arc welding - Lap & Butt Joints
4. TIG/MIG Welding
5. Resistance Spot Welding
6. Brazing and soldering

III METAL FORMING AND POWDER METALLURGY:

1. Blanking & Piercing operations and study of simple, compound and progressive dies.
2. Deep drawing and extrusion operations.
3. Bending and other operations
4. Basic powder compaction and sintering

IV PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/II/II	L	T	P	C
Course/ Code	Thermal engineering Lab. (17130413)	-	-	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)					

Objective: To impart practical exposure to the student on the performance evaluation methods of various types of internal combustion engines and compressors.

1. I.C. Engines valve / port timing diagrams.
2. I.C. Engines performance test (4 -stroke diesel engines)
3. I.C. Engines performance test on 2-stroke petrol.
4. Evaluation of engine friction by conducting morse test on 4-stroke multi cylinder petrol engine.
5. Determination of FHP by retardation and motoring test on IC engine.
6. I.C. Engines heat balance.
7. Economical speed test of an IC engine.
8. Performance test on variable compression ratio engines.
9. Performance test on reciprocating air compressor unit.
10. Study of boilers
11. Dis-assembly / assembly of Engines.
12. Find out properties of fuel (Flash point, Fire point, Viscosity, Calorific value etc).
13. Determine COP of Refrigeration test rig.
14. Determine COP and tonnage capacity of Air conditioning test rig.

Outcomes:

The student will be able to calculate the various efficiencies, various horse powers and energy balance for several types of Internal Combustions Engines and compressors.

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/I	L	T	P	C
Course (Code)	**DYNAMICS OF MACHINERY (17130501)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	**Kinematics of Machinery**				

UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships, static and dynamic force analysis of four bar mechanism and slider crank mechanism.

UNIT – II

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction, film lubrication.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission,

UNIT – III

TURNING MOMENT DIAGRAMS: Dynamic force analysis of slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort and turning moment diagrams – fluctuation of energy – fly wheels and their design.

GOVERNERS: Watt, Porter and Proell governors, Spring loaded governors– Hartnell and Hartung with auxiliary springs. sensitiveness, isochronism and hunting.

UNIT – IV

BALANCING: Balancing of rotating masses single and multiple – single and different planes, use of analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. analytical and graphical methods, unbalanced forces and couples – examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT – V

VIBRATIONS: Free Vibration of spring mass system – oscillation of pendulums, centers of oscillation and suspension, transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems. Introduction to damped and forced vibrations.

Course Outcomes:

After completing this course, a successful student will be able to:

CO-1. Analyze stabilization of sea vehicles, aircrafts and automobile vehicle **(PO 1)**.
CO-2. Compute frictional losses, torque transmission of mechanical systems **(PO 2)**.

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CO-3. Analyze dynamic force analysis of slider crank mechanism and design of flywheel **(PO 6)**.
CO-4. Describe how to determine the natural frequencies of continuous systems starting from the general equation of displacement **(PO 7)**.
CO-5. Estimate the unbalanced forces in reciprocating and rotary masses **(PO 3).**

Text Books:

1. " Theory of Machines," S.S Ratan, Mc. Graw Hill Publ.

References:

1. " Theory of Machines," Thomas Bevan,.CBS Publishers
2. " Theory of machines," Khurmi, S.Chand.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔												✔			
CO2		✔												✔		
CO3						✔										✔
CO4							✔							✔		
CO5			✔												✔	

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/I	L	T	P	C
Course (Code)	**OPERATIONS RESEARCH (17130502)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Mathematics (Matrices, Random variables)				

UNIT –I:
Development, definition, characteristics and phases, types of operation research models, applications. ALLOCATION: Linear programming problem formulation, graphical solution, simplex method, artificial variables techniques, two–phase method, big-M method, multiple optimal solution, infeasibility, unbounded solution, duality principle.

UNIT – II:
TRANSPORTATION PROBLEM: Formulation, optimal solution, unbalanced transportation problem, degeneracy.
ASSIGNMENT PROBLEM: Formulation, optimal solution, variants of assignment problem- traveling salesman problem.
SEQUENCING – Introduction, flow –shop sequencing, n jobs through two machines, n jobs through three machines, job shop sequencing, two jobs through 'm' machines.
REPLACEMENT: Introduction – replacement of items that deteriorate with time, when money value is not counted and counted, replacement of items that fail completely, group replacement.

UNIT – III:
THEORY OF GAMES: Introduction – mini. max (max. mini) – criterion and optimal strategy, solution of games with saddle points, rectangular games without saddle points, 2 x 2 games, dominance principle, m x 2 & 2 x n games , graphical method.

UNIT-IV:
WAITING LINES: Introduction – single channel, Poisson arrivals, exponential service times, with infinite population and finite population models, multichannel, Poisson arrivals , exponential service times with infinite population single channel Poisson arrivals.
INVENTORY: Introduction – single item, deterministic models, purchase inventory models with one price break and multiple price breaks, shortages are not allowed.

UNIT – V:

DYNAMIC PROGRAMMING: Introduction – Bellman's principle of optimality, applications of dynamic programming, capital budgeting problem, shortest path problem, linear programming problem.
SIMULATION: Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages.

Course Outcomes: Upon completion of this course, a successful student will be able to:

CO-1: Formulate the Linear programming problem for real life problems. (PO4)

CO-2: Apply the Linear programming to solve problems. (PO1)

CO-3: Evaluate the Transportation, assignment, game, inventory, replacement, sequencing, queuing techniques for real life problems. (PO4)

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CO-4: Apply the dynamic programming to solve problems of discreet and continuous variables. (PO2)

CO-5: Design the solutions to real world problem and simulate. (PO3)

TEXT BOOKS:

1. "Operations Research," S.D.Sharma, Kedarnath, Ramnath &Co, 5 ed, 2008.
2. "Operations Research," H.A. Taha. An Introduction, PHI, 2008

REFERENCES:

1. "Operations Research Theory &Applications" J.K.Sharma, Macmillan, 5 ed, 2013.
2. "Operations Research," A.M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, 1 ed, 2005.
3. "Operations Research," Methods & Problems, Maurice Saseini, Arhur Yaspan & Lawrence Friedman.
4. "Operations Research," R.Pannerselvam, PHI Publications, 2 ed, 2009.
5. "Operations Research," S Kalavathy, Vikas Publishers, 4 ed, 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2	✔													✔		
CO3				✔												✔
CO4		✔											✔			
CO5			✔										✔			

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/I	L	T	P	C
Course (Code)	DESIGN OF MACHINE MEMBERS-I (17130503)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Strength of Materials				

UNIT – I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design, tolerances and fits –BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses – combined stresses – torsional and bending stresses – impact stresses – stress strain relation – various theories of failure – factor of safety – design for strength and rigidity – preferred numbers. the concept of stiffness in tension, bending, torsion and combined situations – static strength design based on fracture toughness.

UNIT – II

STRENGTH OF MACHINE ELEMENTS: Stress concentration – theoretical stress concentration factor – fatigue stress concentration factor notch sensitivity – design for fluctuating stresses – endurance limit – estimation of endurance strength – Good man's line – Soderberg's line – modified Good man's line.

UNIT – III

RIVETED AND WELDED JOINTS – Design of joints with initial stresses – eccentric loading.

BOLTED JOINTS – Design of bolts with pre-stresses – design of joints under eccentric loading – locking devices – both of uniform strength, different seals.

UNIT – IV

KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints- knuckle joints.

SHAFT COUPLING: Rigid couplings – muff, split muff and flange couplings, flexible couplings – flange coupling (modified).

UNIT – V

SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code. Use of internal and external circlips, gaskets and seals (stationary & rotary).

MECHANICAL SPRINGS:

Stresses and deflections of helical springs – extension -compression springs – springs for fatigue loading, energy storage capacity – helical torsion springs – co-axial springs, leaf springs.

Course outcomes:

After the successful completion of this course student will be able to:

CO - 1. Design procedure to engineering problems, including the consideration of technical and manufacturing constraints. (PO2)
CO-2. Select suitable materials and significance of tolerances and fits in critical design applications.(PO3)
CO-3 Utilize design data hand book and design the elements for strength, stiffness and fatigue.(PO8)
CO-4 Identify the loads, the machine members subjected and calculate static and dynamic stresses and ensure safe design (PO7)

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TEXT BOOKS:

1. Machine Design, V.Bandari, TMH Publishers
2. Machine Design PSG Data hand book

REFERENCES:

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.
3. Data books (1) PSG College of technology (2) Mahadevan

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔														
CO2			✔													
CO3								✔								
CO4							✔									

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/I	L	T	P	C
Course (Code)	**INSTRUMENTATION & CONTROL SYSTEM (17130504)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	BEEE				

UNIT – I

Definition – Basic principles of measurement – measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, classification and elimination of error.

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement – piezo electric, inductive, capacitance, resistance, ionization and photo electric transducers, calibration procedures.

UNIT – II

MEASUREMENT OF TEMPERATURE: Classification – ranges – various principles of measurement – expansion, electrical resistance – thermistor – thermocouple – pyrometers – temperature indicators.

MEASUREMENT OF PRESSURE: Units – classification – different principles used. Manometers, piston, Bourdon pressure gauges, bellows – diaphragm gauges. Low pressure measurement – thermal conductivity gauges

– Ionization pressure gauges, McLeod pressure gauge.

UNIT – III

MEASUREMENT OF LEVEL: Direct method – indirect methods – capacitive, ultrasonic, magnetic, cryogenic fuel level indicators – bubbler level indicators.

FLOW MEASUREMENT: Rota meter, magnetic, ultrasonic, turbine flow meter, hot – wire anemometer, laser Doppler anemometer (LDA).

MEASUREMENT OF SPEED: Mechanical tachometers – electrical tachometers – stroboscope, noncontact type of tachometer

Measurement of Acceleration and Vibration: Different simple instruments– principles of seismic instruments – vibrometer and accelerometer using this principle.

UNIT – IV

STRESS STRAIN MEASUREMENTS: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strain gauge rosettes.

MEASUREMENT OF HUMIDITY– Moisture content of gases, sling psychometer, absorption psychrometer, dew point meter.

MEASUREMENT OF FORCE, TORQUE AND POWER- Elastic force meters, load cells, torsion meters, dynamometers, proving ring.

UNIT – V

ELEMENTS OF CONTROL SYSTEMS: Introduction, importance – classification – open and closed systems, servomechanisms–examples with block diagrams–temperature, speed & position control systems.

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Course outcomes:

After completing this course, a successful student will be able to:

CO-1. Apply fundamental knowledge of science and various engineering principles for measuring different parameters. **(PO1)**

CO-2. Use the principles of design engineering, thermal engineering and production engineering to find out various parameters. **(PO2)**

CO-3. Solve inter disciplinary engineering problems by applying various techniques of thermal, design, automation technologies. **(PO4)**

TEXT BOOKS:

1. "Measurement Systems: Applications & design,"D.S Kumar, Metropolitan Book Co. (P) Ltd, 5 ed, 2015.
2. "Mechanical Measurements,"BeckWith, Marangoni,Linehard, PHI, 6 ed, 2007

REFERENCES:

1. "Measurement systems: Application and design,"Doeblin Earnest, O.Adaptation, Manik, Dhanesh, TMH, 5 ed, 2007
2. "Experimental Methods for Engineers," Holman, McGraw-Hill, 8 ed, 2011
3. "Mechanical and Industrial Measurements," R.K.Jain, Khanna Publishers, 2008.
4. "Instrumentation, measurement & analysis,"B.C.Nakra, K.K.Choudhary, TMH, 2 ed, 2006.

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔															
CO2		✔											✔			
CO3				✔										✔		

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/I	L	T	P	C
Course (Code)	THERMAL ENGINEERING-II (17130505)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Thermodynamics				

UNIT – I

BASIC CONCEPTS: Rankine cycle - schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance – regeneration & reheating. combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, stoichiometry, flue gas analysis.

UNIT II

BOILERS: Classification – working principles of water tube and fire tube boilers with sketches – mountings and accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – height and diameter of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

UNIT – III

STEAM NOZZLES: Function of a nozzle – applications - types, flow through nozzles, thermodynamic analysis – assumptions -velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

STEAM TURBINES: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity & pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency.

UNIT IV

REACTION TURBINE: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency – calculation of blade height.

STEAM CONDENSERS: Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump- cooling water requirement.

UNIT – V

GAS TURBINES: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed and semi-closed cycles – merits and demerits, types of combustion chambers.

JET PROPULSION: Principle of operation –classification of jet propulsive engines – working principles with schematic diagrams and representation on t-s diagram - thrust, thrust power and propulsion efficiency – turbo jet engines – needs and demands met by turbo jet – schematic diagram, thermodynamic cycle, performance evaluation, thrust augmentation – methods.

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Rockets: Application – working principle – classification – propellant type – thrust, propulsive efficiency – specific impulse – solid and liquid propellant rocket engines.

COURSE OUTCOMES:

After successful completion of this course student will be able to

CO-1. To find thermodynamic analysis of thermal power plants, Different methods to improve plant efficiency, different types of boilers, its application (PO-2)

CO-2. To compute performance evolutions of steam nozzles, condenser and turbines. (PO-3)

CO-3. To discriminate gas turbines working principle, different methods to improve thermal efficiencies of gas turbines, their applications on jet propulsion and to conduct their thermal analysis. (PO-6)

TEXTBOOKS:

1. "Gas Turbines"–V.Ganesan,TMH
2. "Thermal Engineering"-P.L.Bellaney,Khannapublishers.

REFERENCES:

1." Gas Turbines and Propulsive Systems", P.Khajuria & S.P.Dubey, Dhanpatrai
2." Thermal Engineering", R.SKhurmi, JSGupta,S.Chand.
3." Thermal Engineering", M.L.Marthur&Mehta,Jainbros

	PO1	PO2	PO3	PO4	PI5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔				✔							✔			
CO2		✔	✔			✔								✔		
CO3			✔			✔							✔	✔		✔

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech. - ME)/III/I	L	T	P	C
Course (Code)	METAL CUTTING & MACHINE TOOLS (17130506)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)	Material Science, Strength of Materials				

UNIT – I

FUNDAMENTALS OF MACHINING:

Elementary treatment of metal cutting theory – Elements of cutting process – Geometry of single point tool angles, chip formation and types of chips – Built up edge and its effects - chip breakers, mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, metal removal rate, tool life, heat generation in metal cutting, coolants, tool materials, machinability, economics of metal cutting.

UNIT –II

LATHE MACHINES:

Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and Capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes – tool layout and cam design for automats.

UNIT – III

SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working – principal parts – specifications, operations performed, machining time calculations.

DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices – twist drill– Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

MILLING MACHINES: Principles of working – specifications – classification of milling Machines – Principle features of horizontal, vertical and universal milling Machine, machining operations, types of cutters, and geometry of milling cutters – methods of indexing, accessories to milling machines.

UNIT –IV

FINISHING PROCESSES: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, diverse types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

UNIT - V

JIGS & FIXTURES: Principles of design of jigs and fixtures and uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, typical examples of jigs and fixtures.

INTRODUCTION TO CNC MACHINES: Working principle and classification.

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DEPARTMENT OF MECHANICAL ENGINEERING
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COURSE OUTCOMES:

After completing this course, a successful student will be able to:

CO-1. Calculate cutting force, time and power requirements of the machining processes. **(PO2)**

CO-2. Describe constructional and operational features of lathe, shaping, slotting, milling, drilling, boring, grinding and broaching machines. **(PO1)**

CO-3. Describe the working principles of CNC Machines. **(PO5)**

CO-4. Apply design principles of broaches, jigs and fixtures. **(PO3)**

TEXT BOOKS:

1. "A Course in Workshop Technology", B.S. Raghu Vamshi, Dhanpat Rai & Co., Vol. II, 10th Ed., 2012
2. "Production Technology: Manufacturing Processes, Technology and Automation", R.K. Jain, Khanna Publishers, 6th ed., 2004

REFERENCES:

1. "Manufacturing Technology: Metal Cutting and Machine Tools", P.N Rao, McGraw Hill Education, Vol. 2, 3rd ed., 2013
2. "Manufacturing Processes for Engineering Materials", Serope Kalpakjian, Steven R.Schmid, Pearson Education, 14th ed., 2016

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔													✔	
CO2	✔												✔			
CO3					✔									✔		
CO4			✔													✔

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Regulation/Year/Sem	GR17(B.Tech. - ME)/III/I	L	T	P	C
Course (Code)	**MACHINE TOOLS LAB (17130511)**	-	-	3	2
Teaching	**Total contact hours – 48**				
Prerequisite (s)	Material Science, Workshop Technology				

The following experiments will be carried out:

1. Step Turning operation on Lathe Machine
2. Taper Turning operation on Lathe Machine
3. Single Start Thread Cutting operation on Lathe Machine.
4. Multi Start Thread Cutting on Lathe Machine.
5. Eccentric Turning operation on Lathe Machine.
6. Surface Grinding operation on reciprocating table type horizontal spindle surface grinding machine.
7. Slot cutting on a Slotting Machine.
8. Cutting Dovetail Guide Ways on Shaping Machine.
9. Cutting Cylindrical Workpiece into Prismatic Bar on Shaping Machine.
10. Spur Gear cutting on Milling Machine.
11. Contour Milling using Vertical milling Attachment on universal milling machine.
12. Drilling operation on Radial Drilling Machine.
13. Study of Chip formation.
14. Shear angle determination in shaping operation.
15. Measurement of Cutting Forces using Tool Force Dynamometer.
16. Tool grinding on Tool and Cutter Grinding Machine.
17. Boring operation on Lathe Machine

COURSE OUTCOMES:

After completing this course, a successful student will be able to:

CO-5.	Perform metal Cutting operation on Lathe, Milling, Shaping, Slotting, Planing, Drilling and Grinding Machines. **(PO1)**
CO-6.	Measure Cutting Forces during Metal Machining. **(PO5)**
CO-7.	Study Shear Angle and Chip Formation in Metal Cutting operations. **(PO2)**

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔												✔			
CO2					✔											✔
CO3		✔													✔	

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech. - ME)/III/I	L	T	P	C
Course (Code)	THEORY OF MACHINES LAB (17130512)	-	-	3	2
Teaching	Total contact hours – 48				
Prerequisite (s)	Engineering mechanics, Theory of machines				

COURSE OBJECTIVE:

Objectives of this Theory of Machines lab are to give practical knowledge on design and analysis of mechanisms for the specified type of motion in a machine. With the study of rigid bodies motions and forces for the transmission systems, machine kinematics and dynamics can be well understood. Demonstration exercises are provided with wide varieties of transmission element models to understand machine kinematics. Various experiments with governors, gyroscopes, balancing machines and universal vibration facilities are available to understand machine dynamics.

The following experiments will be carried out:

1. study the gyroscopic effect of a rotating disc.
2. To find out the angular displacement of various cam follower pairs.
3. Determination of characteristics curves of various governors by universal governor.
4. To study undamped free vibrations of a spring.
5. To calculate equivalent spring stiffness for springs in series.
6. To study the natural vibrations of a spring mass system.
7. To study forced damped vibration of a spring mass system.
8. To study about Simple and Compound Screw Jack and measure various parameters
9. Determination of moment of inertia of Flywheel
10. Determination of the whirling speed of shaft
11. To calculate co-efficient of friction in-between the belt and pulley
12. Study the types of Gears
13. Study the Four Bar Mechanism
14. To show that a two mass system statistically balanced, but not dynamically balanced
15. To show simple dynamic balancing of a three mass system
16. To show simple dynamic balancing of a four mass system
17. To demonstrate balance of four bar system both statically, dynamically

COURSE OUTCOMES:

After completing this course, a successful student will be able to:

1. Understand gyroscopic effect, the angular displacement of various cam follower pairs.
2. To know about universal governor, vibrations of spring.
3. Study about spring mass system, types of gears
4. Can understand belt drives, four bar mechanism, mass balancing system.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/II	L	T	P	C
Course (Code)	FINITE ELEMENT METHODS (17130601)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Strength of Materials, Mathematics (Matrices, Differential Equations, Numerical integration), Heat transfer.				

UNIT –I: Introduction to finite element method, stress and equilibrium, strain – displacement relations, stress – strain relations, plane stress and plane strain conditions, variational and weighted residual methods, concept of potential energy, one dimensional problem. Discretization of domain, element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions.

UNIT – II: Analysis of Trusses: Finite element modeling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations. Analysis of Beams: Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.

UNIT – III: Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems.

UNIT-IV: Higher order and iso-parametric elements: One dimensional quadratic and cubic elements in natural coordinates, two dimensional four noded iso-parametric elements and numerical integration.

UNIT – V: Steady state heat transfer analysis: one dimensional analysis of a fin and two dimensional analysis of thin plate, analysis of a uniform shaft subjected to torsion. Dynamic Analysis: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

Course Outcomes: Upon completion of this course, a successful student will be able to:

CO-1. Describe the concepts behind variational methods and weighted residual methods in FEM.

CO- 2. Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements, and 3-D element.

CO- 3. Develop element characteristic equation procedure and generation of global stiffness equation will be applied.

CO-4. Apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.

CO-5. Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

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TEXT BOOKS:

1. "Introduction to Finite Elements in Engineering," Tirupathi R. Chandrupatla, Ashok D.Belegundu, Fourth edition, Pearson education, 2011.

2. "The Finite element method in engineering," S.S.Rao, 5th edition, Elsevier publications, 2010.

REFERENCES:

1. "An introduction to the Finite element method," JN Reddy, McGraw Hill Education, 3rd edition, 2005

2. "Finite Element Analysis: Theoryand Programming," C.S. Krishnamoorthy, Tata McGrawHill Education, 1995.

3. "Finite element analysis," S.S. Bhavikatti, New Age International, 2005.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2	✔													✔		
CO3				✔												✔
CO4		✔											✔			
CO5			✔										✔			

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/II	L	T	P	C
Course (Code)	CAD/CAM (17130602)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)	COMPUTER GRAPHICS				

UNIT – I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.
COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.
DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – III

PART PROGRAMMING FOR NC MACHINES: NC, NC modes, NC elements, CNC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming. Direct Numerical Control, Adaptive Control.

UNIT –I V

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages. Computer aided processes planning – importance, types
COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods- contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – V

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of manufacturing systems, machine tools and related equipment, material handling systems, material requirement planning, computer control systems, human labor in manufacturing systems, CIMS benefits.

Course Outcomes:

After completing this course, a successful student will be able to:

CO-1. Describe fundamentals of computer aided design, manufacturing and the mathematical basis in the technique of representation of geometric entities. **(PO1, PO2)**

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CO-2. Able to understand part programming codes for CNC machines and to list the various types of Group Technology and Computer aided Process planning. **(PO5, PO6)**

CO-3. Identify the various elements and their activities in the Computer Integrated Manufacturing Systems. **(PO4)**

TEXT BOOKS:

1.“CAD/CAM” E Zimmers & M. Groover, Pearson,1st edition,2003.
2.“Automation, Production systems & Computer integrated
3. Manufacturing**”** M. Groover, Pearson,4th edition,2016.

REFERENCES:

1. “CAD / CAM Theory and Practice”, Ibrahim Zeid & R. Sivasubrmnin, Mc grw Higher Ed, 1st edition, 2003.
2. “Principles of Computer Aided Design and Manufacturing”, Farid Amirouche,Prentice Hall, , 2nd edition, 2004.
3. “Computer Numerical Control Concepts and programming”, Warren S Seames, Delmar Cengage Lernings, 4th edition,2001.
4. “ Product manufacturing and cost estimation using CAD/CAE”, Kuang Hua Chang, Elsevier, 1st edition, 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔	✔														
CO2					✔	✔										
CO3				✔												

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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	DESIGN OF MACHINE MEMBERS– II (17130603)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Mechanics of solid				

UNIT – I

BEARINGS: Classification of bearings- applications, types of journal bearings – lubrication – bearing modulus – full and partial bearings – clearance ratio – heat dissipation of bearings, bearing materials – journal bearing design – ball and roller bearings – static loading of ball & roller bearings, bearing life.

UNIT – II

DESIGN OF ENGINE PARTS: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – cranks and crank shafts, strength and proportions of over hung and center cranks – crank pins, crank shafts.

Pistons, forces acting on piston – construction design and proportions of piston, cylinder, cylinder liners.

UNIT –III

DESIGN OF CURVED BEAMS: introduction, stresses in curved beams, expression for radius of neutral axis for rectangular, circular, trapezoidal and t-section, design of crane hooks, c –clamps**.**

UNIT – IV

POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by belt and rope drives , transmission efficiencies, belts – flat and v types – ropes - pulleys for belt and rope drives, materials, chain drives

DESIGN OF POWER SCREWS: Design of screw, square ACME, buttress screws, design of nut, compound screw, difference screw, ball screw – possible failures.

UNIT – V

SPUR & HELICAL GEAR DRIVES: Spur gears- helical gears – load concentration factor – dynamic load factor, surface compressive strength – bending strength – design analysis of spur gears – estimation of centre distance, module and face width, check for plastic deformation, check for dynamic and wear considerations.

MACHINE TOOL ELEMENTS: Levers and brackets: design of levers – hand levers-foot lever – cranked lever – lever of a lever loaded safety valve- rocker arm straight – angular- design of a crank pin – brackets- hangers- wall boxes.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Course outcomes:

At the end of the course Student will be able to

CO-1. The student will able to select the suitable bearing based on the application of the loads and predict the life of the bearing. (PO3)

CO-2. Design power transmission elements such as gears, belts, chains, pulleys, ropes, levers and power screws. (PO5)

CO-3. Design of IC Engines parts. (PO6AUto)

TEXT BOOKS:

1. Machine Design, V.Bandari, TMH Publishers
2. Machine Design, Pandya & Shaw, Charotar publishers

REFERENCES:

1. Machine Design / R.N. Norton
2. Data Books: (I) P.S.G. College of Technology(ii) Mahadevan
3. Mech. Engg. Design / JE Shigley

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			✔												✔	
CO2					✔										✔	
CO3						✔							✔			

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	BUILDING TECHNOLOGY (17130604a)	3	1	-	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of Building materials, basic ingredients of concrete, design of concrete material, durability of concrete, components of buildings are required. Basics of Various structures, Material requirement, Concrete under various environment.				

Course Learning Objectives:

The objective of the course is to expose the student to

- ***Know about Various construction materials and their products used in the building industry, their nature, characteristics and applications***.
- ***Building Byelaws and regulations, various components of buildings***
- ***Impart the knowledge of cement production, basic constituents/ingredients of cements and various types of cements.***
- ***Provide the knowledge of basic ingredients of concretes and its behaviour in various environments.***
- ***To know about different concepts of green technologies***
- ***Introduce the importance of safety in construction projects.***

Unit 1: **STONES, BRICKS, TIMBER**

Classification of stones, properties of building stones, classification of aggregates, composition of good brick, Manufacture of bricks, Tests on burnt bricks, size, weight, Colour of bricks, structure of a tree, seasoning of timber, defects in timber.

Unit 2: **CEMENT, LIME, STEEL**

Introduction, Chemical composition of cement, manufacturing of cement, Types of cement, Tests on cement, Chemical composition of lime, Classification of lime, Comparison of cement with lime, Steel: manufacturing of steel, types of steel, properties of steel.

Unit 3: CEMENT CONCRETE:

Chemical composition of concrete, grades of concrete, test of concrete-workability, factors affecting workability, test on workability, compressive strength, split tensile strength, flexural strength, segregation, bleeding, manufacturing process of fresh concrete.

Unit 4: BUILDING COMPONENTS

Terminology, objectives of building bye laws, FAR, FSI, open space requirement, built up area limitation, heights of buildings. Lintels, Arches, Vaults, Stair cases – Types. Different types of floors – concrete, Mosaic, Terrazzo Floors, Pitched, Flat roofs. Lean to Roof, Couple Roof.

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DEPARTMENT OF MECHANICAL ENGINEERING
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Unit 5: CONSTRUCTION METHODS AND SAFETY ENGINEERING

Earthwork, Fabrication and erection, Quality control and safety engineering.

Green technology: Introduction to Green technology, Advantages and Disadvantages, Factors affecting Green technology, role of industrial ecology in green technology.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- ***Describe the types and properties of various building materials -stones, clay products, Timber, metals, cement and concrete and their applications in building industry.***
- ***Explain principles of building planning***
- ***understand the basic concepts of concrete***
- ***Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field***
- ***Understand the principles of Energy efficient technologies***
- ***Appreciate the importance of construction planning.***
- ***Understand the functioning of various earth moving equipment***.

Text Books:

"Basic concepts in Civil Engineering by Dr.B.C. Punmia, Ashok K.Jain, Arun K.Jain Laxmi Publications(P) LTD.

"Engineering Materials", Rangwala, S.C, (36th edition),Anand Charotar Publishing House, 2009.

"Building planning and drawing", (3rd edition), Kumara swami & Kameswara rao, N., Anand Charotar Publishing House Pvt Ltd, 2010.

Concrete Technology by M.S.Shetty. – S.Chand & Co.; 2004.

References:

- Building Materials", S.K.Duggal, New Age International Publications.
- "Building Materials", P.C.Verghese, PHI learning (P) Ltd., 2009.
- Properties of Concrete by A.M.Neville – PEARSON – 4th edition
- Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw Hill International.

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	HYBRID VEHICLES (17130604b)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

INSTRUCTIONAL OBJECTIVES

1. Analyzing various aspects of hybrid and electric drive trains such as their configuration, types of electric machines that can be used, energy storage devices, etc.

2. Get exposed to research and development challenges involved in various types of fuel cells.

UNIT I - FUELCELL TECHNOLOGY

Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell) - Characteristics. Electrochemical energy conversion – Theoretical efficiency – Factors affecting electrochemical energy conversion- Helmholtz double layer model

UNIT II - FUEL CELL BASED VEHICLES STRUCTURE

PEMFC: Operating principle (membranes, electrodes and electrolysis, optimization of membrane and electrode assembly, impurities) – Technology development (single cell and stacks, composite plates) – Fuel processing – Modeling studies (membrane, electrode, membrane-electrode assembly, fuel cell, stack and system) – Technology development and applications. DMFC: Operating principle – Noble metal issue – Electro-oxidation of methanol (Catalysts, oxygen electroreduction, electrolyte, non-catalytic aspects) - Methanol crossover.

UNIT III - HYBRID ELECTRIC TECHNOLOGY

Impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

ELECTRIC DRIVETRAINS

Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency**.**

UNIT IV - HYBRID ELECTRIC VEHICLES

Principles of Hybrid Electric Drivetrains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - (Charge Sustaining, Charge Depleting), Practical Models – Toyota Prius, Honda Insight. Hybridization Effects. 42 V System for Traction Applications - Lightly Hybridized vehicles,

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Low –Voltage Storage System, Low –Voltage main system with High voltage bus for propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavy duty vehicles.

UNIT V - HYBRID VEHICLE TECHNOLOGY

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems. Energy Management Strategies in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology",* Anamaya Publishers, New Delhi.,2007.

2. Viswanathan, B. and Aulice Scibioh, M., *"Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.

3. Hoogers, G., Edr. *"Fuel Cell Technology Handbook*", CRC Press, Washington D. C., 2003.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.

2. Ali Emadi, Mehrdad Ehsani, John M. Muller, "*Vehicular Electric Power*

Systems", Marcel Dekker, Inc., 2004.

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	PRINCIPLES OF MANAGEMENT (17130604c)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

LEARNING OBJECTIVES

• To understand the evolution of management thought and its relevance in decision making.
• To highlight the detailed concepts of four basic functions which form the basis of Management
• To arouse participants' interest in the field of Management and its related areas
• To promote group interaction through class discussion.

Unit I:
Introduction to Management: Nature and scope of Management, Functions of Management Management as a Science, Art and Profession - Management & Administration - Principles of Management- Managerial roles: Mintzberg Model - Contributions of F.W.Taylor and Henry Fayol

Unit II:
Planning: Planning premises, types of plans and Planning process, Decision making meaning and importance-types of decision- steps in decision making, Forecasting technicques.

Unit III:
Organization: Structure, types of organizations, principles of organizing, Authority and span of control, delegation and decentralization, Line and staff relationship.

Unit IV:
Directing& Controlling: Nature and scope, Leadership- styles of Leadership; Co-ordination- types of interdependence. Controlling: Process of controlling- making controlling effective, -techniques of controlling.

Unit V:
Contemporary issues – (Brief Study) Quality Circle-Total Quality Management - Business Process Reengineering (BPR)- Six sigma.

COURSE OUTCOMES

On completion of this course the students would be able to
1. Understand theoretical aspects and its application to modern management practice by learning from management cases.
2. Demonstrate critical thinking when presented with managerial issues and problems
3. Understand the importance of Professional Management for effective utilization of resources in organizations.

TEXT BOOK

1. Heinz Weilrich, Mark V. Cannice& Harold Koontz, Management a Global and Entrepreneurial Perspectives. Tata McGraw-Hill Education, New Delhi. 2014. ..
2. Essential of Management - Horold Koontz and Iteinz Weibrich - McGrawhills International
3. Management Theory & Practice - J.N.Chandan 3. Essential of Business Administration - K.Aswathapa Himalaya Publishing House
4. Principles & practice of management - Dr. L.M.Parasad, Sultan Chand & Sons - New Delhi

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5. Business Organization & Management - Dr. Y.K. Bhushan
6. Management: Concept and Strategies By J. S. Chandan, Vikas Publishing
7. Principles of Management, By Tripathi, Reddy Tata McGraw Hill 8. Business organization and Management by Talloo by Tata McGraw

REFERENCES

1. Harold Koontz, "Essentials of Management", 8th Ed., Tata McGraw-Hill Education, New Delhi, 2014
2. Charles Hill, Steven McShane, "Principles of Management", TataMcGraw-Hill Education, New Delhi, 2014
3. Ricky W. Griffin, "Management", Cengage Learning, New Delhi, 2014

JOURNALS

1. Vikalpa, Indian Institute of Management, Ahmedabad
2. Journal of General Management, Mercury House Business Publications, Limited
3. Harvard Business Review, Harvard Business School Publishing Co. USA

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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	INTERNET OF THINGS (17130604d)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

Objectives:

1. Understand the Concepts of IOT Development Infrastructure.
2. Understand the principles of wired and wireless communication protocols
3. Understand the Threats and Securities issues in the development of IOT.
4. Understand the types of measurement errors and sensors.
5. Understand design and development of IOT Platform.

UNIT-I

Fundamental of IoT

Internet of things definition, IoT Functional view Internet of things today, Internet of things tomorrow, potential success factors, internet of things vision, future communication challenges-5G scenario, fundamental characteristics of IoT, IOT Layered Architecture, detailed IoT layered architecture, IoT Enabling technologies, IoT Smart Environment and smart space creation. IoT Applications and use case scenarios. Resource management for IoT.

UNIT-II

Communication Protocols for IoT

Wired Communication Protocols: I2C, SPI, One Wire,RS232, Ethernet, RS 485, UART, USART, USB,
Wireless Communication Protocols: Blue tooth, ZigBee, Z-Wave, LoWPAN, WiFi-ah, NFC, RFID),
Application Protocols MQTT, CoAP, HTTP.

UNIT-III

Threats, Security, Privacy and IoT Cloud

IoT as Interconnection of Threats: Phase attach, Attack as per Architecture, Attach based on Components.
Security Engineering for IOT Development: Building Security into design and development, Secure Design: Safety and Security Design, Processes and Agreements, Technology Selection.
Mitigating to Privacy Concern: Privacy Challenges introduced by IoT, Guide to perform PIA, PbD Principles, Privacy Engineering Recommendations
IOT Cloud: Concepts of Cloud, Your Organization and Cloud Computing, Cloud Computing Services (IaaS, PaaS , SaaS.
Case Study: ThingSpeak Cloud, Blynk Cloud, MQTT Cloud

UNIT-IV

Measurement Errors and Sensors

Measurement Errors: Gross Error, Systemic error, Absolute Error, Relative Error, Accuracy, Precision, Resolution, Significant Figure, Measurement Error Combinations, Basics of Statistical Analysis.
Sensors and Transducers: Passive and Active Sensors, Resistive Sensors, Capacitive Sensors and Inductive Sensors, Temperature Sensor, Humidity Sensor, Ultra-Sonic Sensor, IR Sensor, PIR Sensor, Vibration Sensor, Gas Sensor, Hall Effect Sensor.

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DEPARTMENT OF MECHANICAL ENGINEERING
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UNIT-V

Development Platform: Hardware, Software, Programming Language

Hardware: Arduino Uno Board, NodeMCU Board

Software Tools: Arduino IDE, Compilers, Cross-Compilers, Linkers, Libraries, Debuggers, Simulators, Emulators, Serial Monitor, Intel Hex File and Motorola Hex File Format.

Programming Language: Arduino Programming Structure, Data Types, Operators, Control Statements (IF, IF-ELSE, WHILE, DO-WHILE, FOR, SWITCH-CASE, SWITCH-CASE-BREAK, SWITCH-CASE-CONTINUE) and Precompiled Functions.

Case Studies: Home Automation, Agriculture 3.0, Health Care, Industry 4.0

Course Outcomes:

CO1. Learn about the IOT Development cycles, Challenges and Requirements.
CO2. Learn about the Wired and Wireless Communication Protocols implementation.
CO3. Learn about Privacy, Threats and Security challenges present in IOT and IoT Clouds.
CO4. Learn about types of measurement errors and its impact on measurement and various sensor operation and construction mechanism.
CO5. Learn about Development platform " Arduino IDE", Sensors Libraries and Programming. .

Text Books:

1. O.Vermesan, P.Friess, " Internet of Things-From Research and Innovation to Market Deployment", River Publishers, 2014.
2. B. Russell and D.VanDuren, "PracticalInternetofThingsSecurity", -PacktPublishing, 2016.
3. A. T. Velte, T. J. Velte, R.Elsenpeter, "Cloud Computing – A Practical Approach" Mg-Graw Hill, 2010.
4. R. B. Northrop, " Introduction to Instrumentation and Measurement" Second Edition, CRC Taylor and Francis 2005.
5. J.Balye, " C Programming for Arduino" Packt Publication, 2013.
6. K.V. Shibu, " Introduction to Embedded Systems", Tata Mg-Graw Hill, First Edition, 2009.

Web Links:

1. https://thingspeak.com
2. https://www.blynk.cc/getting-started
3. https://www.arduino.cc
4. https://mqtt.org
5. https://coap.technology

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	SOCIAL NETWORKING (17130604e)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

Course Objective(s)

- Understand the concept of semantic web and related applications
- Learn knowledge representation using antology
- Understand human behavior in social web and related communities
- Learn visualization of social networks.

UNIT-1

Introduction to Semantic Web: Limitations of current Web —Development of Semantic Web — Emergence of the Social Web — Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis — Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities — Web-based networks — Applications of Social Network Analysis,

UNIT-II

Modelling, Aggregating and Knowledge Representation-Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework — Web Ontology Language — Modelling and aggregating social network data: State-of-the-art in network data representation — Ontological representation of social individuals — Ontological representation of social relationships — Aggregating and reasoning with social network data — Advanced representations.

UNIT-III

Extraction and Mining Communities in Web Social Networks- Extracting evolution of Web Community from a Series of Web Archive — Detecting communities in social networks — Definition of community — Evaluating communities — Methods for community detection and mining — Applications of community mining algorithms — Tools for detecting communities social network infrastructures and communities — Decentralized online social networks — Multi- Relational characterization of dynamic social network communities.

UNIT-IV

Predicting Human behavior and Privacy Issues - Understanding and predicting human behavior for social communities - User data management — Inference and Distribution — Enabling new human experiences — Reality mining — Context — Awareness — Privacy in online social networks — Trust in online environment — Trust models based on subjective logic — Trust network analysis — Trust transitivity analysis - Combining trust and reputation — Trust derivation based on trust comparisons — Attack spectrum and countermeasures.

UNIT-V

Visualization and Applications of Social Networks- Graph theory — Centrality - Clustering — Node-Edge Diagrams — Matrix representation — Visualizing online social networks, Visualizing social networks with matrix-based representations — Matrix and Node-Link Diagrams — Hybrid representations — Applications — Cover networks - Community welfare — Collaboration networks Co-Citation networks.

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DEPARTMENT OF MECHANICAL ENGINEERING
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Text Books

1. Peter Mika, "Social Networks and the Semantic Web", , First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Ist Edition, Springer, 2010.

Reference Books

1. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking - Techniques and applications", First Edition Springer, 2011.

2. Dian Goh and Schubert Foo, "Social information Retrieval Systems: Emerging technologies and Applications for Searching the Web Effectively", IGI Global Snippet,2008.

3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.

4, John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	Subject GR 17(B.Tech-M.E)/III/II	L	T	P	C
Course (Code)	ENVIRORNMENTAL POLLUTION CONTROL (17130604f)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

Objectives:

1. To understand the mechanism of spontaneous heating in mines and Graham's Index etc.
2. To study about mine fires including classification of mine fires and preventive measures.
3. To study various types of explosion and inundation in mines
4. To study the methods of illumination and mine rescue operations

UNIT I

Air Pollution

Definition; Atmospheric consideration; Basic of metrology; Ozone layer and greenhouse effect; Contaminant dispersion; Sources of air pollution in mines; Effect of air pollution; Preventive Measures of air pollution in mines.

UNIT II

Water Pollution

Sources of water pollutants; Effect of water pollution; Water Pollution Modeling -Surface Water; Biological oxygen demand Modeling; Oxygen Demanding Waste in Streams; Chemical oxygen demand; Ground Water and its Contamination; Acid mine drainage; Waste Water Treatment.

UNIT III

Noise Pollution

Sources of noise pollution in mines; Effect of noise pollution; Measurement of noise; Noise standard and guidelines; Control measures of noise pollution; Noise induced hearing loss; Sound pressure and sound pressure level; Noise dose.

UNIT IV

Land Degradation

Causes of land degradation; Impact of mining activities on land; Land reclamation method- Rehabilitation, Reclamation, Restoration; Factor affecting the land restoration; Land reclamation planning.

UNIT V

Socio Economics Impact

Impact on society; Case studies on socio economics impact; Legislation relating to environmental protection; Visual impact due to mining; Environmental impact assessment.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Course Outcomes:

CO1: To apply the techniques to control spontaneous heating in mines.
CO2: To comprehend and apply the techniques to prevent and control mine fires.
CO3: To comprehend and apply the techniques to prevent explosion and inundation.
CO4: To comprehend and analyse the requirements of illumination and mine rescue operations.

Text Books:

1. Principles of Mine Panning by Jayant Bhattacharya
2. Principle and practices of modern coal mining by R.D. Singh, New Age International Publishers

Reference Books:

1. Peng, S.S. Ground Control, Wiley Publications, New York, 1987
2. Brady, B.H.G. and Brown, S.T. Rock Mechanics for Underground Mining, Chapman and Hall, 1993
3. Hoek, E. and Brown, S.T. Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B. Tech.-ME)/III/II	L	T	P	C
Course (Code)	HEAT TRANSFER (17130605)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)	Thermodynamics, Fluid Mechanics				

UNIT–I

INTRODUCTION: Modes and mechanisms of heat transfer – basic laws of heat transfer –General discussion about applications of heat transfer.

CONDUCTION HEAT TRANSFER: Fourier rate equation – general heat conduction equation in cartesian, cylindrical and Spherical coordinates. Steady, unsteady and periodic heat transfer – initial and boundary conditions.

ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – critical radius of insulation- Variable thermal conductivity – systems with heat sources or heat generation.

UNIT–II

ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER: Systems with negligible internal resistance – significance of biot and fourier numbers - chart solutions of transient conduction systems. Extended surface (fins) heat Transfer – long fin, fin with insulated tip and short fin, application to error measurement of temperature

CONVECTIVE HEAT TRANSFER: Classification of convective heat transfer – dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem for forced and free convection, application for developing semi – empirical non- dimensional correlation for convective heat transfer – Significance of non-dimensional numbers – concepts of continuity, momentum and Energy Equations.

UNIT–III

FREE CONVECTION: Development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for vertical plates and pipes.

FORCED CONVECTION

EXTERNAL FLOWS: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer-flat plates and cylinders.

INTERNAL FLOWS: Concepts about hydrodynamic and thermal entry lengths – division of internal flow based on this –use of empirical relations for horizontal pipe flow and annulus flow.

UNIT–IV

HEAT TRANSFER WITH PHASE CHANGE

BOILING: Pool boiling – regimes- calculations on nucleate boiling, critical heat flux and film boiling.

CONDENSATION: Film wise and drop wise condensation –nusselt's theory of condensation on a vertical plate - film condensation on vertical and horizontal cylinders using empirical correlations.

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HEAT EXCHANGERS:

Classification of heat exchangers – overall heat transfer coefficient and fouling factor – concepts of LMTD and NTU methods – Problems.

UNIT – V

RADIATION HEAT TRANSFER:

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

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

1. To apply heat conduction equations and overall heat transfer coefficients on practical problems. (PO-1)
2. To find the concepts of heat transfer and associated thermal boundary conditions to transform the physical system into a mathematical model, selecting an appropriate solution technique and evaluating the significance of results. (PO-2)
3. To design and analyze the performance of heat exchangers and evaporators (PO-3)

TEXTBOOKS:

1. "Heat Transfer", HOLMAN, TMH
2. "Heat Transfer", P.K.Nag, TMH

REFERENCEBOOKS:

1. "Heat and Mass Transfer", Cengel, McGraw-Hill.

2. "Heat and Mass Transfer", D.S. Kumar, S.K. Kataria &Sons.

	PO1	PO2	PO3	PO4	PI5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	√					√							√	√		
CO2		√				√							√		√	
CO3		√	√										√	√		

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B. Tech.-ME)/III/II	L	T	P	C
Course (Code)	ATOMOBILE ENGINEERING (17130606a)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)	Internal Combustion Engines				

UNIT I

INTRODUCTION: Components of a four-wheeler automobile, types of automobiles, Chassis types, power unit, power transmission, rear wheel drive, front wheel drive, Four wheel drive, Advantages and disadvantages, types of automobile engines, cylinder liners-dry and wet, naturally aspirated engines, turbo charging and super charging.

LUBRICATION SYSTEM: Necessity, functions of lubrication, properties of lubricants and grading, lubrication systems and types, oil filters, oil pumps, crankcase ventilation, waste oil disposal methods.

UNIT II

S.I. ENGINE FUEL SYSTEM: Fuel supply systems, Mechanical and electrical fuel pump, filters, simple carburetor and its functions, modern carburetors – Zenith & Solex, Air Filters, gasoline injection (GDI), Multipoint Fuel Injection system (MPFI), Selection of fuel injection system.

ENGINE FUEL SYSTEM: Requirements of diesel injection systems, types of injection systems, fuel pump- types, fuel injectors-types, Common Rail Direct Injection System (CRDI).

COOLING SYSTEM: Cooling Requirements, Air Cooling, Liquid Cooling, Types, Cooling Thermo, and Forced Circulation System, Radiators-Types, Cooling Fan, water pump, thermostat, antifreeze solutions.

UNIT III

IGNITION SYSTEM: Function of an ignition system, battery ignition system, auto transformer, contact breaker points, condenser and spark plug, Magneto coil ignition system, electronic ignition system (CDIS & TACIS), Ignition Timings- Ignition Advance and its necessity, Centrifugal Spark Advance Mechanism, Vacuum Advance Mechanism.

ELECTRICAL SYSTEM: Charging system, cut-off relay, starting system, Bendix drive, Horn, wiper, Fuel gauge, oil pressure gauge, and Engine temperature indicator electrical circuit of automobile.

UNIT IV

TRANSMISSION SYSTEM: Types of clutches -single plate, multi plate, and centrifugal clutches, fluid fly wheel, gear box- types, sliding mesh, constant mesh, synchromesh, over drive,
torque converter, Propeller shaft – Hotchkiss drive, Torque tube drive, universal joint, differential, rear axles.

UNIT V

STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toe-in, toe out, center point steering. Steering gears – types, steering linkages, Stub axle, power steering.

SUSPENSION SYSTEM: Elements of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension systems (Wishbone, Macpherson Strut).

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BRAKING SYSTEM: Types-Mechanical, Hydraulic, Pneumatic & Vacuum suspended servo-brake system, Brake fluids and properties.

COURSE OUTCOMES:

After completing this course, a successful student will be able to:

CO-1. Describe various components related to Automobiles. **(PO1, PO2)**
CO-2. Summarize lubrication system, Ignition system, Cooling system, Transmission system, Steering system, Suspension system and Braking system for Automobiles. **(PO5, PO6)**
CO-3. Apply system approach to optimize various systems for automobiles. **(PO2, PO3)**
CO-4. Appraise eco-friendly automobile design with advanced technology and society Requirements. **(PO3, PO7)**

TEXT BOOKS:

1. "Automobile Engineering", V.M Domkundwar, Dhanpatrai & Co, 1ed New Delhi, 2008.
2. "Automotive Mechanics", Kirpal Singh, Volume-I & Volume-II, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. "Automobile Mechanics", N. K. Giri, Khanna Publications.
2. "Automotive Mechanics", Heitner J, CBS Publications, 2 ed
3. "Automotive Mechanics", William H Crouse, McGraw Hill Education (India) Private Limited, 10 ed

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔	✔											✔			
CO2					✔	✔								✔		
CO3		✔	✔													
CO4			✔				✔									✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/II	L	T	P	C
Course (Code)	EXPERIMENTAL STRESS ANALYSIS (17130606b)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Strength of materials and Instrumentation				

UNIT-I

STRAIN MEASUREMENT AND RECORDINGS

Stress, strain, Plane stress and plane strain conditions, Compatibility conditions. Problems using plane stress and plane strain conditions, stress functions, mohrs circle for stress strain, Three-dimensional stress strain relations. Various types of strain gauges, Electrical Resistance strain gauges, semiconductor strain gauges, strain gauge circuits. Introduction, static recording and data logging, dynamic recording at very low frequencies, dynamic recording at intermediate frequencies, dynamic recording at high frequencies, dynamic recording at very high frequencies, telemetry systems.

UNIT – II

PHOTOELASTICITY: Two Dimensional Photo Elasticity, Photo Elastic Materials, Concept of Light – Photoelastic Effects, Stress Optic Law, Transmission Photoelasticity, Jones Calculus, Plane And Circular Polariscopes, Interpretation Of Fringe Pattern, Calibration Of Photoelastic Materials, Compensation And Separation Techniques, Introduction To Three Dimensional Photo Elasticity.

UNIT – III

BRITTLE COATING

Brittle coatings: Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

UNIT – IV

MOIRE TECHNIQUES

Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire- Fringes, experimental procedure and techniques.

UNIT – V

BIREFRINGENT COATINGS

Birefringent Coatings Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation methods.

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Course Outcomes:

After completing this course, a successful student will be able to:

CO-4. Employ elementary elasticity theory to cover the equilibrium, Compatibility, and three-dimensional relationships commonly used in experimental stress analysis. **(PO4)**
CO-5. Attentive of the overall concepts of stress/strain analysis by experimental means. **(PO3)**
CO-6. Familiar with the theory and practice of common experimental stress analysis methods including moiré methods, photo elasticity, moiré analysis, Brittle and bi-refrigent and strain gauges. **(PO6)**
CO-7. Implement the concepts of the theory of elasticity including: stress, strain, stress equilibrium, strain compatibility, constitutive relations, and three dimensional stress states. **(PO7)**

TEXT BOOKS:

1. "Experimental stress analysis," Dr. Sadhu Singh, Khanna Publishers, 6 ed.,1996.
2. "Experimental stress analysis," James Dally and Riley, Mc Graw Hill International, 3 ed, 1978.

REFERENCES:

1. " Experimental stress analysis," Holister, Cambridge university press, 1967.
2. " A treatise on Mathematical theory of Elasticity," Augustus Edward Hough Love, Universities Press, 4 ed, 1906.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2			✔												✔	
CO3						✔							✔			
CO4							✔									✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/II	L	T	P	C
Course (Code)	**INDUSTRIAL HYDRAULICS AND PNEUMATICS (17130606c)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Fluid Mechanics and Hydraulic Machines				

UNIT-I

FUNDAMENTALS OF FLUID POWER SYSTEMS: Introduction-types advantages, disadvantages & applications-fluid characteristics-terminologies used in fluid power-hydraulic symbols-hydraulic systems and components-sources- pumping theory-gear, vane & piston pumps.

UNIT-II

FLUID POWER ACTUATORS: Introduction-hydraulic actuators-hydraulic cylinders- types, construction, specifications and special types. hydraulic motors- working principle-selection criteria for various types-hydraulic motors in circuits- formulae-numerical problems.

UNIT-III

HYDRAULIC ELEMENTS IN THE DESIGN OF CIRCUITS: Introduction-control elements- direction control valve-check valve-pressure control valve-relief valve- throttle valve-temperature & pressure compensation-locations of flow control valve.

UNIT-IV

ACCUMULATORS & INTENSIFIERS: Types, size & function of accumulators- application & circuits of accumulators- intensifiers-circuit & applications.

DESIGN & DRAWING OF HYDRAULIC CIRCUITS: Introduction-case study & specifications-method of drawing a hydraulic circuit-hydraulic cylinder-quick return of a hydraulic cylinder.

PNEUMATIC SYSTEMS: Introduction-symbols used-concepts & components- comparison-types & specifications of compressors-arrangement of a complete pneumatic system-compressed air behavior-understanding pneumatic circuits-direction control valves.

UNIT-V

ELECTRO-PNEUMATICS: Introduction-Pilot operated solenoid valve-electrical connections to solenoids-electro pneumatic circuit switches-relays-solenoids- P.E converter-concept of latching. Applications-servo systems-introduction-closed loop, hydro-mechanical and electro hydraulic – conventional and proportional valves-characteristics of proportional and servo valves- PLC applications in fluid power – selected pneumatic / electro pneumatic circuit problems – failure and trouble shooting in fluid power systems.

Course Outcomes:

After completing this course, a successful student will be able to:

CO-8. Describe general concepts associated with Hydraulic and Pneumatic equipment as found in industry today. **(PO1)**
CO-9. Predict the failure and trouble shooting in fluid power systems. **(PO3)**
CO-10. Design and draw hydraulic circuits. **(PO2)**
CO-11. Explain electro pneumatic valves, circuits switches and accumulators and intensifiers**. (PO6)**

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TEXT BOOKS:

1. "Introduction to Hydraulics and Pneumatics" , S. Ilango and V. Soundararajan, PHI, 2 ed..,2012.
2. "Applied hydraulics and pneumatics", T. Sunder Selwyn & R.Jayendiran, Anuradha Publications.
3." Fluid Power with Applications", Anthony Esposito, PHI / Pearson Education, 4 ed.., 2005.

REFERENCES:

1. "Oil Hydraulics Systems- Principles and Maintenance", Majumdar, S.R, Tata McGraw Hill, 1 ed.., 2001
2. "Pneumatic Systems – Principles and Maintenance", Majumdar, S.R., Tata McGraw Hill, 2017.
3. "Basic Fluid Power", Dudelyt, A Pease and John J Pippenger, Prentice Hall, 2 ed.., 1987.
4. "Hydraulic and Pneumatic controls", Shanmuga sundaram.K, S.Chand, 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔												✔			
CO2			✔											✔		
CO3		✔													✔	
CO4						✔								✔		

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/II	L	T	P	C
Course (Code)	**METHOD ENGINEERING & WORK DESIGN (17130606d)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Industrial management				

UNIT-I

WORK STUDY: Concept of work and productivity – Productivity measurement - Methods study - Charting techniques – Elemental motions, THERBLIGS and principles of Motion Economy - Work measurement - Timing techniques - Introduction to predetermined motion time standards. - Concept of standard time and bench mark jobs.

UNIT – II

HUMAN FACTORS ENGINEERING: Introduction to ergonomics and human factors Engineering - physiological basis of human performance - Biomechanics - Psychology of work and work load perception - Physical work environment - Basis of ergonomic problem identification - Safety.

UNIT - III

ORGANIZATION AND METHODS: Procedure, analysis and developing office standards - MTM application to office work - Forms design and control - Records management.

UNIT – IV

VALUE ENGINEERING: VE concepts, Principles, Methodologies and standards - Methods of functional analysis.

UNIT – V

JOB EVALUATION AND INCENTIVE SCHEME: Job description and job analysis - Job evaluation - different methods - Individual and group incentive concepts and implications - Different types of incentive schemes.

Course Outcomes:

After completing this course, a successful student will be able to:

CO-12. Analyze the fundamental concepts of work systems and work study. **(PO4)**
CO-13. Apply different types of engineering work methods such as charting and diagrams techniques in operations and job analysis. **(PO7)**
CO-14. Apply various types of engineering work measurements such as direct time study, predetermined motion time systems (PMTs), Standard Data Systems, work sampling in analyzing time of tasks. **(PO6)**
CO-15. Attain a grasp of the fundamental principles of experimental design, collection of data related to work study, and their analysis and interpretation. **(PO3)**

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TEXT BOOKS:

3. "Methods, Standards and Work Design," Benjamin W. Niebel and Andris Freivalds, WCB McGraw Hill, 1 ed.,1999.
4. "Introduction to Work Study," I.L.O, 3 ed, 1986.

REFERENCES:

1. " Compendium on Value Engineering," Tufty, H.G, The Indo-American Society, 1983
2. " Compensation Administration," Belchar, David,W., Prentice Hall.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2							✔								✔	
CO3						✔							✔			
CO4			✔													✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/III/II	L	T	P	C
Course (Code)	SOFT SKILLS- 2 (17130607)	1	-	2	1
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be consistent with global employment scenario and professional communicative skills				

Course Objectives: To help the students
1. Participate in group discussions with confidence and to make effective presentations.
2. With- resume packaging, preparing and facing interviews.
3. Build an impressive personality through effective time management and goal setting, self-confidence and assertiveness.
4. Understand, what constitutes proper grooming and etiquette in a professional environment.

(Title: Employability Skills)

Unit-1

Communicative Competence – The Art of Communication, basic grammar, personal SWOT Analysis, analyzing audience, role of emotions and body language in communication-Effective listening skills, using English in different situations (C.O.3)

Unit-2

Group Discussion – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence-Elements of effective presentation – Structure of presentation – Presentation tools (C.O.1)

Unit-3

Interview Skills – Resume' writing – structure and presentation, planning, defining the career objective, projecting strengths and skills-pre-interview planning, opening strategies, answering strategies, mock interviews (C.O.2)

Unit-4

Personality Development Through Soft Skills – Effective Time Management, setting realistic goals, Decision making, self confidence and assertiveness, stress management, moral values, success stories of great business people, Steve Jobe, Chanda Kocher, Warren Buffet, Indra Nuyi.(C.O.3)

Unit- 5

Technical Communication: Report writing: Importance, structure, drafting of reports, Business Writing: Sales letters, notices, agenda and minutes of the meeting (C.O.1)

Course Outcomes: The students will be able to

1. Be effective communicators and participate in group discussions with confidence. Also be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.

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3. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
4. Make the transition smoothly from campus to corporate.

Prescribed Text:

1. **English and Soft Skills by Prof. Dhanvel, Orient Blackswan, 2012.**

Suggested Reading:

2. **Soft Skills by Alex Ben, S Chand Publications.**
3. **Personality Development and Soft Skills - Barun K Mithra, Oxford Publications.**
4. **Technical Communication – Principles and Practice by Meenakshi Raman, Sangeeta Sharma, Oxford Publications.**
5. **Effective Technical Communication – Ashraf Rizvi, Mc. Grawhill Publications.**

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Regulation/Year/Sem	GR17(B.Tech.-ME) III/II	L	T	P	C
Course (Code)	**HEAT TRANSFER LAB (17130611)**	-	-	3	2
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Thermodynamics				

Course Objectives:

The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer including condensation & boiling for several geometries.

1. Determination of overall heat transfer co-efficient of a composite slab.
2. Determination of heat transfer rate through a lagged pipe.
3. Determination of heat transfer rate through a concentric sphere.
4. Determination of thermal conductivity of a metal rod.
5. Determination of efficiency of a pin-fin.
6. Determination of heat transfer coefficient in natural convection.
7. Determination of heat transfer coefficient in forced convection.
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzman constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Demonstration of heat pipe.
14. Study of two – phase flow.
15. Determination of the heat transfer coefficient, fin efficiency and temperature distribution of a pin-fin.
16. Find Heat transfer in natural convection in tube.

Course Outcomes: The student should be able to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries and should be able to compare the performance of extended surfaces and heat exchangers.

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Regulation/Year/Sem	GR17(B.Tech.-ME) III/II	L	T	P	C
Course (Code)	SIMULATION LAB (17130612)	-	-	3	2
Teaching	Total contact hours - 64				
Prerequisite (s)	CAEDP				

Objectives:

To make the students learn:

1. To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for Engineering Simulation.
2. To know various fields of engineering where these tools can be effectively used to improve the output of a product.
3. To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools.

1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. representation of dimensioning and tolerances scanning and plotting. study of script, DXE and IGES files.

2. **PART MODELING:** Generation of various 3D models through protrusion, revolve, shell sweep. creation of various features. study of parent child relation. feature based and Boolean based modeling surface and assembly modeling. study of various standard translators. design simple components.

3. a) Determination of deflection and stresses in 2D and 3D trusses and beams.

b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.

c) Determination of stresses in 3D and shell structures (at least one example in each case)

d) Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.

e) Steady state heat transfer Analysis of plane and Axisymmetric components.

4. a) Development of process sheets for various components based on tooling Machines.

b) Development of manufacturing and tool management systems.

c) Study of various post processors used in NC Machines.

d) Development of NC code for free form and sculptured surfaces using CAM packages

e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.

f) Quality Control and inspection.

Packages to be provided to cater to drafting, modeling & analysis from the following:

Auto CAD, MicroStation, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

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Course outcomes:

1. Upon successful completion of this course student should be able to:
2. Apply the tools like ANSYS or FLUENT in solving real time problems and day to day problems.
3. Use tools for any engineering and real time applications.
4. Utilize these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**POWER PLANT ENGINEERING (**17130701**)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Thermal Engineering				

UNIT - I

INTRODUCTION: Introduction to the sources of energy - resources and development of power in India – Power Generation concepts.

STEAM POWER PLANT: Plant layout, Design of plant layout, working of different circuits, fuel and handling equipment's, coal handling, coal storage, ash handling systems. Coal Combustion: properties of coal - overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, advantages & disadvantages, - Ball Mills – Bowl Mills - combustion needs and draught system, cyclone furnace, design and construction, dust collectors, ESPs - cooling towers - and feed water treatment.

UNIT - II

DIESEL POWER PLANT: Plant layout with auxiliaries - fuel supply system, air starting equipment, super charging – Advantages and Disadvantages. **GAS TURBINE PLANT:** Introduction – components of Gas Turbine - classification – Gas power plant layout with auxiliaries, combined cycle power plants and comparison. **HYDRO ELECTRIC POWER PLANT:** Water power - hydrological cycle - / flow measurement - drainage area characteristics - hydrographs - storage and pondage - classification of dams and spill ways – Typical Hydro Electric Power Plant operation. **HYDRO PROJECTS AND PLANT:** Classification - typical layouts - plant auxiliaries - plant operation -pumped storage plants.

UNIT - III

NUCLEAR POWER STATION: Nuclear Energy-Fission, Fusion Reaction Nuclear fuel - breeding and fertile materials - nuclear reactor - reactor operation. Environmental Considerations.

TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding - radioactive waste disposal.

UNIT - IV

COMBINED OPERATIONS OF DIFFERENT POWER PLANTS:

Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, pump storage plant in combination with steam or nuclear power plant, co-ordination of hydro- electric and gas turbine stations, co-ordination of hydro-electric and nuclear power stations, co-ordination of different types of power plants.

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POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O_2 and CO_2 measurements, measurement of smoke and dust, measurement of moisture in carbon dioxide circuit, nuclear measurements.

UNIT - V

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: General arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor - related calculations. Costs associated with Power Production. Effluents from power plants and their Impact on environment - pollutants and pollution standards - methods of pollution control.

Course Outcomes:

After completing this course, a successful student will be able to:

CO-16. Select Suitability of the site for a power plant and calculate performance, load factor, average load and peak load on a power plant (**PO2)**
CO-17. Compare the operation of different types of power plants. **(PO6)**
CO-18. Analyze safety and environmental aspects of different power plants. **(PO7)**

TEXT BOOKS:

5. " A course in Power Plant Engineering," Arora and Domkundwar, Dhanpatrai & Co.
6. " Power Plant Engineering," P.C. Sharma / S.K. Kataria Pub

REFERENCES:

1. "Power Plant Engineering," P.K. Nag, TMH, 2 ed.
2. "Power station Engineering," ElWakil, McHill .
3. "An Introduction to Power Plant Technology," G.D. Rai

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔														
CO2						✔								✔		
CO3							✔									✔

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**METROLOGY (**17130702**)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Manufacturing Process				

UNIT-I

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, limits, tolerances, deviations, fits - Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, determistic & statistical tolerancing, selective assembly. International standard system of tolerances, selection of limits and tolerances for correct functioning.

UNIT-II

LINEAR MEASUREMENT: Length standards, end standards, slip gauges- calibration of the slip gauges, dial indicators, micrometers.

MEASUREMENT OF ANGLES AND TAPERS:

Different methods – bevel protractor, angle slip gauges- angle dekkor- spirit levels- sine bar- sine table, rollers and spheres used to measure angles and tapers.

LIMIT GAUGES:

Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges.

UNIT-III

OPTICAL MEASURING INSTRUMENTS: Tools maker's microscope and uses - autocollimators, optical projector, optical flats and their uses.

INTERFEROMETRY:

Interference of light, Michaleson's interferometer, NPL flatness interferometer, and NPL gauge interferometer.

UNIT-IV

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness –Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, Method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

COMPARATORS: Types - mechanical, optical, electrical and electronic, pneumatic comparators and their uses.

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GEAR MEASUREMENT: Nomenclature of gear tooth, tooth thickness measurement with gear tooth vernier & flange micro meter, pitch measurement, total composite error and tooth to tooth composite errors, rolling gear tester, involute profile checking.

UNIT – V

SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads- concept of virtual effective diameter, measurement of effective diameter, angle of thread and thread pitch, and profile thread gauges.

FLATNESS MEASUREMENT:

Measurement of flatness of surfaces- instruments used- straight edges- surface plates – auto collimator.

MACHINE TOOL ALIGNMENT TESTS: Principles of machine tool alignment testing on lathe, drilling and milling machines.

Course outcomes:

After completing this course, a successful student will be able to:

CO-1. Inspect the engineering instruments**. (PO4)**
CO-2. Choose appropriate method for calibration**. (PO2)**
CO-3. Design the fits and tolerances for quality product **(PO1)**

TEXT BOOKS:

1. "Engineering Metrology", R.K.Jain,Khanna Publishers

2. "Engineering Metrology", Mahajan, Dhanpat Rai Publishers

REFERENCE BOOKS:

1. "Dimensional Metrology", Connie Dotson, Cengage Learning.

2. "Engineering Metrology", I.C.Gupta, Dhanpat Rai Publishers.

3. "Precision Engineering in Manufacturing", R.L.Murthy,New Age.

4. "Engineering Metrology and Measurements", NV Raghavendra, L Krishna murthy, Oxford publishers.

5. "Engineering Metrology", KL Narayana, Scitech publishers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2		✔													✔	
CO3	✔												✔			

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Regulation/Year/Sem	GR17(B. Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**REFRIGERATION AND AIR-CONDITIONING (17130703)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)	Thermodynamics and Thermal Engineering				

UNIT-I

INTRODUCTION TO REFRIGERATION*:* Necessity and applications – unit of refrigeration and COP.– Mechanical refrigeration – types of ideal cycles of refrigeration. air refrigeration: Bell-Coleman cycle - open and dense air systems – refrigeration systems used in air-crafts and problems.

UNIT- II

VAPOUR COMPRESSION REFRIGERATION: Simple vapour compression refrigeration cycle – COP – representation of cycle on T-s and P-h charts – effect of sub-cooling and super heating – cycle analysis – use of p-h charts – numerical problems

VAPOR ABSORPTION SYSTEM: Calculation of maximum COP – description and working of NH_3 – water system and Li Br –water (Two shell & Four shell) System, principle of operation three fluid absorption system

STEAM JET REFRIGERATION SYSTEM: Working Principle and basic components. Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube.

UNIT- III

REFRIGERANTS: Desirable properties – classification of refrigerants – nomenclature – secondary refrigerants –effect on ozone depletion– lubricants

REFRIGERATION EQUIPMENTS: Compressors- Types of compressors. Condensers – Types of condensers. Evaporators – Types of Evaporators. Expansion Devices – Types of expansion devices.

UNIT – IV

INTRODUCTION TO AIR- CONDITIONING: Psychometric Properties & Processes– Relations– Characterization of Sensible heat and latent heat loads – Heat load concepts: RSHF, GSHF –Problems.

A/C Systems*:* Summer A/C –Winter A/C –Year round A/C–Central A/C– Unitary A/C systems.

UNIT – V

FUNDAMENTALS OF AIR-CONDITIONING: Requirement of the human comfort – Concept of Effective Temperature – Comfort Chart – Comfort Air-Conditioning, Need for ventilation, Consideration of Infiltrated air.

AIR-CONDITIONING EQUIPMENT AND APPLICATIONS: Humidifiers–Dehumidifiers – Air filters– fans and blowers, grills and registers, ducts–supply ducts–outlets–return outlets.

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COURSE OUTCOMES:

After completing this course, a successful student will be able to:

CO-1. Describe the basic working of refrigeration and air conditioning systems. **(PO1, PO2, PO3, PO4, PO6**)

CO-2. Summarize the various equipment's of refrigeration and air conditioning systems. **(PO1, PO2)**

CO-3. Judge appropriate eco-friendly refrigeration and air conditioning methods for domestic and industrial applications**. (PO7)**

CO-4. Analyze the performance of R&AC systems with the usage of advanced technologies on industrial growth. **(PO1, PO3, PO4, PO6, PO9)**

TEXT BOOKS:

1. "A Corse in Refrigeration and Air Conditioning", S.C. Arora & Domkudwar, Dhanapat Rai Publications, New Delhi.
2. "Refrigeration and Air Conditioning", C.P. Arora, Tata McGraw Hill.

REFERENCES:

1. "A Text book of Refrigeration and Air-Conditioning", R S Khurmi, S C Chand Publications.
2. "Refrigeration and Air Conditioning", Manohar Prasad, New Age Publishers.
3. "Refrigeration and Air Conditioning", Wilbert F. Stoecker, Jerold W. Jones, McGraw Hill, 1982.

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔	✔	✔	✔		✔								✔		
CO2	✔	✔											✔			
CO3							✔								✔	
CO4	✔		✔	✔		✔			✔							✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**UNCONVENTIONAL MACHINING PROCESSES (17130704)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Manufacturing Technology I & II				

UNIT – I

INTRODUCTION: Need for non-traditional machining methods - classification of modern machining processes – considerations in process selection, applications.

ULTRASONIC MACHINING – Elements of the process, mechanics of material removal, material removal rate (MRR) process parameters, economic considerations, applications and limitations.

UNIT – II

ELECTRO CHEMICAL MACHINING (ECM): Fundamentals of ECM, electro chemical grinding, electro chemical honing and deburring process, MRR in ECM, tool design, surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate, fundamentals of chemical, machining, advantages and applications.

UNIT - III

THERMAL METAL REMOVAL PROCESSES: General principle and applications of Electric Discharge Machining (EDM), Electric Discharge Grinding and wire EDM – Power circuits for EDM, mechanics of metal removal in EDM, process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface.

UNIT – IV

ELECTRON BEAM MACHINING, LASER BEAM MACHINING AND PLASMA MACHINING: Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications

UNIT-V

ABRASIVE JET MACHINING, WATER JET MACHINING AND ABRASIVE WATER JET MACHINING: Basic principles, equipment, process variables, mechanics of material removal, MRR, applications and limitations.

Magnetic abrasive finishing, abrasive flow finishing.

Comparison of various unconventional machining processes based on Material Removal Rate, surface finish, efficiency and cost.

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Course Outcomes:

Upon completion of this course, the student can able to:

CO-19. Develop an understanding to the need, working principles and the mechanism of material removal in the modern machining processes. **(PO4)**

CO-20. Solve the practical problems related to selection of suitable unconventional machining method for the given machining process and for the given material. **(PO7)**

CO-21. To know the influence of various process parameters on the performance and the applications. **(PO6)**

TEXT BOOK:

1. "Advanced Machining Processes", V. K. Jain, Allied Publishers Pvt. Ltd., New Delhi, 2007
2. "Fundamentals of Modern Manufacturing", Mikell P Groover, WileyPublications- 3 ed.

REFERENCES:

1. "Modern Machining Process", Pandey P.C. and Shah H.S.., TMH.
2. "New Technology", Bhattacharya A, The Institution of Engineers, India 1984

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔													✔	
CO2	✔												✔			
CO3					✔									✔		
CO4			✔													✔

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17 (B.Tech.) IV/I	L	T	P	C
Course (Code)	ROBOTICS (17130705)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Kinematics of machines /Dynamics of machines /mathematics: matrices, differential equations				

UNIT – I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system. Robot applications in manufacturing

UNIT II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.
MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT –I V

Differential transformation and manipulators, Jacobians – problems, Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT – V

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.
ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

.

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

CO-1. Identify various robot configuration and components. (PO4)
CO-2. Select appropriate actuators and sensors for a robot based on specific application. (PO6)
CO-3. Solve kinematic and dynamic problems for simple serial kinematic chains. (PO7)
CO-4. Plan trajectory for a manipulator for avoiding obstacles. (PO5)

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TEXT BOOKS:

1. "Industrial Robotics", Groover M P,Mitchell Weiss,Roger N. Nagel,Tata McGraw-Hill,india,edition-3,2008 /Pearson Education.
2. "Robotics and Control" R K & Nagrath I J / Tata McGraw-Hill,india,edition, 2003.

REFERENCES:

1. "Robotics" K .S. Fu,R.C.Gonzalez,C.S.G.Lee ,Tata McGraw-Hill,india,edition-2, 2008.
2. "Robotic engineering: an integrated approach", Richard David Klafter , Thomas A. Chmielewski, Michael Negin, Prentice Hall, 1989

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔											✔		
CO2						✔										✔	
CO3							✔										✔
CO4					✔									✔			

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**METAL FORMING THEORY AND PRACTICE (17130706a)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)	Engineering Mechanics, Manufacturing Technology				

UNIT – I

Review of two dimensional stress and strain, state of stress in three dimensions, Stress tensor, Invariants, Mohr's circle for 3-dimensional state of stress, strain at a point Mohr's circle for strain, Hydrostatic & Deviatory components of stress, Elastic stress strain relations.

UNIT – II

Elements of theory of plasticity; Flow curve, True stress & true strain, Yield criteria for ductile metals, Von Misses & Teresa yield criteria, combined stress tests. The yield locus, Anisotropy in yielding, Yield surface, levy-Misses, Prandtl-Reuss Stress-Strain relation, Classification of forming processes variables in metal forming and their optimization

UNIT - III

Analysis of deformation processes- Method based on homogeneous compression slip line field theory, Upper bounds and lower bounds, Slab method of analysis.

UNIT – IV

Flow stress determination, Hot working, Cold working, Strain rate effect, Friction and lubrication, Deformation zone geometry, Workability, Residual stress

UNIT-V

Analysis of metal forming processes, forging: Load calculation in plane strain forging, Rolling: Forces & geometrical relationship in rolling, rolling load and torque in cold rolling, Von-Karman work equation, Extrusion: Analysis of extrusion process, extrusion pressure.

Course Outcomes:

Upon completion of this course, a student able to:

CO-1. Develop an understanding to the various metal forming techniques. **(PO4)**
CO-2. The theory of plasticity and its application for analyzing various metal forming Processes. **(PO7)**
CO-3. Describe the advancement in forming technologies. **(PO6)**

TEXT BOOK:

1. "Mechanical Metallurgy", Dieter, Mc Graw Hill Book Co. 3rd ed.,
2. "Plasticity", J. Chakraborty, McGraw Hill Co. 3rd ed.,

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REFERENCES:

1. "Engineering Plasticity" BY- Johson & Mellor, Van Nostrand.
2. "Metal working" Avitzur, Mc Graw Hill.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔														
CO2			✔													
CO3								✔								
CO4							✔									

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Regulation/Year/Sem	GR17(B.Tech.)/IV/I	L	T	P	C
Course (Code)	MECHATRONICS (17130706b)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	BEEE				

UNIT – I

Mechatronics systems – elements & levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT II

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT – III

Hydraulic and pneumatic actuating systems - Fluid systems, Hydraulic systems, and pneumatic systems, components, control valves, electro- pneumatic, hydro-pneumatic, electro-hydraulic servo systems. Mechanical actuating systems and electrical actuating systems – basic principles and elements.

UNIT –I V

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT – V

System and interfacing and data acquisition – Data Acquisition Systems, Analog to Digital and Digital to Analog conversions; Digital Signal Processing – data flow in DSPs, block diagrams, typical layouts, Interfacing motor drives.

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trends.

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

CO-1. Develop a simulation model for simple physical systems and explain mechatronics design process (PO12)

CO-2. Use the various mechatronics systems devices and components in the design of electro mechanical systems. (PO5)

CO-3. Application of fourier series and fourier transform in the field of communication and signal processing (PO6)

CO-4. Design mechatronics component, system or process to meet desired needs. (PO3)

TEXT BOOKS:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran & GK Vijaya Raghavan/WILEY India Edition/2008

2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering? W Bolton/ Pearson Education Press/3rd edition, 2005.

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REFERENCES:

1. "Mechatronics" Source Book by Newton C Braga, ThomsonPublications, Chennai,edition ,2009 .
2. Mechatronics — Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition, Pearson, 2012 VV. Bolton

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1												✔				✔
CO2					✔									✔		
CO3						✔							✔			
CO4			✔												✔	

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**COMPUTATIONAL FLUID DYNAMICS (17130706c)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Basic Mathematics, Fluid Mechanics & Heat Transfer				

UNIT-I

ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: Number system a n d errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, conditioning and numerical instability, computational methods for error estimation, convergence of sequences.

UNIT – II

APPLIED NUMERICAL METHODS: Solution of a system of simultaneous linear algebraic equations, iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for banded matrices.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-Stokes equations, conservation of energy principle, special forms of the Navier-Stokes equations.

UNIT - III

Steady flow, dimensionless form of momentum and energy equations, Stokes equation, conservative body force fields, stream function - vorticity formulation.

Finite difference applications in heat conduction and convention – heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT – IV

Finite differences, discretization, consistency, stability and fundamentals of fluid flow modeling, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT – V

FINITE VOLUME METHOD: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

Course Outcomes:

After completing this course, a successful student will be able to:

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CO-22. Develop an understanding for the major theories, approaches and methodologies used in CFD. **(PO4)**

CO-23. Solve problems in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modelling etc.) in using commercial CFD codes. **(PO7)**

CO-24. Perform the application of CFD analysis to real engineering designs. **(PO6)**

CO-25. Apply various numerical tools like finite volume, finite difference etc. for solving the different fluid flow problems. **(PO3)**

TEXT BOOKS:

7. "Numerical heat transfer and fluid flow," Suhas V. Patankar, CRC press, 1 ed.,2017.
8. "Computational fluid dynamics-Basics with applications," John. D.Anderson, Mc Graw Hill, 3 ed, 2008.

REFERENCES:

1. "Computational Fluid Flow and Heat Transfer," Niyogi P, Pearson Publications, 2006.
2. " Fundamentals of Computational Fluid Dynamics," Tapan K. Sengupta, Universities Press, 2004.
3. "Computational fluid dynamics," John Wendt, Springer publishers, 3 ed, 2012.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2							✔								✔	
CO3						✔							✔			
CO4			✔													✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	**AUTOMATION IN MANUFACTURING (17130706d)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	**Manufacturing Processes**				

UNIT – I

INTRODUCTION: Types and strategies of automation, pneumatic and hydraulic components, circuits, automation in machine tools, mechanical feeding and tool changing and machine tool control.

AUTOMATED FLOW LINES: Methods of part transport, transfer mechanism, buffer storage, control function, design and fabrication considerations.

UNIT –II

ANALYSIS OF AUTOMATED FLOW LINES - General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

ASSEMBLY SYSTEM AND LINE BALANCING: Assembly process and systems, assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – III

AUTOMATED MATERIAL HANDLING and STORAGE SYSTEMS: Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT –IV

ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations. Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

UNIT - V

AUTOMATED INSPECTION: Fundamentals types of inspection methods, procedure, accuracy and equipment. Coordinate Measuring Machines: Constructional detail, Programming and Operation, Machine Vision.

Course Outcomes:

After completing this course, a successful student will be able to:

CO.1.Solve the line balancing problems in the various flow line systems with and without use buffer storage. (PO3)

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CO.2.Describe different automated material handling, storage and retrieval systems and automated inspection system (PO4)
CO.3.Describe use of adaptive control principles in the online inspection and control. (PO5 &PO6)

TEXT BOOKS:

1. Elements of Production Planning and Control / Samuel Eilon.
2. Manufacturing, Planning and Control, Partik Jonsson, Stig-Arne Mattsson, Tata Mc Graw Hill.

REFERENCES:

1. Inventory Control Theory and Practice / Martin K. Starr and David W.Miller.
2. Production Planning and Control, Mukhopadyay, PHI.
3. Production Control A Quantitative Approach / John E. Biegel.
4. Production Control / Moore.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			✔											✔		
CO2				✔											✔	
CO3					✔	✔							✔			

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	IPR & PATENTS (17139707)	2	-	-	1
Teaching	Total contact hours - 32				
Prerequisite (s)					

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation– Breach of Contract – Applying State Law.

UNIT VI

Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

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REFERENCE BOOKS: -

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals ofIPR for Engineers", BS Publications (Press) Cyber Law. Texts & Cases, South-Western's Special Topics Collections
3. Prabhuddha Ganguli: 'Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi
4. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
5. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
6. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Pub.

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4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/I	L	T	P	C
Course (Code)	METROLOGY & INSTRUMENTATION LAB (17130711)	-	-	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)					

COURSE OBJECTIVES:

The Metrology and instrumentation Laboratory course are designed for measuring and gauging instruments for inspection of precision linear, geometric forms, angular and surface finish measurements. The student can learn the measurements with and calibration of instruments. They also understand the machine tool alignment test. Instrumentation lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments for measuring pressure, temperature, displacement, speed, vibration etc.

Note: The students have to conduct at least 8 experiments from each lab.

METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier callipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Machine tool alignment test on the lathe.
4. Machine tool alignment test on drilling machine.
5. Machine tool alignment test on milling machine.
6. Angle and taper measurements with bevel protractor, Sine bars, rollers and balls.
7. Use of spirit level in finding the straightness of a bed and flatness of a surface.

INSTRUMENTATION LAB

1. Calibration of transducer for temperature measurement.
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge.
4. Calibration of thermocouple.
5. Calibration of capacitive transducer.
6. Study and calibration of photo and magnetic speed pickups.
7. Calibration of resistance temperature detector.
8. Study and calibration of a rotameter.
9. Study and calibration of Mcleod gauge for low pressure.

Course outcomes:

Metrology Lab:

Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc).

Instrumentation Lab:

Students will be able to select proper measuring instrument and know requirement of calibration, errors in measurement etc. They can perform accurate measurements.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	**NON DESTRUCTIVE TESTING METHODS (**17130801a**)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering Physics				

UNIT – I

Introduction to non-destructive testing: Radiographic test**,** Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

UNIT – II

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT – III

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

UNIT – IV

Magnetic Particle Test: Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle test.

UNIT – V

Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing.
Industrial Applications of NDT: Span of NDT Activities- Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDT of pressure vessels, castings, welded constructions.

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Course Outcomes:

After completing this course, a successful student will be able to:

CO1- Discuss the techniques and methods of non-destructive testing.
CO2- Apply methods knowledge of non-destructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc.

CO3- Evaluate the methods of application of non-destructive testing.

TEXT BOOKS:

1. "Non-destructive test and evaluation of Materials," J Prasad, GCK Nair, TMH Publishers, 2011.
2. "Ultrasonic testing", Krautkramer and Krautkramer , Springer; 4th edition ,1990.
3. "Non-destructive testing", Warress, JMc Gonmade, AIRWALK PUBLICATIONS, 1 edition 2017.

REFERENCES:

1. "Ultrasonic inspection training for NDT" E. A. Gingel, Prometheus Press, 4th edition ,1999.
2. "Non-destructive Hand Book" – R. Hamchand, McGraw-Hill Education; 2edition, 2012.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔												✔		
CO2						✔									✔	
CO3				✔												✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	**CONDITION MONITORING (**17130801b**)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)	**Basic Electrical and Electronics Engineering, Vibration, Metrology**				

UNIT-I: BASICS OF VIBRATION: Basic motion: amplitudes, period, frequency, basic parameters: displacement, velocity, acceleration, units (including dB scales) and conversions, Mass, spring and damper concept, Introduction to SDOF and MDOF systems, Natural frequencies and resonance, Forced response.

UNIT-II : VIBRATION MEASUREMENTS AND ANALYSIS: Transducers and mounting methods, data acquisition using instrumentation recorders/data loggers, time domain signal analysis, orbit analysis, Filters, Frequency domain analysis (Narrow band FFT analysis), Nyquist criteria, Sampling, aliasing, windowing and averaging.
VIBRATION MEASUREMENT AND ANALYSIS: Use of phase; bode, polar and water fall plots, constant percentage band width analysis (1/3 and 1/1 Octave analysis), envelope detection /spike energy analysis, cepstral analysis, advances in analysis (PC based and portable instruments for vibration analysis).

UNIT-III : Fault Diagnosis, Interpreting vibration measurements for common machine faults, imbalance, misalignment, mechanical looseness, bearing and gearing faults, faults in induction motors, resonances, some case studies, static and dynamic balancing,international standards for vibration condition monitoring.

UNIT-IV : THERMOGRAPHY: The basics of infrared thermography, differences in equipment and specific wave length limitations, application of Ir to: electrical inspection, mechanical inspection, energy conservation, how to take good thermal images, hands-on demonstrations focusing on proper camera settings and image interpretation, analysis of thermal images and report generation, study of thermo graphy applications

UNIT-V : OIL AND WEAR DEBRIS ANALYSIS: Basics of oil analysis, monitoring condition of oil, lubricant analysis, physio – chemical properties, moisture, tan tbn, wear debris analysis, particle counting, spectroscopy, uses & limitations, ferrography wear particle analysis.

ULTRASONIC MONITORING AND ANALYSIS: Ultrasonic monitoring (leak, crack and thickness) basics of ultrasonic monitoring, ultrasonic theory, ultrasonic theory, mathematics of ultrasound, equipment and transducers, inspection parameters and calibration, equipment quality control, flaw origins and inspection methods.

Course outcomes

After completing this course, a successful student will be able to:

CO-1 Identifying the optimum maintenance strategy for different types of equipment. **(PO1, PO4)**

CO-2 Analyze the reasons for selecting particular maintenance strategies. **(PO1, PO6)**

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CO-3. Perform as per International Standards covering asset management. **(PO6, PO11)**

CO-4. Gaining practical approaches to minimize the risk of plant and machinery breakdowns. **(PO12)**

TEXT BOOKS

- "The Vibration Analysis Handbook", J I Taylor, Vibration Consultants; 2 editions, 2003.
- "Machinery Vibration Condition Monitoring", Lynn, Butterworth,1st edition,1989

REFERENCE BOOKS

- "Machinery Vibration: Measurement and Analysis", Victor Wowk, McGraw-Hill Education,1ST edition ,1991.
- "Mechanical fault diagnosis and condition monitoring", RA Collacott, Springer Netherlands, 1ST edition, 1977.
- "The Vibration Monitoring Handbook" Charles W. Reeves, Coxmoor Publishing Co.,1st edition, 1998.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔			✔												
CO2	✔					✔										
CO3						✔					✔					
CO4												✔				

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	GAS DYNAMICS & JET PROPULSION (17130801c)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)	Thermodynamics, Thermal engineering				

Course objectives:
The purpose of this course is to provide the student with the knowledge of basic principles of gas dynamics and its importance in jet propulsion applications.

UNIT-I
Introduction to gas dynamics: control volume and system approaches acoustic waves and sonic velocity – mach number – classification of fluid flow based on mach number – mach cone compressibility factor – general features of one-dimensional flow of a compressible fluid – continuity and momentum equations for a control volume.

UNIT-II
Isentropic flow of an ideal gas: basic equation – stagnation enthalpy, temperature, pressure and density stagnation, acoustic speed – critical speed of sound- dimensionless velocity-governing equations for isentropic flow of a perfect gas – critical flow area – stream thrust and impulse function. Steady one-dimensional isentropic flow with area change-effect of area change on flow parameters- chocking- convergent nozzle – performance of a nozzle under decreasing back pressure -De lavel nozzle – optimum area ratio effect of back pressure – nozzle discharge coefficients – nozzle efficiencies.

UNIT- III
Simple frictional flow: adiabatic flow with friction in a constant area duct- governing equations – fanno line limiting conditions – effect of wall friction on flow properties in an Isothermal flow with friction in a constant area duct- governing equations – limiting conditions. Steady one dimensional flow with heat transfer in constant area ducts- governing equations – Rayleigh line entropy change caused by heat transfer – conditions of maximum enthalpy and entropy.

UNIT-IV
Effect of heat transfer on flow parameters: Intersection of Fanno and Rayleigh lines. Shock waves in perfect gas- properties of flow across a normal shock – governing equations – Rankine Hugoniat equations – Prandtl's velocity relationship – converging diverging nozzle flow with shock thickness – shock strength.

UNIT- V
Propulsion: Air craft propulsion: - types of jet engines – energy flow through jet engines, thrust, thrust power and propulsive efficiency turbojet components-diffuser, compressor, combustion chamber, turbines, exhaust systems.

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Performance of turbo propeller engines, ramjet and pulsejet, scramjet engines. Rocket propulsion - rocket engines, Basic theory of equations - thrust equation - effective jet velocity - specific impulse - rocket engine performance - solid and liquid propellant rockets - comparison of various propulsion systems.

COURSE OUTCOMES:

After successful completion of this course student will be able to

CO-4. To find thermodynamic analysisof thermal power plants,Different methods to improveplant efficiency, different typesof boilers, its application(PO-2)

CO-5. To compute performance evolutions of steam nozzles, condenser and turbines. (PO-3)

CO-6. To discriminate gas turbines working principle, different methods to improve thermal efficiencies of gas turbines, their applications on jet propulsion and to conduct theirthermal analysis. (PO-6)

TEXT BOOKS:

1. Compressible fluid flow - A. H. Shapiro.
2. Fundamentals of compressible flow with aircraft and rocket propulsion- S. M. Yahya.
3. Fundamental of Gas dynamics, 2nd edition– Zucker- Wiley publishers.

REFERENCES

1. Elements of gas dynamics - Liepman & Roshko.
2. Aircraft & Missile propulsion - Zucrow.
3. Gas dynamics - M.J. Zucrow & Joe D.Holfman.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		✔				✔							✔			
CO2		✔	✔			✔								✔		
CO3			✔			✔							✔	✔		✔

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	**ADVANCED OPTIMIZATION TECHNIQUES (17130801d)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)	**Operations research**				

Course objectives:

To enable the students, learn the latest non-linear optimization techniques such as classical optimization methods, dynamic programming, integer programming etc. Provide basic knowledge and enough competence to formulate the optimization problems.

UNIT I

INTRODUCTION TO OPTIMIZATION: Engineering applications of optimization- statement of an optimization problem- classification of optimization problem- optimization techniques.

CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization- multivariable optimization with equality constraints- multivariable optimization with inequality constraints.

UNIT-II

UNCONSTRAINED OPTIMIZATION TECHNIQUES: pattern search method- rosenbrock's method of rotating coordinates- the simplex method- descent methods- gradient of function steepest descent method.

UNIT-III

CONSTRAINED OPTIMIZATION TECHNIQUES: characteristics of a constrained problem methods of feasible directions - basic approach in the penalty function method- interior penalty function method- convex programming problem- exterior penalty function method.

UNIT-IV

GEOMETRIC PROGRAMMING (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. primal dual relationship and sufficiency conditions. Solution of a constrained geometric programming problem (G.P.P). Complimentary geometric programming (C.G.P).

UNIT-V

DYNAMIC PROGRAMMING (D.P): Multistage decision processes. concepts of sub optimization, computational procedure in dynamic programming calculus method and tabular methods. Linear programming as a case of D.P., continuous D.P.

INTEGER PROGRAMMING (I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Integer nonlinear programming.

Course Outcomes: Upon completion of this course, a successful student will be able to:

CO-1: Formulate the Linear programming problem for real life problems. (PO4)

CO-2: Apply the Linear programming to solve problems. (PO1)

CO-3: Evaluate the Transportation, assignment, game, inventory, replacement, sequencing, queuing techniques for real life problems. (PO4)

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CO-4: Apply the dynamic programming to solve problems of discreet and continuous variables. (PO2)

CO-5: Design the solutions to real world problem and simulate. (PO3)

TEXT BOOK:

Optimization Theory and Applications, by S.S.Rao, Wiley Eastern Limited, New Delhi.

REFERENCES:

1. Engineering Optimization By Kalyanmanai Deb, Prentice Hall of India, New Delhi.
2. Optimization Techniques, C.Mohan, Kusum Deep.
3. Operations Research by S.D.Sharma.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2	✔													✔		
CO3				✔												✔
CO4		✔											✔			
CO5			✔										✔			

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	MANAGEMENT INFORMATION SYSTEMS (17130801e)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)					

Course Objectives:
The course is aimed at providing knowledge of Management Information Systems and to familiarize with the process of Information Processing. The course also aimed at solving business problems with information systems and to provide basic insights into select contemporary Management Information Systems along with understanding through various case studies.

UNIT-I
Organization & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, various channels of information & MIS.

UNIT-II
Foundation of Information System: Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS- dataflow diagram, flow chart etc.

UNIT-III
Business application of information technology: electronic commerce Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

UNIT-IV
Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change. Reports: Various types of MIS reports, GUI & Other Presentation tools.

UNIT-V
Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production & Logistics. Supply Chain Management, CRM, Procurement Management System.
Management perspectives: Evolution of MIS in an organization (Nolan's state model), System development life cycle model. Pitfalls in 'MIS' development - MIS in various functional areas.

Course outcomes:
1. To introduce basic concept of Information and its need in decision making with the understanding of various channels of Information.
2. To edify the basics of Information System and Solving Business Problems with Information System.
3. To familiarize with the business application of Information technology and getting the knowledge of the use of Information System in Decision Making.

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4. To understand Managing Information technology and to familiarize with Global Systems and Information Security.

Text Books:

1. O.Brian, "Introduction to Information System", McGraw Hill.

References Books:

1. Management Information Systems: Managing the Digital Firm -Kenneth C. Laudon, Jane P. Laudon, Pearson Education
2. Alter, "Information Systems: A Management Perspective", Addison Wesley.
3. Arora & Bhatia, "Information Systems for Managers", Excel
4. Bansal, "Information System Analysis & Design", TMH.

Web References

Coursera
NPTEL Course from IIT Madras - www . nptel .ac.in/courses/122105022/
nptel.ac.in/video.php?subjectId=122105022freevideolectures.com › Business Management › IIT Kharagpur Moocs Courses from Edex.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1				✔										✔		
CO2	✔													✔		
CO3				✔												✔
CO4		✔											✔			
CO5			✔										✔			

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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	DIGITAL MANUFACTURING (17130802a)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)					

UNIT-I

Introduction to Digital Manufacturing: Concepts and research and development status of digital manufacturing Definition of digital manufacturing – Features and development of digital manufacturing. Digital modeling method, Overview of digital modeling, the characteristics and commonly used principles of digital modeling method. The exchange protocol of product model data and typical case analysis and discussion of digital design

UNIT-II

Theory system of digital manufacturing science: Operation Mode and Architecture of Digital Manufacturing System Operation reference mode of digital manufacturing system – Architecture of digital manufacturing system Modeling theory and method of digital manufacturing science Critical modeling theories and technologies of digital manufacturing science

UNIT-III

Manufacturing Informatics: Principal properties of manufacturing information, characteristics, measurement, synthesis and materialization of manufacturing informatics, integration, sharing and security, Intelligent manufacturing

UNIT-IV

Management of technology (MOT): model of MOT, system framework, management mode, collaborative management mode, technological strategies management, technological venture. Human- Machine designing, Digital marketing based on culture difference and way of thinking

UNIT-V

Technology of digital manufacturing science: product life cycle, CAx technology integration, digital equipment, maintenance and diagnosis, digital logic technology, resource organization and management technology, future development

TEXT BOOKS: -

1. Zude Zhou, Shane (Shengquan) Xie, Dejun Chen-"Fundamentals of Digital Manufacturing Science"-

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
***

Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	**DESIGN FOR MANUFACTURE (17130802b)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)					

UNIT - I

Introduction: Design Philosophy-Steps in design process - General design rules for manufacturability-Basic principles of designing for economical production - Creativity in design.

UNIT –II

Machining processes: Overview of various machining processes-General design rules for machining-Dimensional tolerance and surface roughness- Design for machining – Ease –Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT – III

Metal casting: Appraisal of various casting processes, selection of casting process- General design considerations for casting-Casting Tolerance-Use of solidification, simulation in casting design - Product design rules for sand casting.

UNIT –IV

Metal joining: Appraisal of various welding processes, factors in design of weldments – General design guidelines-Pre and post treatment of welds effects of thermal stresses in weld joints-Design of brazed joints. **Forging:** Design factors for forging – Closed die forging design – Parting lines of dies – Drop forging die design – General design recommendations.

UNIT - V

Extrusion & Sheet metal work: Design guide lines extruded sections- Design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – Component design for blanking.

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components-Design considerations for injection molding – Design guidelines for machining and joining of plastics.

COURSE OUTCOMES:

After completing this course, a successful student will be able to:

CO-8. Describe the design process considering manufacturability and economical production **(PO1)**

CO-9. Simulate the casting design and choose the suitable casting process for product **(PO5)**

CO-10 Design components for Machining, Casting, Welding, Closed die, drop forging and sheet metal forming processes **(PO3)**

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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CO-11 Apply design principles for molding, machining and joining of plastics **(PO2)**

TEXT BOOKS:

3. "Design for Manufacture: Strategies, Principles and Techniques", John Corbett, Mike Dooner, John Meleka, Christopher Pym, Pearson Education, ISBN 10: 0201416948, 1991

4. "Product Design for Manufacture and Assembly", Geoffrey Boothroyd, Peter Dewhurst, Winston A Knight, CRC Press, 3rd Edition, 2010

5. "Design for Manufacturability Handbook", James G. Bralla, McGraw Hill, 2nd Edition, 1998

REFERENCES:

3. "ASM Handbook – Material Selection and Design", George E Dieter, ASM International, Vol. 20, 1997

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔												✔			
CO2					✔										✔	
CO3			✔										✔			
CO4		✔											✔			

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	**PRESSURE VESSALS AND PIPING (17130802c)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)	Strength of materials				

UNIT – I
INTRODUCTION PRESSURE VESSELS & STRESS PATTERNS
Methods of determining stress – (1) strain gauges (2) photo elastic method (3) moiré fringe techniques terminology – ligament efficiency – applications.

UNIT – II
STRESSES IN PRESSURE VESSLES
Introduction – Stresses in a circular ring, cylinder –Dilation of pressure vessels, Membrane stress Analysis of Vessel – Cylindrical, spherical and, conical heads – Thermal Stresses – Discontinuity stresses in pressure vessels.

UNIT – III
DESIGN OF VESSELS
Design of Tall cylindrical self supporting process columns – Supports for short vertical vessels – Stress concentration at a variable Thickness transition section in a cylindrical vessel, about a circular hole, elliptical openings. Theory of Reinforcement – Pressure Vessel Design. Introduction to ASME codes for pressure vessel design.

UNIT – IV
BUCKLING AND FRACTURE ANALYSIS IN VESSELS
Buckling phenomenon, Elastic Buckling of circular ring and cylinders under external pressure, Collapse of thick-walled cylinders or tubes under external pressure, Effect of supports on Elastic Buckling of Cylinders, Design of circumferential stiffeners, Buckling under combined External pressure and Axial loading.

UNIT – V
PIPING
Flow diagram, Piping layout and piping stress analysis; Flexibility factor and stress intensification factor; Design of piping system as per B31.1 piping code. Piping components: bends, tees, bellows and valves. Types of piping supports and their behavior; Introduction to piping Codes and Standards.

Course Outcomes:

After completing this course, a successful student will be able to:

CO-1. Define the major theories, definitions related to stresses in pressure vessels. **(PO1)**
CO-2. Describe various types of stresses in pressure vessel members **(PO2)**
CO-3. Design shells, end closures and nozzles of pressure vessels using ASME codes. **(PO6)**
CO-4. Analyze piping systems. **(PO7)**

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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TEXT BOOKS:

1. John F. Harvey, "Theory and Design of Pressure Vessels", CBS Publishers and distributors,1987.

REFERENCES:

1. Henry H. Bedner, "Pressure Vessels, Design Hand Book", CBS publishers and Distributors,1987
2. William. J., Bees, "Approximate Methods in the Design and Analysis of Pressure Vessels and Piping'', Pre ASME-pressure vessels and piping conference,1997

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	✔													✔		
CO2		✔											✔			
CO3						✔									✔	
CO4							✔									✔

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	PRODUCT LIFE CYCLE MANAGEMENT (17130802d)	3	1	-	3
Teaching	Total contact hours – 64				
Prerequisite (s)					

UNIT-I

Introduction to PLM: Need for PLM, opportunities and benefits of PLM, different views of PLM, components of PLM, phases of PLM, PLM feasibility study, PLM visioning.

PLM Strategies: Industrial strategies, strategy elements, its identification, selection and implementation, change management for PLM.

UNIT-II

Product Data Management (PDM): PDM systems and importance, reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation

UNIT-III

Product Design: Engineering design, organization and decomposition in product design, product design process, methodical evolution in product design, concurrent engineering, design for 'X' and design central development model. Strategies for recovery at end of life, recycling, human factors in product design. Modeling and simulation in product design.

UNIT-IV

New Product Development: Structuring new product development, building decision support system, estimating market opportunities for new product, new product financial control, implementing new product development, market entry decision, launching and tracking new product program. Concept of redesign of product

UNIT-V

Technology Forecasting: Future mapping, invocating rates of technological change, methods of technology forecasting such as relevance trees, morphological methods and mission flow diagram, combining forecast of different technologies, uses in manufacture alternative

Reference Books:

1. Fabio Giudice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor & Francis 2006.

2. Robert J. Thomas, NPD: Managing & forecasting for strategic processes.

3. Martins Joseph, Technological Forecasting for decision Making, 2nd edition, North Holland.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Regulation/Year/Sem	GR17(B.Tech.-ME)/IV/II	L	T	P	C
Course (Code)	**RENEWABLE ENERGY SOURCES (17130802e)**	**3**	1	-	3
Teaching	**Total contact hours – 64**				
Prerequisite (s)					

Course Outcomes

After completion of this course, a successful student will be able to:

CO 1: Understand and analyze the solar thermal applications and solar photovoltaic cells.

CO 2: Analyze the performance of wind, tidal, and Ocean thermal energy conversion systems

CO 3: Understand and analyze the operation of geothermal and bio energy conversion

CO 4: Understand and analyze the biogas digesters and bio power plants

UNIT-1:

Extraterrestrial solar radiation, terrestrial solar radiation, solar thermal conversion, flat plate and concentrated solar thermal collectors, solar ponds, solar heating/cooling technique, solar distillation, photovoltaic energy conversion, solar cells – 4 models.

UNIT-2:

Planetary and local winds, vertical axis and horizontal axis wind mills, principles of wind power,maximum power, actual power, wind turbine operation, yaw control, pitch control and stall control mechanisms, derivation of power coefficient.

UNIT-3:

Ocean temperature differences, principles of OTEC plant operations, wave energy, devices for energy extraction, tides, simple single pool tidal system.

UNIT-4:

Origin and types, Bio fuels, classification, direct combustion for heat and electricity generator, anaerobic digestion for biogas, biogas digester, power generation.

UNIT-5:

Biomass energy conversion technologies, Biogas generation – classification of Biogas plants. Micro hydro electric systems- different types of turbines.

Text books*:*

1. Godfrey Boyle "Renewable Energy", Oxford Publications, Second edition.
2. G. D. Rai, "Non-Conventional Energy Sources", Khanna Publishers, First edition.

Reference books*:*

1. Roger H.Charlier, Charles W. "Ocean Energy- Tide and Tidal Power"ISBN: Library of Congress Control Number: 2008929624_c Springer-Verlag Brerlin Heidelberg 2009.
2. John Twidell & Toney Weir: E&F.N. Spon, "Renewable Energy Sources", Taylor & Francis New York, 2nd edition.
3. John F.Walker & N.Jenkins, "Wind Energy Technology", John Willey and Sons Chichester, U.K – 1997

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

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Course Code : RENEWABLE ENERGY RESOURCES

Course designed By: Department of Electrical & Electronics Engineering

	Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course Outcomes	CO1	✓											
	CO2			✓									
	CO3					✓							
	CO4					✓							

Category	General Humanities	Basic Sciences	Engineering Sciences and Technical	Professional Subjects
			✓	

Mode of Evaluation: Quiz, Assignment, Seminar, Written Examination.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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Godavari Institute of Engg. and Technology (Auto.)
Rajahmundry.
Academic Regulations (GR17)

RBT 1.0	TITLE & DURATION OF THE COURSE
1.1	The courses shall be called the degree course in Bachelor of Technology, abbreviated as B.Tech.
1.2	The course shall be of four years duration having eight semesters. Each semester shall have a minimum of 90 working days. The academic calendar of the course shall be fixed by the institute from time to time.
1.3	The maximum time frame for completion of the course for regular students is Eight years from the date of joining the course. The maximum time frame for completion of the course for lateral entry students (diploma holders admitted in second year) is Six years from the date of joining the course. Those students who are not able to complete the course within the above period shall forfeit their admission in to the course and their admission shall stand cancelled.

RBT 2.0	QUALIFICATION FOR ADMISSION
2.1	Admissions shall be done as per the norms fixed by Government of Andhra Pradesh from time to time.
2.2	The qualifying examination shall be the Board of Intermediate examination of Andhra Pradesh or its equivalent.
2.3	For admission under Lateral Entry category (diploma holders or others admitted into second year through specific admission criteria as decided by the APSCHE) the qualifying examination shall be the Engineering diploma examinations conducted by the Board of Technical Education, Andhra Pradesh **or its equivalent.**

RBT 3.0	AWARD OF B.Tech DEGREE
3.1	A student (regular admission) shall be declared eligible for the award of the B. Tech. Degree if he fulfills the following academic regulations. (a) Pursued a course of study for not less than four academic years and not more than eight academic years. (b) Registered for 180 credits and secured 180 credits (c) Completed all the prescribed single credit audit courses prescribed for the **four years of study** of regular students. With these single digit courses together the total credits become 180.
3.2	A student (LE admission) shall be declared eligible for the award of the B. Tech. Degree if he fulfills the following academic regulations. (a) Pursued a course of study for not less than three academic years and not more than six academic years. (b) Registered for all the courses from 2nd year 1st semester onwords and secured all the prescribed credits from 2nd year 1st semester to 4th year 2nd semester as per the respective Brach Course Curriculum of GR 17.

RBT 4.0	PROGRAMMES/ BRANCHES OF STUDY		
4.1	The following programmes of study are offered as specializations for the B.Tech.		
	S. No	Branch Code	Branch

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
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	01	01-CE	Civil Engineering
	02	02-EEE	Electrical and Electronics Engineering
	03	03-ME	Mechanical Engineering
	04	04-ECE	Electronics and Communication Engineering
	05	05-CSE	Computer Science Engineering
	06	24-AME	Auto Mobile Engineering
	07	26-MM	Mining
	08	And any other course approved by authorities from time to time	

RBT 5.0	STRUCTURE OF THE PROGRAMME
5.1	The curriculum and syllabi are framed as per general pattern with a ceiling on maximum credits at 180 as per respective branch BOS recommendations.
5.2	Each course shall be normally assigned a certain number of credits/ Marks as follows. The specific credits have already been stated clearly in the course structure indicating the credits against each course. The general guide-line is as follows- • 3 credits for 4(3+1) theory periods per week course papers - Maximum 100 marks • 2 credits for 3 laboratory periods per week – Maximum 100marks • 2 credit for internship/mini project-II /training with100 Marks • 2 credits for mini Project I/ with 100 marks • 9 credits for Project work with 200 Marks • 1 credit for Audit /Add on courses with a maximum of 100 marks. • 3credits for Hybrid courses (courses with 25% theory content & 75% practical content) with a maximum of 100 marks.

RBT 6.0	DISTRIBUTION / WEIGHATAGE OF MARKS & MODE OF EVALUATION
6.1	Almost all the courses shall have an internal assessment component where the evaluation shall be done by this college faculty and a semester end component for which the evaluation shall be done externally- by faculty of other institutions. The credits and marks are as specified in course structure.
6.2	**Theory papers- 3 Credits- 100 Marks** The Theory paper syllabus shall be divided in to 5 units. For theory subjects the total marks awarded shall be 100. The internal assessment component shall be for 40 marks & the semester end component shall be 60 marks. i. **The award of 40 marks for internal assessment shall be done as follows.** (Subjective mid exam- 25 M, Objective Mid exam-10 M, Assignments -5 M) a. There shall be two mid examinations. The first mid examination shall be for units 1 to 2 & second mid examination shall be for units 3 to 5. Each mid examination paper shall consist of a descriptive mid examination part & an objective mid examination part as detailed below. b. There shall be two written descriptive internal assessment tests (mid examinations) for 25 marks each. The tests shall be of 90 minutes duration and shall consist of i) 3 Essay questions carrying 8 marks each, out of which 2 are to be answered and ii)5 short answer questions from which 3 are to be answered, carrying 3 marks each. c. There shall be two on-line examinations for all semesters as MID1 and MID2 and are objective internal assessments mid examinations for 10 marks each for every theory paper. The tests shall be of 20 minutes duration and shall consist of 20 questions which shall be compulsory.

	d. Marks of I mid descriptive & I Mid objective exams are added to obtain 1st mid mark for a paper. Similarly the second mid marks are obtained.
	e. The higher marks of the two mid exams for any paper shall be given a weightage of 75% & the other a weightage of 25%. The marks are accordingly reduced/proportionate to 35.

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
***

	f. There shall be a minimum of 5 assignments per semester with a minimum of 2 class room assignments & 3 home assignments. Assignments shall carry 5 marks. g. The mid examination's weighted average marks reduced to 35 shall be added to the mark's obtained in assignments to obtain the maximum total mark in theory for the internal assessment. h. In the case of papers like Engineering Drawing, out of the 40 marks for internal assessment 25 marks shall be allocated by continuous evaluation of the day to day work. The remaining 15 marks shall be awarded by conducting two subjective mid examinations with 15 marks each. The better marks of these two mid exams shall be given a weightage of 75% & the other a weightage of 25%. The marks are reduced to 15. i. The marks distribution for internals and externals is - 40% for Internals and 60% for externals in case of **theory subjects**. 50% each for Internals and Externals for all the Practical/ Workshops etc., For the practical part of the Hybrid courses the internal assessment rules of practical will hold good and for the theory part of the Hybrid course the internal assessment rules of theory papers will hold good.
	ii. The award of 60 marks for semester end examination shall be done as follows a. There shall be a descriptive written examination of 3 Hours duration for 60 marks covering all the 5 units of the syllabus. Question paper for this examination shall be prepared externally by paper setters from the panel of paper setters recommended by the Chairperson of the Boards of Studies. The evaluation of the answer scripts shall be done externally by evaluators belonging to University colleges, Autonomous colleges or by evaluators recommended by the Chairpersons of BOS. b. The number of units in each of the subject are limited to 5 (Five) (with limitations for the courses for Building Design/ Machine Drawing etc.,) covering the required syllabus. Question papers for GR-17 be made with the new model set of one question from one unit to be answered compulsorily from all five units but a choice with-in the question be given in the form of either/ or method.

6.3	**Practical– 2 credits – 100 marks**
	Practical(s) shall be evaluated for 100 marks out of which 50 marks shall be for continuous internal assessment and the remaining 50 marks shall be for external assessment.
	i. Award of 50 marks for internal assessment shall be done as follows a. A maximum of 25 marks shall be assigned by continuous evaluation for the best 10, day to day experimental work. b. A maximum of 25 marks shall be awarded by conducting an internal practical examination at the end of the semester. There shall be two examiners for the internal examination. One shall be the concerned faculty and the other shall be an internal faculty nominated by the HOD. c. The end examination shall be conducted by the teacher concerned and external examiner.

6.4	**Hybrid Courses - 3 credits - 100 Marks**
	A standard theory paper of a branch is replaced by a hybrid course. In a hybrid course syllabus 25% is theory & 75% is practical. Evaluation is done separately for theory & practical. For the theory part and lab/practical part of the Hybrid courses the internal assessment rules of theory and practical respectively will hold good. Theory part: Out of 25 marks of Theory 10 marks are for internal assessment and 15 marks are for semester end examination. The internal assessment exam will be conducted for 40 marks

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DEPARTMENT OF MECHANICAL ENGINEERING
4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)
***

	like any other theory paper and the final marks obtained will be reduced to 10. The semester end examination will be held for 100 marks and the marks obtained will be reduced to 15. Practical part: Out of 75 marks for practical 37 marks are allotted for internal assessment and 38 marks are allotted for semester end examination (to avoid decimal confusion). The internal assessment component will be evaluated for 50 marks and the marks obtained will be reduced to 37. The semester end component will be evaluated for 50 marks and the marks obtained will be reduced to 38. The passing minimum for semester end theory exam is 35% and for semester end practical exam is 50%. If a student fails to secure the minimum pass requirement either in theory or practical (refer rule RBT.8) both the theory and practical part are to be repeated.

6.5	**Mini Project I/ Study project – 2 credits - 100 Marks**
	Mini Project / Study Project carrying 2 credits shall be done during summer vacation after II Year II sem & will be evaluated by the Departmental committee consisting of Head of the department, mini project supervisor and a senior faculty member for 100 Marks. **There shall be no external examination for mini project.**

6.6	**Mini project II/Summer internship/ Summer training – 2 credits – 100 Marks**
	Summer internship/ Summer training carrying 2 credits shall be done during summer vacation after III Year II semester & will be evaluated by the Departmental committee consisting of Head of the department, Summer internship/ Summer training supervisor and a senior faculty member for 100 Marks. **There shall be no external examination for Summer internship/ Summer Training project.**

6.7	**Add on courses/Audit courses -** 1 credit for specific Audit /Add on courses with a maximum of 100 marks and are compulsory to get the award of the degree and are detailed in structure and syllabus.

6.8	Seminars: Seminars are the part of total programme. Specific credits were given for seminar in the respective programme structure. The final structure for respective programme/ Branch to be referred for further information.

6.9	**Project – 9 credits - 200 Marks**	
	Out of a total of 200 Marks for the project work, 60 marks shall be for internal valuation and 140 marks shall be for the semester end evaluation. The project work shall be spread over the entire VIII semester. It shall be innovative in nature with, industry/ research orientation. A project batch shall comprise of not more than four students	
	i.	**The award of 60 marks for internal evaluation shall be done as given below** A mid course review shall be conducted by HOD and the project coordinator for 30 marks. On completion of the project another evaluation shall be made by the same committee for another 30 marks.
	ii.	**The award of 140 marks for external evaluation shall be done as follows** External evaluation shall be done by a three men committee consisting of a) an external examiner nominated by the Principal from the panel of evaluators recommended by the BOS, b) HOD and c) the project coordinator, based on the report submitted by the candidate and a viva-voce examination.

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DEPARTMENT OF MECHANICAL ENGINEERING

4 Years B.Tech. (Mechanical Engineering) Course Structure: (2017-18)

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RBT 7.0	ATTENDANCE REQUIREMENTS	
7.1	i.	A student shall be eligible to write the semester end examination if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
	ii.	Condonation of shortage of attendance in aggregate up to 10% (attendance below 75% but above 65%) in each semester may be condoned by the College Academic Committee. [The number of times the condonation can be availed by a candidate is (n-1) where n is the number of years of study of the course]
	iii.	A stipulated fee shall be payable towards condonation of shortage of attendance.
	iv.	Shortage of attendance below 65 % in aggregate shall not be condoned.
	v.	A student who is short of attendance in any semester may seek readmission into that semester when it is offered again but with-in one week from the date of commencement of class work of the new semester.
	vi.	Students whose shortage of attendance is not condoned in any semester shall not be eligible to write their semester end examination of that class.
	vii.	A student shall be promoted to next semester if he satisfies the a) attendance requirement of the present semester b) the credits requirement if any & c) paid the semester end examination fee
	viii.	If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

RBT 8.0	MINIMUM ACADEMIC REQUIREMENTS
8.1	The following academic requirements shall be satisfied by every student in addition to the attendance requirements mentioned under rule No 7.
	i. A student shall be deemed to have satisfied the minimum academic requirements in theory subjects if he has earned the credits allotted to each theory subject and secures not less than 21 marks out of 60 (35%) in semester end theory examinations & a minimum of 40 % of marks in each theory paper when the internal marks and semester end marks are added together.
	ii. A student shall be deemed to have satisfied the minimum academic requirements in practical subjects if he has earned the credits allotted to each practical subject and secures not less than 50% marks in semester end practical examinations & a minimum of 50 % of marks in each practical paper when the internal marks and semester end marks are added together.
	iii. A student shall be deemed to have satisfied the minimum academic requirements in design /drawing /mini project/industry oriented mini project/ summer internship & project if he has earned the credits allotted to each of this subject and secures not less than 35% marks in semester end examinations if any & a minimum of 40 % of marks in each paper when the internal marks and semester end marks are added together.
	iv. A student shall be promoted from I year to II year if he fulfills the minimum attendance requirement.
	v. A student shall be promoted from II Year to III Year if he fulfills the academic requirement of 50% of the credits up to II Year II semester from all the examinations (1-1 R+3S, 1-2 R+2S, 2-1 R+1S, 2-2 R), whether or not the candidate take the examination & secures the prescribed minimum attendance in II Year II Semester (R- Regular, S – Supplies).
	vi. A student shall be promoted from III Year to IV Year if he fulfills the academic requirement of 50% of the credits up to III Year II semester from all the examinations (1-1 R+5S, 1-2 R+4S, 2-1 R+3S, 2-2 R+2S, 3-1 R+1S, 3-2 R) , whether or not the candidate take the examination & secures the prescribed minimum attendance in III Year II Semester. (R- Regular, S – Supplies)
	vii. A regular B. Tech student shall register in all the 180 credits and earn all the 180 credits. Marks obtained in all the 180 credits shall be considered for the calculation of grade awarded. A lateral entry B.Tech student shall register from Second year first semester and shall complete all courses/ subjects/labs as per the structure till 4th year 2nd semester and only 2nd year to 4th year credits/marks/grades obtained in all the 3 Years (2nd to 4th) shall be considered for the calculation of grade awarded.

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9.0 AWARD OF GRADE AND DEGREE

9.1 METHOD OF AWARDING LETTER GRADE AND GRADE POINTS FOR A COURSE

A letter grade and grade point will be awarded to a student in each course based on performance as per grading system given below, subject to minimum Academic Regulations.

Theory/Drawing / Projects/ Summer internship (%) Total (Internal + External)	Laboratory (%)/ Workshop Total (Internal + External)	Grade Points	Letter Grade	Remark
Percentage of Marks ≥ 90	Percentage of Marks ≥ 90	10	O	OUTSTANDING
≥80 & < 90	≥80 & < 90	9	A^+	EXCELLENT
≥70 & < 80	≥70 & < 80	8	A	VERY GOOD
≥60 & < 70	≥60 & < 70	7	B^+	GOOD
≥50 & < 60	≥50 & < 60	6	B	AVERAGE
≥40 & < 50	-	5	P	PASS
< 40	< 50	F	F (Fail)	FAIL
Absent		Ab	Ab	ABSENT

9.2 CALCULATION OF GRADE POINT AVRAGE FOR A SEMESTER

The performance of each student at the end of the each semester is indicated in terms of GPA. The SGPA is calculated as below:

$$\text{SGPA} = \sum(\text{CR} \times \text{GP}) / \sum \text{CR}$$

Where **CR**= Credits of a course
GP = Grade points awarded for a course
***GPA** is calculated for the candidates who passed all the courses in that year/semester.
** Method of Calculation is similar for both SGPA & CGPA

9.3 CALCULATION OF CUMULATIVE GRADE POINT AVERAGE (CGPA) FOR ENTIRE PROGRAMME

The CGPA is calculated as below:

$$\text{CGPA} = \sum(\text{CR} \times \text{GP}) / \sum \text{CR}$$ (for entire programme)

Where **CR**= Credits of a course
GP = Grade points awarded for a course

9.4 AWARD OF DIVISION

A student who has passed all the examinations and satisfied all the requirements prescribed for the program shall be eligible for the award of B.Tech. Degree & he shall be placed in a grade / division as given below.

a. CGPA ≥ 7.5 : Degree with Distinction (Subject to not having any 'Back-Log' or supplementary re-appearance in any of the subjects in any semester, else Degree with First Class)

b. CGPA ≥ 6.5 and < 7.5 : Degree with First Class

c. CGPA ≥ 5.5 and < 6.5 : Degree with Second Class

d. CGPA < 5.5 : Degree with Pass Class

RBT 10.0 Minimum instruction days

Minimum instruction days for each semester shall be 90 working days.

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RBT 11.0	WITHHOLDING OF RESULTS
11.1	If the student has not paid the dues payable to the college or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree also may be withheld. Malpractice Rules As per Annexure I.

RBT 12.0	TRANSITORY REGULATIONS
12.1	Refer Annexure II

RBT 13.0	GENERAL
13.1	The terms "he", "him", or "his" are used to include all genders of students.
13.2	The academic regulation should be read as a whole for the purpose of any interpretation.
13.3	In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman Academic Council shall be final.
13.4	The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

RBT 14.0	GAP YEAR
14.1	Refer Annexure III

ANNEXURE I

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
MPR 1. a	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
b	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an

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	communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	outsider, he will be handed over to the police and a case is registered against him.
MPR 2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester. The Hall Ticket of the candidate shall be cancelled
MPR 3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical(s) and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
MPR 4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
MPR 5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
MPR 6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the

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	instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
MPR 7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
MPR 8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
MPR 9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
MPR 10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared

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		including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
MPR 11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
MPR 12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic council for further action to award suitable punishment.	

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ANNEXURE II

TRANSITORY REGULATIONS FOR UG/PG STUDENTS SEEKING RE-ADMISSION INTO 2014 REGULATIONS

(Detained due to shortage of attendance / lack of credits in earlier Regulations)

1. The student has to continue the course work along with the regular students of the respective semester in which the student gets re-admission. Prior approval from JNTUK should be obtained before re-admission of a candidate through Transitory Regulations.
2. Substitute / compulsory subjects shall be offered in place of subjects that are already studied earlier. The student has to register for those specific subjects. The Chairman BOS and Chairman Academic Council are to consult JNTUK and obtain authorization to offer alternative subjects in new regulation.
3. The mode of internal evaluation (i.e., in-course assessments) and external evaluation (i.e., end-semester examinations) shall be on par with the regular students, i.e., the student has to follow the new mode of internal evaluation and the new question paper model for the end-semester examinations along with the regular students of the respective semester in which the student gets re-admission. However, the affiliating university's approval is to be obtained before such re-admission on case to case basis.
4. For the subjects studied under earlier regulations but failed, the student has to appear, pass and acquire credits from the supplementary examinations with-in the time provided by the affiliating university.
5. The promotion criteria based on attendance as well as credits shall be in accordance with the regulations under which the student is re- admitted into the New Regulation specific to the New Subjects/ Substitute subjects in the new regulation as approved by JNTUK.
6. Credits already awarded and approved as per new regulation will be pro-rated in terms of new-credit system. To be eligible for the award of the degree, the student shall complete the attendance requirements and appear for the end semester examination in all the courses as per new regulation, including the substitute/compulsory courses as prescribed in the transitory course structure and shall acquire at least the minimum of stipulated credits. If a student in such exercise crosses the said minimum no of credits, the lowest marks/grades scored will be excluded for calculating final grade. The affiliating university's decision is final in this regard.
7. All other academic requirements shall be in accordance with the regulations under which the student was re-admitted.
8. The decision of the affiliating university is final and is binding on the transitory students on any clarification/ query/doubt and whatsoever, the decision of the Affiliating University - JNTUK is final.

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ANNEXURE III

GAP YEAR - CRITERIA

- The Student requiring such facility should approach Principal through HOD before going for such Internship/ Training in Gap Year and should take prior sanction from Principal in writing.
- The said Organization should be either of PSU/Govt. Org/ MNC or Public Limited Company.
- Student should secure minimum Grade Point (SGPA) making him eligible for First Class as per regulations either by Grade Point or Percentage System till the said completed years of study.
- The student must not be a "detained" candidate in any of the prior years.
- The Student needs to pass all the subjects till the previous Academic Year to get eligible for applying for GAP Year and the GAP Year is restricted to 1 Academic Year with-out interruption.
- The GAP year is not admissible for gainful employment.
- The principal should obtain necessary authorization in writing on case to case basis from affiliated university JNTUK before providing such facility to any student.

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