w.e.f. 2017-18

VR17

MECHANICAL ENGINEERING

B. Tech.

FOUR YEARS SYLLABUS

Department of Mechanical Engineering

(B.Tech.Programme Accredited by NBA)

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

(An Autonomous, ISO 9001:2008 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A' Grade, Affiliated to JNTUK, Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Apply their Knowledge in the domain of thermal systems to solve engineering problems using modern technological tools.

PSO2: Develop and implement new ideas related to product design and manufacturing for societal and industrial needs using modern CAD/CAM/CAE tools.

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
DEPARTMENT OF MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION FOR FIRST YEAR UG PROGRAMME

SEMESTER I **Contact Hours: 26**

S.No	Course Code	Title of the Course	L	T	P	Credits
1.	17MA1101	Matrices And Differential Calculus	3	1	0	4
2.	17CH1102A	Engineering Chemistry	3	0	0	3
3.	17CS1103	Problem Solving Methods	2	1	0	3
4.	17ME1104A	Engineering Mechanics – I	3	0	0	3
5.	17ME1105	Engineering Graphics	2	0	4	4
6.	17CH1151	Engineering Chemistry Laboratory	0	0	3	1.5
7.	17CS1152	Computing and Peripherals Laboratory	0	0	2	1
		Total	**13**	**2**	**9**	**19.5**
8.	17MC1106B	Professional Ethics & Human Values	2	0	0	-
9.	17MC1107	Induction Program				-

SEMESTER II **Contact Hours: 27**

S.No	Course Code	Course	L	T	P	Credits
1.	17MA1201	Laplace Transforms And Integral Calculus	3	1	0	4
2.	17PH1202C	Physics for Engineers	3	0	0	3
3.	17CS1203	Programming in C	3	0	0	3
4.	17ME1204	Engineering Mechanics – II	3	0	0	3
5.	17HS1205	Technical English and Communication Skills	2	0	2	3
6.	17PH1251	Engineering Physics Laboratory	0	0	3	1.5
7.	17CS1252	Computer Programming Laboratory	0	0	3	1.5
8.	17ME1253	Basic Workshop	0	0	3	1.5
		Total	**14**	**1**	**11**	**20.5**
9.	17MC1206A	Technology and Society	1	0	0	-

L – Lecture, T – Tutorial, P – Practical, C – Credits

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DEPARTMENT OF MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION FOR SECOND YEAR UG PROGRAMME

Semester III **Contact Hours: 28**

S.No	Course Code	Course	L	T	P	Credits
1.	17MA1301D	Mathematics for Mechanical Engineers	3	1	0	4
2.	17ME3302	Mechanics of Materials	3	1	0	4
3.	17ME3303	Basic Thermodynamics	3	1	0	4
4.	17ME3304	Manufacturing Processes	3	0	0	3
5.	17ME3305	Kinematics of Machines	3	0	0	3
6.	17TP1306	Logic & Reasoning	0	0	2	1
7.	17ME3351	Solid Modeling Laboratory	0	0	3	1.5
8.	17ME3352	Manufacturing Process Laboratory	0	0	3	1.5
Total			**15**	**3**	**8**	**22**
9.	**17MC1307B**	Indian Constitution	**2**	**0**	**0**	**-**

Semester IV **Contact Hours: 27**

S.No	Course Code	Course	L	T	P	Credits
1.	17ME3401	Fluid Mechanics and Hydraulic Machines	3	1	0	4
2.	17ME3402	Machine Dynamics	3	0	0	3
3.	17ME3403	Engineering Metallurgy	3	0	0	3
4.	17ME3404	Electrical and Electronics Engineering	4	0	0	4
5.	17TP1405	**English for Professionals**	0	0	2	1
6.	17HS2406	Humanities Elective	1	0	0	1
7.	17ME3451	Computational Methods Laboratory	0	0	3	1.5
8.	17ME3452	Electrical and Electronics Engineering Laboratory	0	0	3	1.5
9.	17HS1453	Communication Skills Laboratory	0	0	2	1
Total			**14**	**1**	**10**	**20**
10.	17MC1407A	Environmental Studies (EIE/CE/ME/EEE)	2	0	0	-

List of Humanities Electives

17HS2406A	Yoga & Meditation	17HS2406G	Film Appreciation
17HS2406B	Music	17HS2406H	Sanskrit Bhasa
17HS2406C	Human Rights and Legislative Procedures	17HS2406I	Foreign Languages (German/French)
17HS2406D	Philosophy	17HS2406J	Law for Engineers
17HS2406E	Development of societies	17HS2406K	Psychology
17HS2406F	Visual Communication		

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SIDDHARTHA ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

SCHEME OF INSTRUCTION FOR THIRD YEAR PROGRAMME

Semester V **Contact Hours: 26**

S.No	Course Code	Course	L	T	P	Credits
1.	17ME3501	Applied Thermodynamics	3	1	0	4
2.	17ME3502	Design of Machine Elements	3	1	0	4
3.	17ME3503	Machine Tools and Metal Cutting	3	1	0	4
4.	17ME2504	Open Elective -I	3	0	0	3
5.	17ME2505	Open Elective -II (Inter Disciplinary Elective)	3	0	0	3
6.	17ME2506	Open Elective-III (Self-Learning Elective Course)	0	0	0	2
7.	17TP1507	Personality Development	0	0	2	1
8.	17ME3551	Fuels and IC Engines Laboratory	0	0	3	1.5
9.	17ME3552	SM & FM Laboratory	0	0	3	1.5
Total			**15**	**3**	**8**	**24**

*Students can opt any one of the self-learning courses prescribed by the Department. Students register and complete the opted course in approved MOOCS platform on or before the Last Instruction Day of **V semester.** They have to submit the certificate before the Last Instruction Day of **V semester**

Open Elective –I: A**.** Robotics, B. Hydraulic and Pneumatic Systems

Open Elective –II: A. Project Management, B. Reliability Engineering

Open Elective –III (Self-Learning): A. Unconventional Machining Processes, B. Work Study, iii. or NPTEL/ MOOCS offered courses

Semester VI **Contact Hours: 29**

S.No	Course Code	Course	L	T	P	Credits
1.	17ME3601	Design of Transmission Systems	3	1	0	4
2.	17ME3602	Heat Transfer	3	1	0	4
3.	17ME4603	**Programme Elective -1**	3	0	0	3
4.	17HS1604	Engineering Economics and Finance	2	0	0	2
5.	17ME2605	Open Elective-IV	3	0	0	3
6.	17TP1606	Quantitative Aptitude	0	0	2	1
7.	17ME3651	Machine Tools Laboratory	0	0	3	1.5
8.	17ME3652	Heat Transfer Laboratory	0	0	3	1.5
9.	17ME5653	Engineering Project for community services*	0	1	2	2
Total			**14**	**3**	**10**	**22**
10.	17MC1607	Biology for Engineers	2	0	0	0

* Students will go to the society (Villages/ Hospitals / Towns etc,.) to identify the problem and survey the literature for a feasible solution. The work will be carried out during summer vacation after IV Semester and the report shall be submitted at the end of V Semester. The student is encouraged to take up real life problems leading to innovative model building

Programme Elective -1: A. IC Engines & Gas Turbines, B. Manufacturing Management, C. Advanced Mechanics of Materials

Open Elective-IV **(Open Elective):** A. Mechatronics, B. Additive Manufacturing

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SIDDHARTHA ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

SCHEME OF INSTRUCTION FOR FOURTH YEAR PROGRAMME

Semester VII **Contact Hours: 27**

S.No	Course Code	Course	L	T	P	Credits
1.	17ME3701	Computer Aided Manufacturing	3	0	2	4
2.	17ME4702	**Programme Elective -2**	3	0	0	3
3.	17ME4703	**Programme Elective -3**	3	0	0	3
4.	17ME4704	**Programme Elective -4**	3	0	0	3
5.	17ME4705	**Programme Elective -5**	3	0	0	3
6.	17ME3751	Design & Metrology Laboratory	0	0	2	1
7.	17ME3752	Simulation and Analysis Laboratory	0	0	2	1
8.	17ME5753	Mini Project *	0	0	4	2
9.	17ME6754	A Internship B Industry offered Course C Global Professional Certification	2	0	0	2
Total			**17**	**0**	**10**	**22**

* Could be done in a group of students; involves working under a faculty member and carrying out a detailed feasibility study, literature survey and preparing a work plan for major project.

Programme Elective -2: A. Electric & Hybrid Vehicles, B. Metal Forming, C. Finite Element Method

Programme Elective -3: A. Jet & Rocket Propulsion, B. Metrology, C. Computer Graphics and Geometrical Modelling

Programme Elective -4: A. Computational Fluid Dynamics (CFD), B. Operations Research, C. Mechanical Vibrations

Programme Elective -5: A. Refrigeration & Air Conditioning (R&AC), B. Theory of Metal Cutting, C. Mechanical Measurements

Industry offered Course (17ME6754B): 1. Non Destructive Testing, 2. Smart Materials

Semester VIII **Contact Hours: 19**

S.No	Course Code	Course	L	T	P	Credits
1.	17ME4801	**Programme Elective -6**	3	0	0	3
2.	17ME2802	Open Elective –V*	3	0	0	3
3.	17ME5851	Major Project**	0	5	8	9
Total			**6**	**5**	**8**	**15**

*Open Elective- V may also opt as self-learning course. Students register and complete the opted course in approved MOOCS platform on or before Last Instruction Day of VIII Semester. They have to submit the certificate before the last Instruction Day of VIII Semester. Students who have not opted as a self-learning are required to attend for the class work and internal assessment as per the regular theory course.

**Major project involves continuation of Mini Project. The objective is to complete the work as per the prepared work plan and prepare a detailed project report.

Programme Elective -6: A. Energy Conversion Systems,
B. Production Planning and Control, C. Advanced materials

Open Elective –V (Self-learning): A. Automobile Engineering, B. Solar Energy Utilization

17MA1101 MATRICES AND DIFFERENTIAL CALCULUS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Fundamentals of Matrices, Fundamentals of Calculus, Integration, Differentiation.	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Determine Eigen values, Eigen vectors of a matrix

CO2 Estimate Maxima and Minima of Multi Variable Functions

CO3 Solve the Linear differential equations with constant coefficients

CO4 Solve the Linear differential equations with variable coefficients

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M			M									
CO2	H	M			M									
CO3	H	M			M									
CO4	H	M			M									

COURSE CONTENT

UNIT I

Matrices: Rank of a Matrix, Elementary transformations, Inverse of a Matrix (Gauss Jordan Method), Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen values, Properties of Eigen values, Finding Inverse and Powers of a Matrix by Cayley-Hamilton Theorem. Reduction to Diagonal form, Reduction of Quadratic form to Canonical form, Nature of a Quadratic form, Complex matrices.

UNIT II

Differential Calculus: Rolle‘s Theorem, Lagrange‘s Mean Value Theorem, Cauchy‘s Mean Value Theorem, Taylor‘s Theorem, Maclaurin‘s Series.

Application: Curvature, Radius of Curvature**.**

Functions of two or more Variables: Partial Derivatives, Change of Variables, Jacobians, Taylor‘s Theorem for Function of two Variables, Maxima and Minima of Functions of two Variables, Lagrange‘s Method of Undetermined Multipliers.

UNIT III

Differential Equations of First Order: Formation of a Differential Equation, Solution of a Differential Equation, Linear Equations, Bernoulli‘s Equation, Exact Differential Equations, Equations Reducible to Exact Equations.

Applications: Orthogonal Trajectories, Newton‘s Law of Cooling.

Linear Differential Equations of Higher Order: Definitions, Operator D, Rules for Finding the Complementary Function, Inverse Operator, Rules for finding Particular Integral, Working Procedure to Solve the Equation.

UNIT IV

Linear Dependence of Solutions, Method of Variation of Parameters, Method of Undetermined Coefficients, Equations Reducible to Linear Equations with Constant Coefficients: Cauchy‘s Homogeneous Linear Equation, Legendre‘s Linear Equation, Simultaneous Linear Differential Equations with Constant Coefficients.

Applications: L-C-R Circuits.

TEXT BOOKS

[1] B.S.Grewal , ―Higher Engineering Mathematics‖, Khanna Publishers, 43rd Edition, 2014.

REFERENCE BOOKS

[1].Pal Bhunia, Engineering Mathematics, Oxford University Press, 2015.

[2].Erwin Kreyszig , ― Advanced Engineering Mathematics‖, John Wiley & Sons, 10th Edition, 2015.

[3].B.V.Ramana, ‖Higher Engineering Mathematics‖, Tata MC Graw Hill, 1st Edition, 2007.

[4].N.P.Bali, Dr.Manish Goyal, ―A Text Book of Engineering Mathematics‖, Laxmi Publications, 9th Edition, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT‘S)

[2]. nptel.ac.in/courses/122104017

[3]. nptel.ac.in/courses/111105035

[4]. Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/Loughborough%20website/

17CH1102A ENGINEEERING CHEMISTRY

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Knowledge of Chemistry at Intermediate level	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Analyze various water treatment methods and boiler troubles

CO2 Apply the principles of spectroscopic techniques to analyse different materials and apply the knowledge of conventional fuels for their effective utilization

CO3 Apply the knowledge of working principles of conducting polymers, electrodes and batteries for their application in various technological fields

CO4 Evaluate corrosion processes as well as protection methods

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium,H- High)

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

COURSE CONTENT

UNIT – I

Water technology-I: WHO standards - Water treatment for drinking purpose - sedimentation, coagulation, filtration, disinfection by chlorination, breakpoint chlorination and its significance - Desalination of brackish water - principle and process of electrodialysis and reverse osmosis, advantages and disadvantages.

Water technology-II: Boiler troubles - scales-formation, disadvantages and internal conditioning methods - phosphate conditioning, calgon conditioning and sodium aluminate, caustic embrittlement- reasons, mechanism and its control, and boiler corrosion – causes and control.

UNIT II

Spectroscopic Techniques and Applications: Interaction of electromagnetic radiation with matter - Ultraviolet-visible spectroscopy: Frank-Condon principle, types of electronic transitions, Lambert-Beer's law – definition and numerical problems, problems on interpretation of UV-visible spectra of simple molecules of arenes, aldehydes and ketones. Infrared (IR) spectroscopy: Principle, types of vibrations, problems on interpretation of IR spectra of simple molecules of amines, alcohols, aldehydes and ketones.

Fuel technology: Fuel-definition, calorific value- lower and higher calorific values, analysis of coal – proximate analysis and ultimate analysis, refining of petroleum, flue gas analysis by Orsat's apparatus, numericals based on calculation of air required for combustion**.**

UNIT III

Conducting polymers: Definition, examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped polyacetylene, doping of conducting polymers- mechanism of conduction of p-doped and n-doped polyacetylenes – applications of conducting polymers.

Electrochemistry: Construction and working of Calomel electrode, silver-silver chloride electrode and principle, construction and working of glass electrode, determination of pH using glass electrode - Chemistry of modern batteries - Li/SOCl2 battery and LixC/LiCoO2 battery - construction, working and advantages, Chemistry of H2-O2 fuel cell-advantages.

UNIT IV

Corrosion principles: Introduction, definition, reason for corrosion, examples – electrochemical theory of corrosion, types of electrochemical corrosion - hydrogen evolution and oxygen absorption – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion – pitting corrosion and concept of passivity.

Corrosion control methods: Cathodic protection- principle and types - impressed current method and sacrificial anode method, anodic protection-principle and method, corrosion inhibitors – types and mechanism of inhibition – principle, process and advantages of electroplating and electroless plating.

TEXT BOOKS

[1] *Engineering Chemistry - Fundamentals and Applications, Shikha Agarwal, 1st edition (2015), Cambridge University Press, New Delhi.*

REFERENCE BOOKS:

[1] A Textbook of Engineering Chemistry, Sunita Rattan, First edition 2012, S.K. Kataria & Sons, New Delhi.

[2] Engineering Chemistry, P.C. Jain, 15th edition, Dhanpat Rai Publishing Company (P) Limited, New Delhi.

[3] Essentials of Physical Chemistry, B.S. Bahl, G. D. Tuli and Arun Bahl, S. Chand and Company Limited, New Delhi.

[4] Engineering *Chemistry, O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd., New Delhi.*

[5] Text book of Analytical Chemistry, *Y.Anjaneyulu, K. Chandrasekhar and Valli Manickam*, Pharma Book Syndicate, Hyderabad.

[6] Spectroscopy, *H. Kaur*, I Edition, 2001, Pragati Prakashan, Meerut.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.cip.ukcentre.com/steam.htm

[2] http://corrosion-doctors.org/Modi;es/mod-basics.htm

[3] http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR%2063%289%29%20715-728.pdf

[4] https://chem.libretexts.org/Core/Analytical_Chemistry/Electrochemistry/Basics_of_Electrochemistry

[5] http://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipal-water-treatment/

[6] https://www.khanacademy.org/test-prep/mcat/physical-processes/infrared-and-ultraviolet-visible-spectroscopy/e/infrared-and-ultraviolet-visible-spectroscopy-questions

[7] NPTEL online course, "Analytical Chemistry", offered by MHRD and instructed by Prof. Debashis Ray of IIT Kharagpur.

[8] NPTEL online course, "Corrosion Part-I" offered by MHRD and instructed by Prof. Kallol Mondal of IIT Kanpur

17CS1103 PROBLEM SOLVING METHODS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 -1- 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Understand the Computer problem solving approaches, efficiency and analysis of algorithms

CO2 Apply the factoring methods to solve the given problem

CO3 Apply the array techniques to find the solution for the given problem

CO4 Solve the problems using MATLAB

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H			M									M	M
CO2	M												M	M
CO3	M												M	M
CO4	L												M	M

COURSE CONTENT

UNIT - I

Introduction to Computer Problem Solving: Programs and Algorithms, characteristics of an algorithm, Requirements for solving problems by computer; Flowchart, pseudo-code **The Problem – Solving Aspect**:

Problem definition phase, Getting started on a problem, Similarities among problems, Working backwards from the solution, General problem-solving strategies; **Top-Down design**: Breaking a problem into sub-problems, Construction of loops, Establishing initial conditions for loops, Finding the iterative construct, Termination of loops;

The Efficiency of Algorithms: Redundant Computations, Referencing array elements, Inefficiency due to late termination, Early detection of desired output conditions, Trading storage for efficiency gains;

Analysis of Algorithms: Computational complexity, The order notation, Worst and average case behavior.

UNIT - II

Fundamental Algorithms: Problem, Algorithm Development, Algorithm Description **-** Exchanging values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci sequence, Reversing the digits of an Integer. Using pseudo-codes and flowcharts to represent fundamental algorithms.

Factoring Methods: Finding the Square Root of a number: Smallest Divisor of an Integer, GCD of two Integers, Generating Prime numbers, Computing the Prime Factors of an Integer, Raising a Number to a Large Power, Pseudo random number generation, Computing n^{th} Fibonacci number.

UNIT – III

Array Techniques: Introduction, Array Order Reversal, Array counting, Finding the maximum number in a set, Removal of duplicates from an ordered array, Partitioning an array, Finding The K^{th} Smallest Element.

Merging, Sorting and Searching: Sorting By Selection, Sorting By Exchange, Linear Search, Binary search;

UNIT – IV

Introduction to MATLAB: MATLAB Environment, **Constants, Variables and Expressions:** Data types, Constants and Variables, Operators, Built-in Functions, **Vectors and Matrices:** Introduction, Scalars and Vectors, Matrix Manipulations, **Control Structures:** Loops, Branches.

Input-Output Statements: Reading/Storing File Data, **MATLAB Graphics:** Introduction, Two-Dimensional Plots.

TEXT BOOKS

[1] R.G. Dromey , ―How to Solve it By Computer‖, Prentice-Hall International Series in Computer Science,1982.

[2] Bansal.R.K, Goel.A.K, Sharma.M.K, ―MATLAB and its Applications in Engineering‖, Pearson Education, 2012.

REFERENCE BOOKS

[1] Michael Schneider, Steven W. Weingart, David M. Perlman, ―An Introduction to Programming and Problem Solving With Pascal‖, John Wiley and Sons Inc ,1984.
[2] David Gries, ―The Science of Programming‖, Springer Verlag, 1981.
[3] ReemaThareja, ―Computer Fundamentals and C Programming‖, Oxford, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL
MATLAB Getting Started Guide http://www.mathworks.com/help/pdf_doc/ matlab/getstart.pdf

17ME1104A ENGINEERING MECHANICS-I

Course Category:	Engineering Science	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Basic Mathematics, Physical Science	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Analyze coplanar concurrent forces

CO2 Analyze coplanar parallel forces and determine centroids for plane figures.

CO3 Analyze coplanar general case of force systems

CO4 Analyze spatial concurrent and parallel forces

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M	M											M
CO2	H	M	M											M
CO3	H	M	M											M
CO4	H	M	M											M

COURSE CONTENT

UNIT I

Concurrent Forces in a Plane: Principles of statics, Force, Addition of two forces: Parallelogram Law – Composition and resolution of forces – Constraint, Action and Reaction. Types of supports and support reactions. Free body diagram. Equilibrium of concurrent forces in a plane – Method of projections –Moment

of a force, Theorem of Varignon, Method of moments.

UNIT II

Parallel Forces in a Plane: Introduction, Types of parallel forces, Resultant. Couple, Resolution of Force into force and a couple. General case of parallel forces in a plane.

Centroids: Introduction, Determination of centroids by integration method, Centroids of composite plane figures. Distributed forces in a plane.

UNIT III

General Case of Forces in a Plane: Composition of forces in a plane – Equilibrium of forces in a plane – Plane Trusses**:** Method of joints

Friction: Introduction, Laws of dry friction. Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Frictional forces on wheel, Wedge friction.

UNIT IV

Force System In Space: Components of a force, defining a force by its magnitude and two points on its line of action, components of a vector, work done by a force, Resultant of system of concurrent and parallel forces in space, Moment of a force, Component of a vector and moment about an axis, Equilibrium of concurrent and parallel forces in space.

TEXT BOOKS

[1] S.Timoshenko, D.H.Young, J.V.Rao & Sukumar Pati, ―Engineering Mechanics‖, Vth edition, Mc Graw Hill Education (India) Pvt Ltd, 2013 (For Concepts and symbolic Problems).

[2] A.K.Tayal , ‒Engineering Mechanics Statics and dynamics‖, Umesh Publications, XIIIth edition, 2006 (For numerical Problems using S.I.System of Units).

REFERENCE BOOKS

[1] Beer and Johnston, ―Vector Mechanics for Engineers Statics and Dynamics‖, Tata McGraw Hill, IIIrd edition, 2010.

[2] SS Bhavikatti and KG Rajasekharappa, ―Engineering Mechanics‖, New Age International Private Limited, IVth Edition, 2012

[3] K.Vijaya Kumar Reddy and J Suresh Kumar, ― Singer‘s Engineering Mechanics Statics and Dynamics‖, BS Publications, IIIrd Edition 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://emweb.unl.edu/, Accessed On 15-06-2017

17ME1105 ENGINEERING GRAPHICS

Course Category:	Institutional Core	**Credits:**	4
		Lecture-Tutorial –Practice:	2-0-4
Course Type:	Theory&Practice	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
Prerequisites:	Nil	**Total Marks:**	100

COURSE OUTCOMES:

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

CO1 Understand the Scales, conics and Cycloidal curves.

CO2 Draw Orthographic projections of points, Lines, Planes and Solids

CO3 Understand Sectional views of Solids, Development of surfaces and their representation

CO4 Construct isometric scale, isometric projections, isometric views and convert pictorial views to orthographic projections

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H		H							H				L
CO2	M		H							H				L
CO3	M		H							H				L
CO4	L		H							H				L

COURSE CONTENT

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance

Scales: Construction of plain and diagonal Scales

Conic Sections: Construction of ellipse, parabola and hyperbola (Treatment is limited to Eccentricity or General method only)

Engineering Curves: Cycloidal curves - Cycloid, Epicycloid and Hypocycloid

UNIT – II

Orthographic Projections: Principles of Orthographic Projections –Projections of Points, Lines (Treatment is limited to First Angle Projection) and Projections of Plane regular geometric figures (Up to Plane Inclined to both of the Reference planes)

UNIT – III

Projections of Solids: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions (Limited to Solid Inclined to one of the Reference planes)

Sections of Solids: Sections of solids such as Cubes, Prisms, Pyramids, Cylinders and Cones. True shapes of sections(Limited to the solids perpendicular to one of the Principal Planes)

UNIT – IV

Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones

Isometric Projections: Isometric Projection and conversion of isometric views into Orthographic Projections (Treatment is limited to simple objects only)

Conventions Auto CAD: Basic principles only (Internal assessment only)

Text Books

[1] N.D. Bhatt & V.M. Panchal, ―Elementary Engineering Drawing‖, Charotar Publishing House, Anand. 49th Edition – 2006

[2] Basanth Agrawal & C M Agrawal,‖ Engineering Drawing‖, McGraw Hill Education Private Limited, New Delhi

Reference Books

[1] K. L. Narayana & P. Kannaiah, ‒Text Book on Engineering Drawing‖, Scitech publications (India) Pvt. Ltd.,Chennai, 2nd Edition - fifth reprint 2006

[2] K. Venugopal, ―Engineering Drawing and Graphics + Auto CAD‖, New Age International, New Delhi

[3] D M Kulkarni, AP Rastogi, AK Sarkar, ―Engineering Graphics with Auto CAD‖, PHI Learning Private Limited, Delhi Edition – 2013

E-Resources and other digital material

[1] http://www.youtube.com/watch?v=XCWJ XrkWco, Accessed On 01-06-2017.

[2] http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html# isodrawing, Accessed On 01-06-2017.

[3] http://www.slideshare.net, Accessed On 01-06-2017.

[4] http://edpstuff.blogspot.in, Accessed On 01-06-2017.

17CH1151 ENGINEERING CHEMISTRY LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:	Knowledge of chemistry practicals at intermediate level	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Analyse quality parameters of water samples from different sources and commercial solid samples
CO2	Analyse samples of acids and bases quantitatively using instrumental methods
CO3	Apply the knowledge of preparation of polymers, mechanism of corrosion inhibition and photochemical reactions

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

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

COURSE CONTENT

- Volumetric analysis of water samples
- Quantitative determination of commercial samples - boric acid and bleaching powder
- Quantitative analysis of copper and Mohr's salt
- Instrumental analysis using conductometer and pH meter
- Preparation of polymers, determination of effectiveness of corrosion inhibitors, and photochemical

reactions

List of Experiments:

1.Determination of total alkalinity of a water sample

2.Determination of purity of a boric acid sample

3.Conductometric analysis of a strong base using a strong acid

4.Determination of total hardness of a water sample

5.Determination of copper in a given sample

6.Chemistry of blueprinting

7.Determination of Mohr's salt - Permanganometry

8.Determination of Mohr's salt - Dichrometry

9.Determination of efficiency of a corrosion inhibitor

10.Determination of available chlorine in a bleaching powder sample

11.Determination of chlorides in a water sample

12. pH metric analysis of a strong base using a strong acid

13. Preparation of urea-formaldehyde resin

REFERENCE BOOKS

[1] Laboratory Manual on Engineering Chemistry, S.K. Bhasin and Sudha Rani, 2nd edition, Dhanpat Rai Publishing Company, New Delhi.

[2] Experiments in Applied Chemistry, Sunita Rattan, 2nd edition, S. K. Kataria & Sons, Delhi.

17CS1152 COMPUTING AND PERIPHERALS LABORATORY

Course Category:	Institutional Core	**Credits:**	1
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 – 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Understand and Apply MS Office tools

CO2 Configure the components on the motherboard and install different operating systems

CO3 Understand and configure different storage media

CO4 Perform Networking, troubleshooting and system administration tasks

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H				L							M	M	M
CO2				L								M	M	M
CO3	H												M	M
CO4				M								M	M	M

COURSE CONTENT

CYCLE - I:Word Processing, Presentations and Spread Sheets

1. Word Processing:

a) Create personal letter using MS Word.

b) Create a resume using MS Word.

c) Creating project abstract**:** Features to be covered:- Table of Content, List of Tables, Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check,Track Changes.

d) Creating a Newsletter: Features to be covered:- Table of Content, List of figures, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphsand Mail Merge in word.

2. Spread Sheets:

a) Create a worksheet containing pay details of the employees.

b) Creating a Scheduler: Features to be covered:- Gridlines, Format Cells, Summation, auto fill,Formatting Text

c) Create a worksheet which contains student results: .Features to be covered:- Cell Referencing, Formulae in excel – average, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

d) Create a worksheet importing data from database and calculate sum of all the columns.

3. Presentations:

a) Create a presentation using themes.

b) Save, edit, print and import images/videos to a presentation.

c) Create a power Point presentation on business by using master layouts, adding animation to a presentation and see the presentation in different views.

4. MS Access:

a) Create simple table in MS Access for results processing.

b) Create a query table for the results processing table.

c) Create a form to update/modify the results processing table.

d) Create a report to print the result sheet and marks card for the result.

CYCLE - II: Hardware Experiments

1. Identification of System Layout: Front panel indicators & switches and Front side & rear side connectors. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD,HDD, CD, DVD and add on cards. Install Hard Disk. Configure CMOS-Setup. Partition and Format Hard Disk.

2. Install and Configure a DVD Writer or a Blu-ray Disc writer.

3. Install windows operating system and check if all the device (graphics, sound, network etc.) drivers are installed.

4. Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.

5. Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.

6. PC system layout: Draw a Computer system layout and Mark the positions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVDDrive add on cards in table top / tower model systems.

7. Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, cooling fan, I/O slots and I/O ports and various jumper settings.

8. Configure BIOS setup program to change standard and advanced settings to troubleshoot typical problems.

9. Install and configure Printer/Scanner/Web cam/Cell phone/bio-metric device with system. Troubleshoot the problems

CYCLE – III : Networking

1. Prepare an Ethernet/UTP cable to connect a computer to network switch. Crimp the 4 pair cable with RJ45 connector and with appropriate color code.

2. Manually configure TCP/IP parameters (Host IP, Subnet Mask andDefault Gateway) for a computer and verify them using IPCONFIG command. Test connectivity to a server system using PING command.

3. Creating a shared folder in the computer and connecting to that folder using Universal Naming Convention (UNC) format. (Ex: computername sharename)

4. Connects computers together via Switch/ Hub

5. Connect different devices via Switch/Hub

6. Statically configure IP address and subnet mask for each computer

7. Examine non-existent IP address and subnet conflicts

8. Configure a computer to connect to internet (using college internetsettings) and troubleshoot the problems using PING, TRACERT and NETSTAT commands.

9. Using scan disk, disk cleanup, disk Defragmenter, Virus Detectionand Rectifying Software to troubleshoot typical computer problems.

10. Configure DNS to establish interconnection between systems anddescribe how a name is mapped to IP Address.

11. Remote desktop connections and file sharing.

12. Installation Antivirus and configure the antivirus.

13. Introducing Ethereal , a packet capture tool.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar,Department of Physics, IIT Madras https://www.youtube.com/ watch?v=zjyR9e #1D4&list=PLC5DC6AD60D798FB7

[2]Introduction to Coding ConceptsInstructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11

17MC1106B PROFESSIONAL ETHICS & HUMAN VALUES

Course Category:	Instituitonal core	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0 - 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Know the moral autonomy and uses of ethical theories
CO2	Understand morals, Honesty and character
CO3	Understand about safety, risk and professional rights
CO4	Apply the ethics regarding Global issues related to Environment, Computers and weapon‘s development

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

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

COURSE CONTENT

UNIT I

Engineering Ethics: Senses of ‘Engineering Ethics‘ - variety of moral issues- types of inquiry - moral dilemmas - moral autonomy - Kohlberg‘s theory -Gilligan‘s theory - consensus and controversy - Models of Professional Roles -theories about right action - Self-interest - customs and religion- uses of ethical theories.

UNIT II

Human Values:Morals, Values and Ethics - Integrity- Work Ethic – Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring – Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment –Empathy - Self-Confidence - Character - Spirituality .

UNIT III

Engineering as Social Experimentation: Engineering as experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT IV

Global Issues: Multinational corporations- Environmental ethics- computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership- sample code of Ethics (Specific to a particular Engineering Discipline).

TEXT BOOKS

[1] Mike Martin and Roland Schinzinger, ―Ethics in engineering‖, McGraw Hill, New York (1996).

[2] Govindarajan M, Natarajan S, Senthil Kumar V. S., ―Engineering Ethics‖, Prentice Hall of India, New Delhi(2004).

REFERENCE BOOKS

[1] Baum, R.J. and Flores, A., ―Ethical Problems in Engineering, Center for the studyof the Human Dimensions of Science and Technology‖, Rensellae Polytechnic Institute,Troy, New York, 335 pp. eds. (1978)

[2] Beabout, G.R., Wennemann, D.J. , ―Applied Professional Ethics: A Developmental Approach for Use with Case Studies‖, University Press of America Lanham, MD, 175 pp (1994).

17MA1201 LAPLACE TRANSFORMS AND INTEGRAL CALCULUS

Course Category:	Institutional Core	**Credits:**	4
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 1 - 0
Prerequisites:	Vectors, Curve Tracing.	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Solve Linear Differential Equations using Laplace Transforms

CO2 Examine the nature of the Infinite series

CO3 Evaluate areas and volumes using Double, Triple Integrals

CO4 Convert Line Integrals to Area Integrals and Surface Integrals to Volume Integrals

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M			L									
CO2	H	M			L									
CO3	H	M			L									
CO4	H	M			L									

COURSE CONTENT

UNIT I

Laplace Transforms: Introduction, Definition, Conditions for Existence, Transforms of Elementary

functions, Properties of Laplace Transforms, Transforms of Periodic functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by t^n, Division by _t', Inverse Transforms, Method of partial fractions, Other methods of finding Inverse Transform, Convolution Theorem, Unit Step and Unit Impulse functions.

Applications: Evaluation of Improper Integrals, Solving Differential equations by Laplace Transform.

UNIT II

Partial Differential Equations: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order. **Sequence and Series**: Convergence of series, Comparison test, Integral test, D'Alembert's Ratio test, Cauchy's Root Test, Alternating series test, Absolute and Conditional convergence.

UNIT III

Integral Calculus: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Triple Integrals, Change of Variables. **Applications:** Area enclosed by Plane Curves, Volumes of Solids.

Special Functions: Beta Function, Gamma Function, Relation between Beta and Gamma Function, Error Function.

UNIT IV

Vector Calculus: Scalar and Vector point functions, Del applied to Scalar point functions, Del applied to Vector point functions, Physical interpretation of Divergence, Del applied twice to point functions, Del applied to products of point functions. Integration of Vectors, Line Integral, Surface Integral, Green's Theorem in a plane, Stokes's Theorem, Volume Integral, Gauss Divergence Theorem, Irrotational Fields.

TEXT BOOKS

[1] B.S.Grewal, ―Higher Engineering Mathematics, Khanna Publishers‖, 43rd Edition, 2014.

REFERENCE BOOKS

[1].Erwin Kreyszig , ―Advanced Engineering Mathematics‖ , John Wiley & Sons, 10th Edition,2015

[2].B.V.Ramana, ―Higher Engineering Mathematics‖, Tata MC Graw Hill, 1st Edition,2007

[3].N.P.Bali, Dr.Manish Goyal, ―A Text Book of Engineering Mathematics‖, Laxmi Publications, 9th Edition,2014

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT,Stanford,IIT'S)
[2]. nptel.ac.in/courses/122104017
[3]. nptel.ac.in/courses/111105035
[4]. Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/Loughborough%20website/

17PH1202C PHYSICS FOR ENGINEERS

Course Category:	**Institutional Core**	**Credits:**	**3**
Course Type:	**Theory**	**Lecture -Tutorial-Practice:**	**3 - 0 - 0**
Prerequisites:		**Continuous Evaluation:**	**30**
		Semester end Evaluation:	**70**
		Total Marks:	**100**

COURSE OUTCOMES

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

CO1	Analyse and understand various types of crystal structures and their characterization
CO2	Understand various concepts of acoustics and thermal performance
CO3	Analyze the classification, properties, preparation and applications of various engineering materials-
CO4	Understand the fabrication of nanomaterials and carbon Nanotubes-

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO I**	**PSO II**
CO1	**H**			**L**										
CO2	**H**													
CO3	**H**													
CO4	**H**													

COURSE CONTENT

UNIT – I

Crystallography: Introduction, Fundamental terms of crystallography, Types of crystals: Bravais lattices, Miller indices; Relation between inter planar distance and inter atomic distance, Crystal structures of materials: SC, BCC, FCC.

Characterization of materials: Introduction, diffraction of X-rays (Derivation for Bragg‘s law, Bragg‘s X-ray spectrometer), Determination of crystal structure by Powder crystal method.

UNIT – II

Acoustics: Introduction, Classification of sound, Sound absorption: Absorption coefficient, Sabine‘s formula for reverberation time and its limitations, Factors effecting acoustics of building and their remedies and

acoustic design of a hall.
Thermal Performance: Heat transfer through fenestrations, thermal insulation and its benefits- heat gain and heat loss estimation- factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices-central heating.

UNIT – III

Engineering Materials: Composite materials: Introduction, classification, processing technique for composite materials (Fiber reinforced) and applications.
Ceramics: Introduction, classification, ceramic fabrication (Isostatic pressing) and applications.
Dielectric Materials: Fundamental definitions, Types of Polarization: Electronic and Ionic polarizations, ferroelectric materials and their applications.
Shape memory alloys: Introduction, properties, commercial shape memory alloys (Ni-Ti and copper based alloys) and applications.

UNIT- IV

Nanotechnology: Basic concepts of Nanotechnology, Nano scale, Introduction to nano materials, Surface to volume ratio, General Properties of Nano materials, Fabrication of nano materials: Plasma Arcing, Chemical vapour deposition, Characterization of nano materials: SEM, TEM. Carbon nano tubes: SWNT, MWNT, Formation of carbon nanotubes: Arc discharge, Laser ablation, Properties of carbon nano tubes, Applications of CNT‘s & Nanotechnology.

TEXT BOOKS

[1]. V. Rajendran, Materials science, Mc Graw Hill Publications, 4th Edition, 2014.
[2]. M.N. Avadhanulu & P.G. Kshirsagar, Engineering Physics, S. Chand publications, Revised Edition, 2014.

REFERENCE BOOKS

[1]. S.O. Pillai, ―Solid State Physics‖, New age international publishers, 7th Edition, 2015.
[2]. M.R. Srinivasan, ―Engineering Physics‖, New age international publishers, First Edition, 2011.
[3]. Severns, W.H. & Fellows, J.R., ―Air Conditioning and Refrigeration‖, John Wiley and sons, London, 1988. (Unit-I).

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. http://nptel.ac.in/courses/112106227/
2. https://ocw.mit.edu/courses/materials-science-and-engineering/3-60-symmetry-structure-and-tensor-properties-of-materials-fall-2005/video-lectures/introduction-to-crystallography-part-1/
3. https://architecture.mit.edu/subject/spring-2014-4431
4. http://freevideolectures.com/Course/3048/Physics-of-Materials/36
5. https://www.peterindia.net/NanoTechnologyResources.html

17CS1203 PROGRAMMING IN C

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 – 0 – 0
Prerequisites:	Problem Solving Methods	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Understand the fundamentals and structure of a C programming language
CO2	Apply the loops, arrays, functions and string concepts in C to solve the given problem
CO3	Apply the pointers and text input output files concept to find the solution for the given applications
CO4	Use the Enumerated, Datatypes, Structures and Unions

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M			L									M	M
CO2	M			L									M	M
CO3	H			L	L								M	M
CO4	H			L	L								M	M

COURSE CONTENT

UNIT - I

Introduction to the C Language : Background, C Programs, Identifiers, Types, Variables, Constants, Input/Output, Programming Examples.

Structure of a C Program: Expressions, Precedence and Associatively, Evaluating Expressions, Type Conversion, Statements, Sample Programs.

Selection: Storage Class,Logical Data and Operators, Two -Way Selection, Multiway Selection, More Standard Functions

UNIT - II

Repetition: Concept of a Loop Loops In C, Loop Examples, Recursion, The Calculator Program.

Arrays: Concepts, Using Array in C, Inter-Function Communication, Array Applications, Two Dimensional Arrays, Multidimensional Arrays.

Functions: Functions in C, User Defined Functions, Inter Function Communication, Standard Functions, Scope.

Strings: String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String- Data Conversion.

UNIT - III:

Pointers: Introduction, Pointers For Inter Function Communications, Pointers to Pointers, Compatibility, Lvalue and Rvlaue.

Pointer Applications: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocations Functions, Array of Pointers.

Text Input/output: Files, Streams, Standard Library Input/Output Functions, Formatting Input/output Functions and Character Input/Output Functions, Command-Line Arguments.

UNIT - IV:

Enumerations: The Type Definition (Typedef) , Enumerated Types: Declaring an Enumerated Type , Operations on Enumerated Types, Enumeration Type Conversion, Initializing Enumerated Constants, Anonymous Enumeration: Constants, Input/Output Operators.

Structures: Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures, Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures through Pointers.

Unions: Referencing Unions, Initializers, Unions and Structures, Internet Address, Programming Applications.

TEXT BOOKS

[1] Behrouz A. Forouzan & Richard F. Gilberg , –Computer Science A Structured Programming Approach using C‖ , CENGAGE Learning, Third Edition.

REFERENCE BOOKS

[1] Kernighan and Ritchie , –The C programming language‖ , The (Ansi C Version), PHI, second edition.

[2] Yashwant Kanetkar , ―Let us C‖ , BPB Publications, 2nd Edition 2001.

[3] Paul J. Dietel and Dr. Harvey M. Deitel, ―C: How to Program‖, Prentice Hall ,7th edition (March 4,2012).

[4] Herbert Schildt, ―C:The Complete reference‖, McGraw Hill, 4th Edition, 2002.

[5] K.R.Venugopal, Sundeep R Prasad, ―Mastering C‖, McGraw Hill, 2nd Edition, 2015

17ME1204 ENGINEERING MECHANICS – II

Course Category:	Engineering Sciences	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	3 - 0 - 0
Prerequisites:	Basic Mathematics, Physical Science, Engineering Mechanics-I (Statics)	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Analyze the rectilinear motion of particles.

CO2 Analyze the curvilinear motion of particles.

CO3 Evaluate the moment of inertia of areas and material bodies.

CO4 Analyze the motion of rigid bodies.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M	M											M
CO2	H	M	M											M
CO3	H	M	M											M
CO4	M	H	H											H

COURSE CONTENT

UNIT – I

Kinematics of Rectilinear Translation: Introduction, displacement, velocity and acceleration. Motion with Uniform and Variable acceleration.

Kinetics of Rectilinear Translation: Equations of rectilinear motion. Equations of Dynamic Equilibrium: D'Alembert's Principle. Work and Energy, Conservation of energy, Impulse and Momentum, Impact-Direct central Impact.

UNIT – II

Kinematics of Curvilinear Motion: Introduction, rectangular components of velocity and acceleration. Normal and Tangential acceleration, Motion of projectiles.

Kinetics of Curvilinear Motion: D'Alembert's Principle, and Work and Energy in curvilinear motion.

UNIT –III

Moment of Inertia of Plane Figures: Moment of Inertia of a plane figure with respect to an axis in its plane – Moment of inertia with respect to an axis perpendicular to the plane of the figure, Radius of gyration – Parallel axis theorem, MI of composite plane figures.

Moment of Inertia of Material Bodies: Moment of inertia of a rigid body – Moment of inertia of slender bar, laminas (2D), Radius of gyration, Parallel axis theorem, Moment of inertia of 3D bodies- cone, cylinder, sphere and parallelepiped.

UNIT – IV

Kinematics of Rigid Body:

Rotation: Linear and angular Velocity, linear and angular acceleration in uniformly accelerated rotation.

Plane motion: Concepts of relative velocity and Instantaneous center.

Kinetics of Rigid Body:

Rotation: Equation of motion for a rigid body rotating about a fixed axis – Rotation under the action of a constant moment.

TEXT BOOKS

[1] S. Timoshenko & D. H. Young , ―Engineering Mechanics‖ , McGraw Hill International Edition. (For Concepts and symbolic Problems), 4th Edition, 2007.

[2] A. K. Tayal, ―Engineering Mechanics Statics and dynamics‖ , Umesh Publication, Delhi, (For numerical Problems using S.I.System of Units),13th Edition, 2006.

REFERENCE BOOKS

[1] Beer and Johnston, ―Vector Mechanics for Engineers Statics and Dynamics‖, Tata McGraw Hill, IIIrd edition 2010.

[2] SS Bhavikatti and KG Rajasekharappa, ―Engineering Mechanics‖, New Age International Private Limited, IVth Edition 2012

[3] K.Vijaya Kumar Reddy and J Suresh Kumar, ― Singer's Engineering Mechanics Statics and Dynamics‖, BS Publications, IIIrd Edition 2010.

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://emweb.unl.edu/, Accessed On 15-06-2017

17HS1205 TECHNICAL ENGLISH &COMMUNICATION SKILLS

Course Category:	Institutional Core	**Credits:**	3
Course Type:	Theory	**Lecture -Tutorial-Practice:**	2 - 0- 2
Prerequisites:	Basic understanding of the language skills ,viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Develop administrative and professional compilations including web related(On-line) communication with felicity of expression
CO2	Demonstrate Proficiency in Interpersonal Communication, in addition to standard patternsof Pronunciation
CO3	Apply the elements of functional English with sustained understanding for authentic use of language in any given academic and/or professional environment
CO4	Execute tasks in Technical communication with competence

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1								**H**	**M**	**H**				
CO2								**H**	**M**	**H**				
CO3								**H**	**M**	**H**				
CO4								**H**	**M**	**H**				

COURSE CONTENT

UNIT I

Professional Writing Skills

- Professional Letter- Business, Complaint and Transmittal

- Essay Writing- Descriptive and Analytical
- Administrative and On-line drafting skills –Minutes and Web notes including e-mail

UNIT II

Interpersonal Communication Skills

- **Communicative Facet**- Speech acts- Extending Invitation, Reciprocation, Acceptance, Concurrence, Disagreeing without being disagreeable
- **Articulation-oriented Facet**- Transcription using International Phonetic Alphabet, Primary Stress

UNIT III

Vocabulary and Functional English

- Root words (A Representative collection of 50)
- A basic List of 500 words – Overview
- Verbal analogies, Confusables, Idiomatic expressions and Phrasal Collocations
- Exposure through Reading Comprehension- Skimming, Scanning and Understanding the textual patterns for tackling different kinds of questions
- Functional Grammar with special reference to Concord, Prepositions, use of Gerund and Parallelism

UNIT IV

Technical Communication skills:

- Technical Proposal writing
- Technical Vocabulary- a representative collection will be handled
- Introduction to Executive Summary
- Technical Report writing Informational Reports and Feasibility Report

TEXT BOOKS

[1] Martin Cutts, ―Oxford guide to Plain English‖, Oxford University Press, 7th Impression 2011.

[2] TM Farhathullah, ―Communication skills for Technical Students‖, Orient Longman, I Edition 2002

[3] John Langan, ―College Writing Skills‖, McGraw Hill, IX Edition, 2014.

[4] ―Eclectic Learning materials offered by the Department‖

REFERENCE BOOKS

[1] Randolph Quirk, ―Use of English‖, Longman, I Edition (1968) Reprinted 2004.

[2] Thomson A.J & A.V, Martinet, ―Practical English Grammar‖, Oxford University Press, III Edition 2001

[3] V.Sethi and P.V. Dhamija, ―A Course in Phonetics and Spoken English‖, PHI, II Edition 2006

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.britishcouncil.org/english *Accessed on 15th June 2017*

[2] www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online *Accessed on 15th June 2017*

[3] https://www.unimarburg.de/sprachenzentrum/selbstlernzentrum /.../apps_for_esl.pdf *Accessed on 15th June 2017*

17MC1206A TECHNOLOGY AND SOCIETY

Course Category:	Institutional Core	**Credits:**	-
Course Type:	Theory	**Lecture -Tutorial-Practice:**	1 - 0 – 0
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Understand the origins of technology and its role in the history of human progress

CO2 Know the Industrial Revolution and its impact on Society

CO3 Interpret the developments in various fields of technology till Twentieth Century

CO4 Distinguish the impacts of Technology on the Environment and achievements of great scientists

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1												L		
CO2							M							
CO3												L		
CO4							M							

COURSE CONTENT

UNIT – I

Introduction: Origins of technology, The Agriculture revolution, Technological contributions of ancient

civilizations- Mesopotamian, Egyptians, Greeks, Romans, Indians and Chinese.

UNIT - II

Industrial revolution: The social and political background, The technical background, Steam: The power behind the Industrial Revolution, The revolution in Textile Industry, The Impact of Industrial Revolution on Society.

UNIT - III

The Flowering of modern technology: Manufacturing Technologies, Prime Movers, Internal Combustion engines, Production of Metals and Alloys, The Birth of Electrical Technology, Twentieth Century: The Flowering of modern technology

UNIT - IV

Technology, Science and Society: Impact of technology on society, The Impacts of Technology on the environment, Sustainable development.

Achievements of famous scientists:

(**World**): Einestein, Newton, Faraday, Graham Bell, Edison, S.Hawking.

(**India**): CV Raman, S.Chandrasekhar, Aryabhatta, Homi J Bhabha, Vikram Sarabhai, APJ Abdulkalam, S.Ramanujan, M.Visweswarayya.

TEXT BOOKS

[1] Dr. R.V.G Menon, ―Technology and Society‖, Pearson Education, 2011

REFERENCE BOOKS

[1] Quan-Haase, A., ― Technology and Society: Inequality, Power, and Social Networks‖, Oxford University Press, 2013.

17PH1251 ENGINEERING PHYSICS LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES

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

CO1	Analyse and understand various types of crystal structures and their characterization
CO2	Understand various concepts of acoustics and thermal performance-
CO3	Understand the classification, properties, preparation and applications of various engineering materials –

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1				H	M									
CO2				H										
CO3				H										

COURSE CONTENT

1. Melde‘s apparatus- Determine the frequency of tuning fork
2. Wedge method- Measurement of thickness of a foil
3. Variation of magnetic field along the axis of current-carrying circular coil
4. Fibre Optics- Determination of Numerical aperture
5. Photo cell-Study of V-I Characteristics, determination of work function
6. Solar cell –Determination of Fill Factor

7. Torsional Pendulum-Determination of Rigidity modulus
8. Determination of Dielectric constant of a sample
9. Diffraction grating-Measurement of wavelength of mercury source
10. Hall effect –Hall coefficient measurement
11. Compound pendulum-Determination of ‗g‘
12. Figure of merit of a galvanometer

TEXT BOOKS

[1] Madhusudhan Rao, ―Engineering Physics Lab Manual‖, Ist ed., Scitech Publications, 2015

[2] Ramarao Sri, Choudary Nityanand and Prasad Daruka, ‖Lab Manual of Engineering Physics‖., Vth ed., Excell Books, 2010

E-RESOURCES

[1] http://plato.stanford.edu/entries/physics-experiment

[2] http://www.physicsclassroom.com/The-Laboratory

[3] http://facstaff.cbu.edu/~jvarrian/physlabs.html

VIRTUAL LAB REFERENCES

[1] http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1

[2] http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1

[3] http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

17CS1252 COMPUTER PROGRAMMING LABORATORY

Course Category:	Institutional Core	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 – 3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1	Implement the use of programming constructs in a structured oriented programming language
CO2	Implement conditional and iterative statements through C Language
CO3	Analyze and implement user defined functions to solve real time problems
CO4	Implement the usage of pointers and file operations on data
CO5	Implement the user defined data types via structures and unions to solve real life problems

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M – Medium, H – High)

CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H												M	M
CO2	L												M	M
CO3	M			H								M	M	M
CO4	M			L								M	M	M
CO5	H			L								M	M	M

COURSE CONTENT

CYCLE – I : PROGRAMMING CONSTRUCTS AND CONTROL STRUCTURES

1. Introduction to C Programming:
   a) Use of Turbo C IDE
   b) The Structure of C Program with Sample program
2. Data Types and Variables:
   a) Programs to usage of keywords and identifiers in c
   b) Programs on declaration of variables, rules for naming a variable, constants and different type of constants, data types
   c) Programs to perform on various operators in C
3. Branching and Selection:
   a) To specify the conditions under which a statement or group of statements should be executed.
   b) To choose exactly one out of two statements (possibly compound statements) to be executed; specifies the conditions under which the first statement is to be executed and provides an alternative statement to execute if these conditions are not met.
   c) To choose one statement (possibly compound) to be executed from among a group of statements (possibly compound); specifies the conditions under which each statement may be executed and may contain a default statement (in an else clause at the end) to be executed if none of these conditions are met. Note that in the absence of a final else clause, it may be the case that none of the statements are executed.
4. Unconditional control Transfer statements in C:
   a) Design and develop programs that use of goto Statement
   b) Design and develop programs that the use of Break Statement
   c) Design and develop programs that use of Continue Statement
5. Looping constructs:

   Design and develop programs based on
   a) Iterative loops using While, Do While, For, Nested For
   b) Selection Statement using the switch-case Statement
   c) Multiple way selections that will branch into different code segments based on the value of a variable or expression
6. Arrays
   a) Design and develop programs which illustrates the implementation of single-dimensional arrays and Multi dimensional arrays
7. Strings
   a) Create programs to initialize strings and usage of them for various input, output operations.
   b) Design and develop programs to handle String functions

CYCLE - II: ADVANCED PROGRAMMING CONSTRUCTS

1. Concept of user defined functions
   a) Design and develop programs depending on functions both user defined and standard library functions in C with different approaches.
2. File handling operations
   a) FILE structure
   b) Opening and closing a file, file open modes
   c) Reading and writing operations performed on a file
   d) File Pointers: stdin, stdout and stderr
   e) FILE handling functions: fgetc(), fputc(), fgets() and fputs() Functions
3. Pointers:
   a) Programs on declaration of pointers and their usage in C
   b) Programs to relate between arrays and pointers and use them efficiently in a program
   c) To pass pointers as an argument to a function, and use it efficiently in program
4. Command Line Arguments
   a) Design and develop programs that accept arguments from command line to perform different kinds of operations
5. Structures and Unions
   a) Programs to define, declare and access structure and union variables
   b) Design and develop programs to work with pointers to access data within a structure

Programs to pass structure as an argument to a function

TEXT BOOKS

[1] Ashok N Kamthane, ―C And Data Structures‖, Pearson Education; First edition, 2008

REFERENCE BOOKS

[1] Brain W Kernighan and Dennis Ritchie, ―The C Programming language‖, Pearson Education India,2015

[2] David Griffiths and Dawn Griffiths, ―Head First C‖:A Brain Friendly Guide, O:Reilly media, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Introduction to Programming C: http://nptel.ac.in/courses/106104128/

[2] C-Programming - IIT Kharagpur lectures https://www.youtube.com/watch?v=S47aSEqm_0I&list=PLeCxvb23g7hrw27XlekHtfygUTQ0TmFfP

[3] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4& list=PLC5DC6AD60D798FB7

17ME1253 BASIC WORKSHOP

Course Category:	Engineering Sciences	**Credits:**	1.5
Course Type:	Laboratory	**Lecture -Tutorial-Practice:**	0 - 0 - 3
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

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

CO1 Develop basic models using wood and familiarize with various fundamental aspects of house wiring.

CO2 Develop basic models using sheet metal and practice joining of metals using arc welding technique.

CO3 Develop with various manufacturing processes such as lathe operations, injection moulding and 3Dprinting.

CO4 Outline the preparation of PCB

CO5 Illustate simple IOT Applications using Arduino

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1			M		H									
CO2			M		H									
CO3			M		H									
CO4			M											
CO5					L									

COURSE CONTENT

Part-A

Carpentry:

a. . Preparation of Cross half lap joint and use of power tools.
b. b. Preparation of a T joint.

House Wiring:

a. Fundamentals of house wiring and practice of Series wiring.

b. Practice of stair case wiring and connecting a fluorescent Tube.

Sheet metal & soldering:

a. Preparation of complete funnel using sheet metal and practice of soldering.

b. Preparation of a square box using sheet metal and practice of soldering.

Welding:

a. Preparation of Corner Joint using arc welding process.

b. Preparation of ―T‖ joint using arc welding process.

Manufacturing processes:

a. Demonstration of Green sand moulding process.

b. Demonstration of various operations on a lathe machine.

c. Preparation of a small plastic part using injection moulding process.

d. Demonstration of manufacturing a simple model using 3D printing process.

Part-B

Electronic Circuits :

1. To prepare PCB for the given electronic circuit

a. To prepare the layout and printing it on copper clad board

b. To etch and drill the holes on PCB

2. To solder the components on the PCB prepared and test the circuit

a. To identify and solder the components on the PCB prepared

b. To test the operation of the circuit.

Basic IOT:

1. Demonstration of Arduino board

a. Demonstrate different components & pin configuration of Arduino

b. To set up Arduino IDE for programming.

2. To measure Temperature & Humidity

a. Interfacing of temperature & humidity sensor with Arduino.

b. Execute the program on Arduino IDE & display the measured values.

3. To measure Distance

a. Interfacing of Ultrasonic Sensor with Arduino

b. Execute the program on Arduino IDE & display the measured value.

TEXT BOOKS

[1] Kannaiah P. & Narayana K. C., ‐Manual on Workshop Practice‖, Scitech Publications, Chennai, 1999.

[2] Venkatachalapathy, V. S., ―First year Engineering Workshop Practice‖, Ramalinga Publications, Madurai, 1999.

REFERENCE BOOKS

[1] Gopal, T.V., Kumar, T., and Murali, G., ―A first course on workshop practice – Theory, Practice and Work Book‖, Suma Publications, Chennai, 2005

E-resources and other digital material:

1. https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17- 1.pdf
2. https://www.protosystech.com/rapid-prototyping.htm
3. https://www.arduino.cc/en/Tutorial/Foundations
4. https://www.tutorialspoint.com/arduino/

17MA1301D MATHEMATICS FOR MECHANICAL ENGINEERS

Course Category: Programme Core **Credits**: 4

Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /1/ 0

Prerequisites: **Continuous Evaluation**: 30

Algebra of Complex numbers, **Semester end Evaluation**:70

convergence of infinite series, **Total Marks:**100

Basic concepts of probability & statistics

Course Outcomes:

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

CO1: Determine analytic, non-analytic functions and evaluate complex integrals

CO2: Analyze Taylor, Laurent series and evaluate real definite integrals using residue theorem.

CO3: Solve Algebraic and transcendental, system of equations and understand the concept of polynomial interpolation.

CO4: Understand the concept of Normal distribution, sampling distribution and estimate correlation, regression coefficients.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	10	11	12	PSO I	PSO II
CO1	H	M		L								L	L
CO2	H	M		L								M	M
CO3	H	M		L	L							M	M
CO4	H	M		M	L							M	M

(L-Low, M-Medium, H-High)

UNIT I:
Complex Analysis: Introduction, continuity, Cauchy-Riemann equations. Analytic functions, Harmonic functions, Orthogonal systems, Application to Flow Problems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula

UNIT II:
Taylor's series, Laurent's series, Zeros and singularities.Residue theorem, calculation of residues, evaluation of real definite integrals (by applying the residue theorem).
Standard transformations: Translation - Magnification and Rotation – Inversion and reflection - Bilinear transformation.

UNIT III:

Numerical Methods: Solution of Algebraic and Transcendental Equations : Introduction, Newton - Raphson method, Solution of simultaneous linear equations: Gauss Elimination Method, Gauss - Seidel iterative method.

Interpolation: Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Missing terms, Newton‘s formulae for interpolation, Central difference interpolation formulae –Gauss‘s, Sterling‘s, Bessel‘s formulae Interpolation with unequal intervals – Lagrange‘s and Newton‘s Interpolation formulae.

UNIT – IV

Probability Densities: Continuous random variables – Normal distribution.

Sampling Distributions: Populations and samples – Sampling distribution of the mean (SD known) – Sampling distribution of the mean (SD unknown) – Sampling distribution of the variance.

Statistics: Method of Least Squares – correlation – Regression.

Text Book:

[1] B.S.Grewal, –Higher Engineering Mathematics‖, 43rd Edition Khanna Publishers, 2014.
[2] Richard A.Johnson, ― Probability and statistics for Engineers‖–Prentice Hall of India.

Reference Books:

[1] Krezig, –Advanced Engineering Mathematics‖, 8th Edition, JohnWiley & Sons.2007,
[2] R.K.Jain and S.R.K.Iyengar, –Advanced Engineering Mathematics‖, 3rd Edition, Narosa Publishers.
[3] N.P.Bali, Manish Goyal, –A Text book of Engineering Mathematics‖, 1st Edition, Lakshmi Publications (P) Limited, 2011
[4] H.K.Das, Er. RajnishVerma, –Higher Engineering Mathematics‖, 1st Edition, S.Chand& Co., 2011.
[5]Rukmangadachari E, ―Probability and Statistics‖, Pearson, 2012

E-resources and other digital material:

[1] faculty.gvsu.edu/fishbacp/complex/complex.html.
[2] nptelvideolectures/iitm.ac.in

17ME3302 MECHANICS OF MATERIALS

Course Category: Programme Core **Credits**: 4

Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /1/ 0

Prerequisites: **Continuous Evaluation**: 30

17ME1104A Engineering Mechanics - I **Semester end Evaluation**:70

17ME1204 Engineering Mechanics - II **Total Marks:**100

Course Outcomes:

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

CO1: Understand stress-strain concepts and analyze axially loaded members.

CO2: Illustrate and analyze the structures subjected to bending & torsion.

CO3: Determine deflections of beams and safe load on columns.

CO4: Analyse plane stress problems.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	L	L											M
CO2	M	H	L											M
CO3	M	H	L											M
CO4	M	H	L											M

(L-Low, M-Medium, H-High)

UNIT - I

TENSION, COMPRESSION AND SHEAR : Introduction, Concepts of Normal Stress and Strain, Stress-Strain Diagrams, Elasticity and Plasticity, Linear Elasticity and Hooke‘s Law, Poisson‘s Ratio, Shear Stress and Strain, Allowable Stresses and Allowable Loads. Numerical problems on Change in lengths of axially loaded members. Change in lengths under Non-uniform conditions.

TORSION: Introduction, Torsional deformations of Circular Bar, Circular bars of linearly elastic materials, Relationship between Moduli of Elasticity E and G.

UNIT - II

STATICALLY DETERMINATE BEAMS : Introduction, Types of Beams, Loads and Reactions, Shear Force and Bending Moments, Relationships between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams

STRESSES IN STATICALLY DETERMINATE BEAMS: Introduction, Normal Stresses in Beams, Shear Stresses in Beams of Rectangular cross section.

UNIT – III

DEFLECTIONS OF STATICALLY DETERMINATE BEAMS: Introduction, Differential Equations of the Deflection Curve, Deflections by Integration of the Bending Moment Equation, Macaulay's Method.

COLUMNS: Introduction, Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula.

UNIT – IV

ANALYSIS OF PLANE STRESS: Introduction, Plane Stress, Principal Stresses and Maximum Shear Stress. Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress.

THIN CYLINDRICAL AND SPHERICAL PRESSURE VESSELS: Introduction, Stresses in thin cylindrical and spherical pressure vessels subjected to internal pressure. Effect of internal pressure on the dimensions of the thin cylindrical and spherical pressure vessels.

Text Books:

[1] James M. Gere and Barry J. Goodno, ―Mechanics of Materials‖, Seventh edition, CENGAGE Learning, 2009

[2] R.K.Bansal, ―Strength of Materials‖ Fifth edition, Laxmi Publishers, 2012

Reference books:

[1] Dr. Sadhu Singh,‖Strength of Materials‖, Ninth edition, Khanna Publishers, 2007.

[2] R.K. Rajput,―Strength of Materials‖,First Edition, S.Chand & Company, 2006.

[3] S.S.Rattan, ―Strength of Materials‖, Second Edition,Tata McGraw Hill Education Private Limited, 2012.

E-resources and other digital material:

[1] Prof. M.S. Sivakumar, IIT Madras, Strength of material, [English], Web
Available: http://nptel.ac.in/courses/112106141/

[2] Dr. Satish C Sharma, IIT Roorkee, Strength of material, [English], Web
Available: http://nptel.ac.in/courses/112107146/

[3] Dr. S. P. Harsha, IIT Roorkee, Strength of material, [English], Video
Available: http://nptel.ac.in/courses/112107147/

17ME3303 BASIC THERMODYNAMICS

Course Category : Programme Core **Credits:** 4

Course Type : Theory **Lecture/Tutorial/Practice:** 3/1/0

Prerequisites : **Continuous Evaluation:** 30

Semester End Evaluation: 70

Total Marks: 100

Course Outcomes:

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

CO1: Understand the basic concepts of thermodynamics and differentiate between work and heat forms of energy.

CO2: Apply mass and energy balance equations for open and closed thermodynamic systems.

CO3: Understand the second law of thermodynamics and the concept of entropy, exergy and irreversibility.

CO4: Evaluate the properties of steam and analyze Rankine steam power cycle.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H	M	L										M	
CO 2	M	H	H										M	
CO 3	M	H	M										M	
CO 4	M	H	M										M	

UNIT I:

FUNDAMENTAL CONCEPTS AND DEFINITIONS:

Thermodynamic system and control volume, Macroscopic and microscopic points of view, properties and state of a substance, Thermodynamic equilibrium and Quasistatic Process, thermodynamic path, cycle, Zerothlaw, concept of temperature, Perfect gases. Equation of a state for perfect gas

WORK AND HEAT: Definition of work, units, work done at the moving boundary of a system, work done in various non-flow processes, definition of heat, units, heat transfer in various processes**,** comparison of heat and work.

UNIT II:

FIRST LAW FOR NON-FLOW SYSTEMS: First law of thermodynamics for a system undergoing a cycle and for a change in state of system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases.

FIRST LAW FOR FLOW SYSTEMS: Control mass and control volume, first law of thermodynamics

for a control volume, steady state steady flow energy equation and application to engineering equipment.

UNIT III:

SECOND LAW OF THERMODYNAMICS: Limitations of First law of thermodynamics, Heat engines and Refrigerators, Statements of Second law of Thermodynamics, Carnot cycle and the two propositions regarding the efficiency of Carnot cycle, Thermodynamic temperature scale, processes-reversible and irreversible, factors that render a process irreversible

ENTROPY: Inequality of Clausius, Entropy change in reversible process, T-ds relations, Maxwell relations, Entropy change of a system during an irreversible process, Principle of increase of entropy, Entropy change of an ideal gas, Concepts of Exergy, and irreversibility

UNIT IV:

PURE SUBSTANCES: p-v, p-T, T-s and h-s diagrams for a pure substance, Triple point, Critical point, Dryness fraction, Steam tables, problems using steam tables and Mollier chart.

VAPOUR AND AIR POWER CYCLES: Rankine cycle, reheat cycle, regenerative cycle, Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto and Diesel cycles.

TextBooks:

[1] P.K.Nag,–Engineering Thermodynamics‖ 6th edition,Tata Mc Graw Hill Education Private Limited,2017.
[2] Yunus A.Cengel M. and Michael A.Boles,– Thermodynamics – An Engineering Approach‖, 8th edition,McGrawHillEducation(India)PrivateLimited,2014.

Reference Books:

[1] G.J.Van Wylen& Sonntag, –Fundamentals of Classical Thermodynamics‖, 4th Edition, Wiley publication 2005.
[2] Mahesh M. Rathore –Thermal Engineering‖ Mc Graw-Hill education,2010

e- Resources:

[1] www.learnthermo.com/tutorials.php
[2] www.khanacademy.org/science/physics/thermodynamics
[3] www.courseera.org/learn/thermodynamics-intro
[4] www.edx.org/course/thermodynamics-iitbombayx-me209-1x-1
[5] http://nptel.ac.in/courses/112106141
[6] http://nptel.ac.in/courses/112108148

Note: Steam tables are permitted in internal and external examinations

17ME 3304 MANUFACTURING PROCESSES

Course Category : Programme Core **Credits:** 3

Course Type : Theory **Lecture/Tutorial/Practice:** 3/0/0

Prerequisites : **Continuous Evaluation:** 30

17PH1102/1202 Engineering Physics **Semester End Evaluation:** 70

17ME1204 Engineering Mecahnics- II **Total Marks:** 100

17ME1105 Engg. Graphics

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Explain the Technology of the casting processes.

CO2: Distinguish various casting methods and their applications.

CO3: Illustrate various joining processes with applications.

CO4: Categorize the various bulk Metal forming and sheet metal processes.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H	H	H											L
CO 2	H	L	L											L
CO 3	H	L	L											L
CO 4	H	H	H											L

(L-Low, M-Medium, H-High)

UNIT I

Metal casting processes:

Introduction to Manufacturing Processes - Selecting manufacturing processes, General method in making a Casting, pattern: types, materials and allowances. Molding materials, equipment, Preparation, control and testing of molding sands. Types of Cores, Fundamentals of Gating system design, Functions of Risers, types of risers.

Cupola Furnace: Description, operation and zones, Electric furnace - Arc

UNIT II:

Special casting methods: Permanent Mold Casting, Die Casting: Hot chamber die casting- Cold chamber die casting, Centrifugal casting: True centrifugal casting, Semi-centrifugal casting and Centrifuging.

Investment casting - Shell Mold Casting - CO2 Process and Continuous casting, Thermocol Pattern casting.

Casting defects: causes, remedies and testing.

UNIT III:
Welding:
Gas welding Processes: Principles of oxy-acetylene gas welding,
Arc welding: TIG – MIG - Submerged, arc length, arc blow, duty cycle.
Resistance welding: Principles of resistance welding- types- Butt welding - Spot welding -Seam welding.

Special welding Processes: Thermit Welding -Electro slag welding- Laser beam welding. Under water welding. Welding defects, causes and remedies, Weld design-simple problems. Brazing & Soldering

UNIT IV :
Bulk Metal forming processes: Introduction, Hot and Cold working of metals - Rolling- Forging- Extrusion -Tube making, and Wire drawing.
High Energy Rate Forming Processes: Explosive Forming – Electro Hydraulic
Forming – Electro Magnetic Forming.

Sheet metal working operations: Introduction, Sheet metal Blanking - Punching operations. Clearance and shear as applied to Punching/Blanking operations. Simple related problems. Elastic recovery in bending operation.

Text Books:
[1] Manufacturing Technology by PN RaoVol.1,Edition-3,2009, TMH
[2] Principles of Metal Casting by Heine, Loper, Rosenthal.33rd Reprint,2008,TMH
[3] A course in Work shop technology Vol-I by V.S.Raghuwamshi, 2007, Dhanpatrai & sons.
[4] Mechanical Metallurgy by George. E. Dieter, SI Metric Edition 2000, McGraw Hills.

Reference Books:
[1] Welding and welding Technology by Richard L.Little,1973, Mc Graw Hill
[2] Workshop Technology Vol.1 by S.K.Hazra Chowdary. Khanna publishers.

E-resources and other digital material
[1] http://nptel.iitm.ac.in
[2] http://www.egr.msu.edu
[3] http://www.engr.sjsu.edu
[4] http://mechatronic.me.hfu.edu.tw
[5] http://web.iitd.ac.in

17ME3305 KINEMATICS OF MACHINES

Course Category : Programme Core **Credits:** 3

Course Type : Theory **Lecture/Tutorial/Practice:** 3/0/0

Prerequisites : **Continuous Evaluation:** 30

17ME1104A Engineering Mecahnics- I **Semester End Evaluation:** 70

17ME1204 Engineering Mecahnics- II **Total Marks:** 100

17ME1105 Engg. Graphics

Course Outcomes:

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

CO1: Distinguish the principle of mechanisms.

CO2: Evaluate velocity and acceleration of linkages

CO3: Develop profile & Estimate velocity and acceleration of cams

CO4: Illustrate the principle of gear design and solve gear train problems

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H	L	M											L
CO 2	L	H	M											M
CO 3	M	M	H											M
CO 4	M	H	M											M

(L-Low, M-Medium, H-High)

UNIT - I

INTRODUCTION : Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Types of joints, Constrained motions, Degrees of Freedom, Classifications of Kinematic pairs, kinematic-chain, Linkage, mechanism and structure, Classification of mechanisms, Inversions of Mechanism- Four - Link (bar) chain, Single Slider - Crank Chain, Double – Slider Crank Chain.

UNIT II

VELOCITY AND ACCELERATION ANALYSIS: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Velocity and Acceleration, Angular velocity and Angular acceleration of Links: Four bar Mechanism, Velocity and Acceleration of Intermediate and offset points. Coriolis acceleration of Slider - Crank Mechanism, Crank and Slotted Lever Mechanism

UNIT Ill

Instantaneous centre, Notation, Number of I - Centres, Kennedy's theorem, Locating I - Centres, Angular velocity by I - Centre Method for simple mechanisms (Four bar and single slider).

CAMS: Introduction, Types of cams, Types of Followers, Definitions, Graphical synthesis of cam profile limited to reciprocating & radial follower. (Knife Edge, Roller and flat faced Followers)

UNIT IV

GEARS: Introduction, Classification of gears, Gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth- Cycloidal Profile Teeth, Involute Profile Teeth, Path of contact, Arc of contact, Number of pairs of Teeth in contact, Concept of Interference in Involute Gears. Minimum number of Teeth in Involute Gears, Comparison of Cycloidal and Involute tooth forms.

GEAR TRAINS: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Tabular method only.

Text Books:

[1] S.S.Rattan, Theory of Machines, 4th Edition, 2014, TMH.
[2] Dr. R. K. Bansal & Dr. J. S. Brar, Theory of Machines 4th Edition, 2009, Lakshmi publications

Reference Books:

[1] C S Sharma and Kamlesh Purohit, Theory of Mechanisms and Machines, Prentice Hall of India.
[2] Ghosh and Mallik, Theory of Mechanisms and Machines, 3rd Edition,2006 East West Press

Additional Resources:

[1] http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Delhi/Kinematics%20of%20Machines.htm
[2] http://freevideolectures.com/Course/2359/Kinematics-of-Machines
[3] http://www.rapidmaniac.com/search/relevant/All/solution-manual-kinematics-and-dynamics-of-machines

17TP1306 LOGIC & REASONING

Course Category: Institutional core **Credits**: 1

Course Type : Learning by Doing **Lecture/Tutorial/ Practice**: 0/0/2

Prerequisites : **Continuous Evaluation**: 100

Semester end Evaluation: 0

Total Marks: 100

Course Outcomes:

Upon successful completion of the course, the student will be able to:
CO1: Interpret reason logically in any critical situation

CO2: Analyze given information to find correct solution

CO3: To reduce the mistakes in day to day activities in practical life

CO4: Develop time-management skills by approaching different shortcut methods

CO5: Use mathematical based reasoning to make decisions

CO6: Apply logical thinking to solve problems and puzzles in qualifying exams in any competitive exam

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT I :

1. Series Completion,
2. Coding-Decoding,
3. Blood Relation Blood,
4. Puzzles test

UNIT II:

1. Direction sense test,
2. Logical Venn diagrams,

3. Number test, ranking test,
4. Mathematical operations

UNIT III:

1. Arithmetical Reasoning,
2. Inserting missing character,
3. Syllogism.

UNIT IV: Non – Verbal:

1. Water images,
2. Mirror images,
3. Paper folding,
4. Paper cutting,
5. Embedded Figures,
6. Dot situation,
7. Cubes & Dice

TEXT BOOK:

[1] R. S. Aggarwal, ― Verbal and non-verbal reasoning‖, Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6

17ME3351 SOLID MODELLING LAB

Course Category: Programme Core **Credits**: 1.5

Course Type : Laboratory **Lecture/Tutorial/ Practice**: 0/0/3

Prerequisites : **Continuous Evaluation**: 30

Semester end Evaluation: 70

Total Marks: 100

Course Outcomes:

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

CO1: Construct sketches in modelling software.

CO2: Build part modeling of machine components.

CO3: Develop 2D sketches for machine components

CO4: Combine various parts of Machine and generate their orthographic views.

CO5: Translate geometric models to other file formats.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1			M		H									H
CO2			M		H									H
CO3			M		H									H
CO4			M		H					M				H
CO5			M		H									H

(L-Low, M-Medium, H-High)

Course Content:

Lab Exercises:

1. Construction of 2D sketches.
2. Modelling of simple machine components.
3. Assembly of Machine components.
4. Orthographic views of the assembled components.
5. Solid modelling of real components
6. Exporting the files to other file formats
7. Group assignment topics
   i. Part drawing & Assembly of Screw jack
   ii. Part drawing & Assembly of Stuffing Box
   iii. Part drawing of Marine engine connecting rod end
   iv. Part drawing & Assembly of Single tool post
   v. Part drawing & Assembly of Socket and spigot joint
   vi. Part drawing & Assembly of Foot-step bearing
   vii. Develop various types of GI pipe fittings

viii. Develop double strap diamond butt joint

Text Books:

[1] Pro/Engineer Wildfire 5.0 by Roger Toogood, Jack Zecher, SDC Publications.
[2] Machine Drawing by K.L Narayana, P.Kannaiah, K.Venkata Reddy, Publisher: New Age International

Reference books:

[1] Parametric Modeling with Pro/ENGINEER Wildfire 5.0
[2] Parametric Modeling with Creo Parametric 1.0

E-resources and other digital material:

Web Resources:

[1] http://www.proetutorials.com/
[2] http://learningexchange.ptc.com/tutorials/by_sub_product/ptc-creo-elements-pro-pro-engineer/sub_product_id:1
[3] http://www.eng-tips.com/viewthread.cfm?qid=48209
[4] https://catiatutor.com/
[5] www.v5train.com

NPTEL Video references:

[1] https://www.youtube.com/watch?v=c2VtgkfZ2BQ
[2] https://www.youtube.com/watch?v=hjgGxl4Yk_M
[3] https://www.youtube.com/watch?v=xsKtzWBZ5FY
[4] https://www.youtube.com/watch?v=rIFeKNzm4gE
[5] https://www.youtube.com/watch?v=uCdypjnnKto
[6] https://www.youtube.com/watch?v=YIzwA_Wlj_M

17ME3352 MANUFACTURING PROCESS LAB

Course Category : Programme Core **Credits:** 1.5

Course Type : Laboratory **Lecture/Tutorial/Practice:** 0/0/3

Prerequisites : **Continuous Evaluation:** 30

Semester End Evaluation: 70

Total Marks: 100

Course Outcomes:

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

CO1: Build various joints used in fitting.

CO2: Develop various welding joints

CO3: Build various sand moulds.

CO4: Developmental casting.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1			H	H										L
CO 2			H	H										L
CO 3			M	H										L
CO 4			H	H										M

(L-Low, M-Medium, H-High)

I. FITTING : To make the following joints

a. Half round Joint
b. Stepped Joint
c. Universal Joint

II .WELDING : To make the following welding joints

a. To make Lap Joint using Oxy Acetylene Gas welding
b. To make _T'– Joint using MIG welding
c. To make spot joint using Resistance welding

III. FOUNDRY :

To make the following sand moulds

a. Single piece pattern (Stepped Rectangular Block)
b. Two piece pattern (Step Cone Pulley)
c. T-Pipe Pattern (Pattern with core)

IV. PROJECT:

To prepare a metal Casting (Automobile component) – Group Assignment.

Text Books:

[1] S.K.Hajra Chowdary, A.K. Hajra Chowdary, Nirjhar Roy, ―Elements of Workshop Technology, Vol.II.Media Promoters and Publishers Pvt.Ltd, Mumbai, Scitech Publications, Chennai, 2013

17MC1307B INDIAN CONSTITUTION

Course Category : Institutional core **Credits:** 0

Course Type : Theory **Lecture/Tutorial/Practice:** 2/0/0

Prerequisites : **Continuous Evaluation:** 100

Semester End Evaluation: 00

Total Marks: 100

Course Outcomes:

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

CO1: Know the fundamental law of the land

CO2: Understand how fundamental rights are protected

CO3: Perceive the structure and formation of the Indian Government System

CO4: Explain when and how an emergency can be imposed and the consequences

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1								L						
CO 2								M						
CO 3								M						
CO 4								L						

(L-Low, M-Medium, H-High)

UNIT - I

Introduction to Constitution of India: Meaning of the Constitution Law and Constitutionalism, Historical perspective of constitution of India, Salient features of Constitution of India.

UNIT II:

Fundamental rights: Scheme of the fundamental rights, scheme of the fundamental right to equality, scheme of the fundamental right to certain freedoms under Article 19, scope of the right of life and personal liberty under Article 21, writs jurisdiction.

UNIT III:

Nature of the Indian constitution: Federal structure and distribution of legislative and financial powers between the Union and states

Parliamentary form of government in India: The Constitution powers and status of the President of India, Amendment of the Constitutional powers and Procedure, Historical Perspectives of the constitutional amendments in India

Local Self Government: Constitutional Scheme in India

UNIT IV:

Emergency Provisions: National Emergency, President rule, financial emergency

Text Books:

[1] Dr. J.N. Pandey, Constitutional Law of India published by Central law Agency, Allahabad, Edition 2018

Reference Books:

[1] V.N Shukla‘s, Constitution of India Eastern Book Company, Lucknow.
[2] M.P. jain, Indian Constitution Law, Wadhwa and Company, Nagpur.
[3] D.D. basu, Constitution of India, Wadhwa and Company, Nagpur

E-resources and other digital material

17ME3401 FLUID MECHANICS AND HYDRAULIC MACHINES

Course Category: Programme Core **Credits:** 4

Course Type : Theory **Lecture/Tutorial/Practice:** 3/1/0

Prerequisites : **Continuous Evaluation:** 30

17ME1104A Engineering Mechanics- I **Semester End Evaluation:** 70

17ME1204 Engineering Mechanics- II **Total Marks:** 100

Course Outcomes:

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

CO1: Understand the Basic concepts of fluid mechanics.

CO2: Apply the principles of fluid Dynamics to solve pipe flow problems.

CO3: Make use of the momentum principles in impact of jets &Understand Boundary layer concept

CO4: Analyze the performance of hydraulic turbines, pumps and hydraulic devices.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H	M	L										L	
CO 2	M	H	M										M	
CO 3	M	H	L										M	
CO 4	M	H	M										M	

(L-Low, M-Medium, H-High)

UNIT – I

FLUID PROPERTIES AND FLUID STATICS: Density, Specific weight, Specific gravity, viscosity, Surface Tension, Capillarity, Types of Fluids, Vapour pressure, compressibility, Pressure and its measurements(Treatment limited to Manometers).

FLUID KINAMETICS: Stream line, path line, streak line, stream tube, classification of flows, one and three dimensional Continuity equation.

UNIT – II

FLUID DYNAMICS: Surface and Body forces - Euler's and Bernoulli's equation for flow along a streamline. Momentum equation, applications of Bernoulli's equation.

INTERODUCTION TO PIPE FLOW: Reynold‘s experiment –Darcy‘s equation, Minor Losses in pipes (Treatment limited to explanation), Losses in series and parallel pipe flows, Construction of total energy line and hydraulic gradient line.

UNIT – III

BOUNDARY LAYER CONCEPTS: Definition, Displacement Thickness, Momentum thickness, Energy Thickness and Drag and lift (Treatment limited to concept only).

INTERODUCTION TO TURBO MACHINERY: Review of moment equation, Impact of Jet of water on various configurations and derivation of force applied by jet in all applications, Introduction to velocity triangles and applications.

UNIT – IV

INTERODUCTION TO TURBINES: Classification of turbines, Pelton wheel construction and working principle, Francis turbine and Kaplan turbines details discussion, Heads, Efficiencies and Performance of turbines.

PUMPS AND HYDRAULIC SYSTEMS: Classification of pumps with definition, Working Principles and derivations of Centrifugal and Reciprocating pumps. Hydraulic Systems (Treatment limited to Hydraulic press, lift and Hydraulic ram).

Text Books

[1] R.K.Bansal, ―Fluid Mechanics & Hydraulic Machines‖Ninth Edition, Laxmi Publications, 2009.

[2] Robert W. Fox , Alan T. McDonald and Philip J. ―Fluid Mechanics‖ Eighth edition, Wiley Publishers.

Reference Books

[1] P.N.Modi& S.M. Seth.,‖Hydraulics and Fluid Mechanics‖, 2nd edition, Standard Book House, 2005.

[2] R.K. Rajput,―Fluid Mechanics & Hydraulic Machines‖, Fourth Edition, S.Chand& Company, 2008.

[3] D.S.Kumar, ―Fluid Mechanics & Fluid Power Engineering‖, Second Edition,SK.Kataria&SonsPublishers, 2014.

E-Resources and other digital material

[1] Prof. S.K. Som, IIT Kharagpur, Fluid Mechanics & Hydraulic Machines, [English], Web Available:http://nptel.ac.in/courses/112105171/

[2]Prop. Gowtham Biswas, IIT Kharagpur, Fluid Mechanics & Hydraulic Machines, [English], WebAvailable: http://nptel.ac.in/courses/112104118/

[3] Fluid Mechanics & Hydraulic Machines, [English], WebAvailable: http://www.efluids.com/

17ME3402 MACHINE DYNAMICS

Course Category: Programme Core **Credits**: 3

Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /0/ 0

Prerequisites: **Continuous Evaluation**: 30

17ME1104A Engineering Mechanics - I **Semester end Evaluation**:70

17ME1204 Engineering Mechanics - II **Total Marks:**100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1 Apply the concepts of energy fluctuations in fly wheels.

CO2 Estimate Principle of governors and analyze gyroscopic effects on vehicles.

CO3 Analyze balancing of rotating and reciprocating masses.

CO4 Evaluate natural frequency for longitudinal, transverse and torsional vibrations.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	L											M
CO2	M	H	L											M
CO3	M	H	H											M
CO4	M	H	L											M

(L-Low, M-Medium, H-High)

UNIT – I

TURNING MOMENT DIAGRAMS: Introduction, Single - cylinder double – acting steam engine, Single - cylinder four stroke engine, Multi-cylinder engine, Fluctuation of energy, determination of maximum fluctuation of energy, coefficient of fluctuation of energy.

FLY WHEELS: Introduction, Coefficient of fluctuation of speed, energy stored in fly wheel.

UNIT – II

GOVERNORS: Introduction, Watt Governor, Porter Governor, Hartnell Governor, Sensitiveness of a Governor, Hunting, Isochronism, Stability.

GYROSCOPES: Angular Velocity, Angular Acceleration, Gyroscopic Torque, Gyroscopic Effect on Air-planes and Naval Ships

UNIT – III

BALANCING OF ROTATING SYSTEMS: Introduction, Static balancing, Dynamic balancing, Transferring of a Force from one plane to another, Balancing of Several Masses in Different planes.

BALANCING OF RECIPROCATING SYSTEMS: Primary balancing.

UNIT – IV
UNDAMPED FREE VIBRATIONS:
LONGITUDINAL VIBRATION: Introduction, Definitions, Types of vibrations, Basic features of vibrating systems, Degree of freedom, free longitudinal vibrations.
TRANSVERSE VIBRATION: Single concreted load, shaft carrying several loads, whirling of shafts.
TORSIONAL VIBRATION: Single and two rotor systems.

Text Books:

[1] S.S.Rattan, ―Theory of Machines‖, Fourth edition, McGraw Hill Education (India) Private Limited, 2014

[2] Dr.R.K.Bansal & Dr.J.S.Brar,‖ Theory of Machines‖, Fourth edition, Laxmi Publications (P) Limited, 2009.

Reference books:

[1] R.S.Khurmi & J.K.Guptha,― Theory of Machines‖, 14th Edition, S.Chand & Company, 2006.

[2] V.P.Singh,‖Mechanical vibrations‖, Second Edition, Dhanpat Rai & Co (P) Limited, 2009

E-resources and Other digital material:

[1] Video in web: http://nptel.ac.in/courses/112104114/

[2] Video in web: https://youtu.be/OlZXxPVpmBs

[3] Notes in web: http://www.vssut.ac.in/lecture_notes/lecture1429901026.pdf

17ME3403 ENGINEERING METALLURGY

Course Category: Programme Core **Credits**: 3

Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /0/ 0

Prerequisites: **Continuous Evaluation**: 30

17PH1102/1202 Engineering Physics **Semester end Evaluation**:70

17CH1102/17CH1202) Engineering Chemistry **Total Marks:**100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Recognize the importance and concept of materials and solid solutions.

CO2: Exemplify the phase diagrams and TTT diagrams of steels.

CO3: Classify the heat treatment processes and strengthening mechanisms.

CO4: Outline the principles of powder metallurgy and manufacturing methods of different types of composites.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H		M										L	L
CO2	H		M										L	L
CO3	H		M										L	L
CO4	H		M										L	L

(L-Low, M-Medium, H-High)

UNIT - I

INTRODUCTION TO MATERIAL SCIENCE: Material Science, Classification of materials, Requirement and selection of materials, Mechanical properties of materials.

INTRODUCTION TO CRYSTALLOGRAPHY:

Crystal imperfections, Crystal deformation- Slip and Twinning.

SOLID SOLUTIONS: Introduction, Substitutional solid solutions, Ordered Substitutional solid solutions, Disordered Substitutional solid solutions, Hume Rothery's rule, Interstitial solid solution.

UNIT – II

PHASE DIAGRAMS: Binary phase diagrams – Phase rule – one component system, two component system, isomorphous, eutectic, eutectoid, peritectic and peritectoid systems, Fe-Fe_3C equilibrium diagram.

TTT Diagrams: TTT diagrams for eutectoid, hypo and hyper eutectoid steels.

UNIT – III

HEAT TREATMENT PROCESSES: Annealing, normalizing, hardening, tempering, austempering, martempering, flame Hardening, Induction Hardening & Chemical hardening techniques, hardenability concept and experimental determination.

STRENGTHENING MECHANISMS: Strain hardening, solid solution strengthening, grain refinement, dispersion strengthening.

UNIT – IV

POWDER METALLURGY: Powder metallurgy process, preparation of powders, characteristics of metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy.

COMPOSITE MATERIALS: Introduction, Classification of composites, Advantages and Dis-advantages of composite materials, applications of composite materials, various methods of component manufacture of composites – Hand Lay-up method, Resin transfer moulding, Filament winding process, and continuous pultrusion process.

Text Books:

[1] Kodgirie .V.D and Kodgirie.S.V, ―Material Science and Metallurgy‖, Thirty-seventh Edition, Everest House Publication, 2015.
[2] Raghavan.V, ― Material Science and Metallurgy‖ ,Fifth Edition, PHI Learning Pvt Limited,2013

Reference books:

[1] Avener , ―Introduction to Physical Metallurgy‖, Second Edition, Tata McGraw hill Education (India) Pvt Limited,1997.
[2] Rajput R. K,―Material Science and Engineering‖, Fourth Edition, S.K.kataria& Sons,2009.

E-resources and other digital material:

[1] Prof.R.N.Ghosh, IIT Kharagpur, Solidification Binary Alloys, Iron-Carbon Phase Diagram,[English] https://www.youtube.com/results?search_query=prof.r.n+ghosh+lecturers
[2] Prof.S.K.Gupta, IIT Delhi, Phase Diagrams, Crystal imperfections [English] Web Available: https://www.youtube.com/watch?v=x3n9ht-eRfg

17ME3404 ELECTRICAL AND ELECTRONIC ENGINEERING

Course Category: Programme Core **Credits**: 4

Course Type : Theory **Lecture/Tutorial/ Practice**: 4 /0/ 0

Prerequisites: **Continuous Evaluation**: 30

Semester end Evaluation:70

Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand the fundamentals of electric circuits and Discuss construction, operation and performance of DC Machines

CO2: Understand the construction, operation of three phase induction motors and Identify meters for measuring electrical quantities

CO3: Illustrate the operation of various diodes and rectifier circuits

CO4: Explain the operation of various transistor configurations and FET‘s

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H	H		M									L	L
CO 2		L		M									L	L
CO 3			H	M									L	L
CO 4			H	M									L	L

(L-Low, M-Medium, H-High)

UNIT-I

DC and AC circuits: Kirchoffs laws, simple circuits -Alternating current - waveforms - RMS - Average values-simple R-L-C- circuits, Power factor, 3-phase balanced circuits.

D.C. Machines: DC Machines: Principle of operation, construction and Classification of DC Machines, EMF and Torque equations, Characteristics of Generators and Motors, Principle of starters-3 point starter.

UNIT-II

Three Phase Induction Motor: Principle of Rotating Magnetic Field, construction and Principle of Operation of 3-φ I.M, Torque Equation, Torque-Slip Characteristics of 3-φ I.M.

Measuring Instruments: Classification of instruments, Principles and operation of moving - coil and moving-iron instruments. – Dynamometer –type watt meter.

UNIT-III:

Semiconductor Diode Characteristics : Conductors, Semiconductors, Insulators, p-n Junction as a Diode, The Volt Ampere Characteristics (Forward bias & Reverse bias), Zener diode, characteristics of Zener diode(Forward bias & Reverse bias), Zener diode as a regulator,

Rectifier circuits: Operation of Half wave Rectifier, Full wave Rectifier, Bridge rectifier, Ripple factor derivation (HWR, FWR, Bridge rectifier), Capacitor filter for full wave rectifier, Compare Half wave, Full wave, Bridge rectifiers.

UNIT-IV:

Transistor Characteristics: Operation of the Junction Transistor (PNP & NPN), Transistor as an Amplifier, Transistor as a switch, The Common Base Configuration, The Common Emitter Configuration, The Common Collector Configuration, Comparison of CB, CE, CC configurations.

Filed Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion-type MOSFET and Enhancement-type MOSFET, Uni-Junction Transistor.

Text Books:

[1] I.J.Nagrath and Kothari, ―Theory and problems of Basic Electrical Engineering‖,Prentice- Hall of India Pvt. Ltd.
[2] V.K.Mehta and Rohit Mehta,Principles of electrical machines,S.Chand publications
[3] S. Salivahanan, N. Suresh Kumar, A. Vallava Raj ― Electronic Devices and circuits‖ Second edition, Tata McGraw Hill Publication.

Reference Books:

[1] Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.
[2] BL Theraja, A text book of Electrical Technology, Nirja
[3] Jacob Millman, Christos C. Halkias and Chetan D Parekh, ―Integrated Electronics‖, 2nd Edition, Tata McGraw Hill Publication, 2012.

E-resources and other digital material

[1] http://nptel.ac.in/courses.php?branch=eee
[2] http://en.wikipedeia.org/wiki/electrical
[3] https://embeddedengineers.files.wordpress.com/2015/09/electronic-devices-and-circuits-by-salivahanan.pdf
[4] http://www.nptelvideos.in/2012/12/basic-electronics-drchitralekha-mahanta.html

17HS2406 (A) YOGA & MEDITATION

Course Category: Humanities elective **Credits**: 1

Course Type: Theory **Lecture/Tutorial/ Practice**: 1/0/0

Prerequisites : **Continuous Evaluation**: 100

Semester end Evaluation: 00

Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Build better attitude and behavior

CO2: Imbibe set of values enabling a balanced life focused on an ethical material life-

CO3: Develop levels of concentration through mediation

CO4: Apply conscience for the missions of life

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT I

Understanding Yoga : Orientation, Introduction to Values , The positive impact of yoga , Application of Values in real life , Universal values

(**Lec-demo pattern with illustrations representing Yogic Postures and value system related pictorial is followed**)

UNIT II

Yogic Practices: Yoga, Self and Ultimate goal of yoga, Introduction to various types of yoga, Integration of values in Yoga

(Activity based processes with Assasanas and Pranayama are implemented)

UNIT III

Practice of Meditation: Art of Meditation, Observation, Introspection, Contemplation, Meditation and Concentration

(Activity based processes involving Mediation sessions followed by demonstrations are implemented)

UNIT IV:

Towards professional excellence through Yoga and meditation: Stress Management, Choices we make, Excellence and Integration

(Lec-demo pattern is followed)

Text Book(s):

[1] 1.Common Yoga protocol, Ministry of Ayush, Govt of India
[2] Journey of the Soul- Michael Newton, 2003, Llewellyn

Reference Books:

[1] . Lectures from Colombo to Almora, Swami Vivekakanada, 2010 Ramakrishna Mission
[2] Essays of Ralph Waldo Emerson, 1982, Eastern press
[3] Eclectic materials Offered by English Dept.

E-resources and other digital material

[1] www.heartfulness.org accessed on 27th April 2018
[2] www. *ayush.gov.in accessed on* 27th April 2018
[3] www. belurmath.org *accessed on* 27th April 2018

17HS2406 (D) PHILOSOPHY

Course Category: Humanities elective **Credits**: 1

Course Type: Theory **Lecture/Tutorial/ Practice**: 1/0/0

Prerequisites : **Continuous Evaluation**: 100

Semester end Evaluation: 00

Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand major philosophical issues

CO2: Illustrate the philosophical doctrines of western thinkers

CO3: Understand the eminence of Indian classical thought

CO4: Appreciate relation between science and values

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT I
What's Philosophy **:** Definition, Nature, Scope and Branches

UNIT II:
Introduction to Western philosophy **:** Ancient Greek and Modern philosophy

UNIT III:
Introduction to Indian Thought**:** Six systems – Modern philosophers

UNIT IV:
Philosophy of science & Technology : Human values and professional Ethics

Text Book:

[1] ― The story of philosophy ‖,Will Durant, Simon & Schuster 1926

[2] ― An Introduction to philosophy ‖,O.O.Fletcher, Word Public Library,2010

Reference Books:

[1] ― Six systems of Indian Philosophy ‖, DH Dutta ,

[2] ― The pleasures of philosophy, Will Duran, Simon & Schuster,1929

E-resources and other digital material

[1]J. K. Author. (day, month, year). Title (edition) [Type of medium]. Available: http://www.(URL)

17HS2406 {I2} FOREIGN LANGUAGE (GERMAN)

Course Category: **Humanities elective** **Credits**: 1

Course Type: Theory **Lecture/Tutorial/ Practice**: 1/0/0

Prerequisites : **Continuous Evaluation**: 100

Semester end Evaluation: 00

Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Learn basics of German Language

CO2: Write German Writing

CO3: Understand German Hearing

CO4: Form sentence in Present, past and future tense

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT I
Alphabets, Numbers, Exact articles and not exact Articles
UNIT II
Prepositions**,** Present Tense

UNIT III
Past Tense and about family
UNIT IV
Future Tenses

Text Book:
[1] Studio d A1Cornelsen Goyalaas Publications New Delhi.

Reference Books:
E-resources and other digital material

17HS2406 (K) PSYCHOLOGY

Course Category: Humanities elective **Credits**: 1

Course Type: Theory **Lecture/Tutorial/ Practice**: 1/0/0

Prerequisites : **Continuous Evaluation**: 100

Semester end Evaluation: 00

Total Marks: 100

Course Outcomes:

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

CO1: Relate biological and socio-cultural factors in understanding human Behavior

CO2: Understand the nature of sensory processes, types of attentions

CO3: Explain different types of learning and the procedures, distinguishes between different types of memory

CO4: Demonstrate an understanding of some cognitive processes involved in Problem solving and decision-making

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT I

Introduction: Psychology as a scientific study of behavior. Biological and sociocultural bases of behavior, fields of psychology

UNIT II:

Sensory and perceptual processes: Sensation, attention and perception

UNIT III:

Cognition and Affect: Learning and memory. Emotion and motivation

UNIT IV:

Thinking, problem solving and decision making, Personality and intelligence

Text Book:

[1] Zimbardo, P. G. (2013). Psychology and Life (20th Ed.). New York: Pearson Education

Reference Books:

[1] Baron, R. A. (2006). Psychology (5th Ed.). New Delhi: Pearson Education.

[2] Coon, D., & Mitterer, J. O. (2007). Introduction to Psychology: Gateway to mind and behaviour. New Delhi: Cengage.

[3] Feldman, R. S. (2013). Psychology and your life (2nd Ed.). New York: McGraw Hill.

17TP1405 ENGLISH FOR PROFESSIONALS

Course Category: Institutional core **Credits**: 1

Course Type : Learning by Doing **Lecture/Tutorial/ Practice**: 0/0/2

Prerequisites : **Continuous Evaluation**: 100

Semester end Evaluation: 0

Total Marks: 100

Course Outcomes:

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

CO1: How conversations are made

CO2: Usage of grammar

CO3: Etiquettes and manners

CO4: Speaking Skills

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT-I

1. Beginners, Functional, Situational Conversations
2. Practicing on Functional Conversations.

UNIT-II

1. Errors in usage of Parts of Speech with a thrust on Verbs, Adjectives and Conjunctions, Idioms/Phrases.
2. B. Introducing Basic Grammar
3. C. Practicing on Functional Conversations.

UNIT-III

1. Introducing Self & Others
2. Structures and Forming Sentences
3. Telephonic Etiquette, Social Etiquette and Table Manners
4. Practicing on Functional Conversations.

UNIT-IV

1. Direct, Indirect/Reporting Speech
2. Public Speaking Basics
3. Versant Test Preparation
4. Practicing on Situational Conversations.

Methodology: Audio—Visuals / Hand Outs (Compiled/Created by Training Division, T&P Cell, VR Siddhartha Engineering College), Board & Chalk and Interactive Sessions.

17ME3451 COMPUTATIONAL METHODS LABORATORY

Course Category: Programme Core **Credits**: 1.5

Course Type : Laboratory **Lecture/Tutorial/ Practice**: 0/0/3

Prerequisites: **Continuous Evaluation**: 30

14MA1301Complex Analysis and Numerical Methods **Semester end Evaluation**: 70

17MA1101 Matrices and Differential Calculus **Total Marks:** 100

17CS1103 Problem Solving Methods

Course Outcomes:

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

CO1: Illustrate basic commands in Mat lab and perform matrix Operations

CO2: Solve the linear equations and PDE using different numerical Techniques

CO3: Make use of a tool box to solve 2D partial differential equations

CO4: Develop Line and Surface plots

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H												H	
CO2	H	M											H	
CO3	L	H			H								H	
CO4	L	H		M	H								H	

L-Low, M-Medium, H-High

COURSE CONTENT

LIST OF EXERCISES:

1. Basics of MATLAB (Menu Items, Basic Commands).
2. Mathematical operations on matrices. (Addition, Multiplication, and Division), Transpose, determinant and inverse of a matrix
3. Solutions of simultaneous algebraic equations using exact methods
4. Solutions of simultaneous algebraic equations using iteration methods
5. Numerical Differentiation, Integration
6. Solution of 2D PDE using FDM method-Elliptic Equations
7. Solution of 2D PDE using FDM method- Parabolic Equations
8. Solution of 2D PDE using FDM method- Hyperbolic Equations
9. Line and Surface Plots

TEXT BOOKS AND REFERENCE BOOKS

[1] MATLAB programming by Y.Kirani Singh &B.B.Chaudhuri. PHI Publications (2010).
[2] Getting started with MATLAB -a quick reference for scientists & engineers by Rudra Pratap. Oxford University Press (2009).
[3] An introduction to programming and numerical methods in MATLAB by S.R.Otto, J.P. Denier. Springer Publications (2007)
[4] Ordinary and Partial Differential Equation Routines in C, C++, FORTRAN, Java, Maple, and MATLAB by H.J. Lee, W.E. Schiesser.
[5] Graphics and GUIs with MATLAB, Third Edition (Graphics & GUIs with MATLAB) 3rd Edition by O. Thomas Holland, Patrick Marchand.

E-RESOURCES AND OTHER DIGITAL MATERIAL

WEB REFERENCES:

[1] http://www.math.ucsd.edu/~bdriver/21d-s99/matlab-primer.html
[2] http://www.mathworks.in/academia/student_center/tutorials/ launchpad.html
[3] http://www.cyclismo.org/tutorial/matlab/
[4] http://www.mathworks.com/matlabcentral/fileexchange?s_cid=wiki_matlab_17

VIDEOS:

[1] http://www.youtube.com/user/matlab?feature=results_mai
[2] http://www.youtube.com/watch?v=DPLBPdux6bs

17ME3452 ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Course Category : Programme Core **Credits:** 1.5

Course Type : Lab **Lecture/Tutorial/Practice:** 0/0/3

Prerequisites : **Continuous Evaluation:** 30

Semester End Evaluation: 70

Total Marks: 100

Course Outcomes:

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

CO1: Conduct and analyze the parameters of electrical network

CO2: Analyze the performance of DC and AC machines

CO3: Appreciate the operation of various diodes and rectifier circuits and obtain its characteristics

CO4: Explain the operation of various transistor configurations and FET‘s and obtain its characteristics

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1			M	H									L	L
CO 2			M	H									L	L
CO 3			H	M									L	L
CO 4			H	M									L	L

(L-Low, M-Medium, H-High)

ELECTRICAL ENGINEERING

1. Verification of KCL & KVL
2. Determination of parameters of choke coil
3. Measurement of low and medium resistance.
4. Open circuit characteristics of separately excited generator
5. Brake test on DC shunt motor
6. Brake test on 3-phase Induction motor

ELECTRONIC ENGINEERING

1. Obtain the V-I characteristics of PN junction diode.
2. Obtain the V-I characteristics of Zener diode.
3. Verify the output waveform for full wave bridge rectifier and calculate ripple factor. Compare the result with theoretical value.
4. Obtain the input and output characteristics of transistor in CB configuration.
5. Obtain the input and output characteristics of transistor in CE configuration.

6. Obtain the drain and transfer characteristics of JFET.

Text Books:

[1] I.J.Nagrath and Kothari, ―Theory and problems of Basic Electrical Engineering‖,Prentice- Hall of India Pvt. Ltd.
[2] V.K.Mehta and Rohit Mehta, Principles of electrical machines, S.Chand publications
[3] S. Salivahanan, N. Suresh Kumar, A. Vallava Raj, Electronic Devices and circuits Second edition, Tata McGraw Hill Publication.

Reference Books:

[1] Nagsarkar, Sukhija, Basic Electrical Engineering, Oxford Publications, 2nd edition.
[2] BL Theraja, A text book of Electrical Technology, Nirja
[3] Jacob Millman, Christos C. Halkias and Chetan D Parekh, ―Integrated Electronics‖, 2nd Edition, Tata McGraw Hill Publication, 2012.

Additional Resources:

[1] http://nptel.ac.in/courses.php?branch=eee
[2] http://en.wikipedeia.org/wiki/electrical
[3] https://embeddedengineers.files.wordpress.com/2015/09/electronic-devices-and-circuits-by-salivahanan.pdf

17HS1453 COMMUNICATION SKILLS LAB

Course Category : Institutional Core **Credits:** 1

Course Type : Lab **Lecture/Tutorial/Practice:** 0/0/2

Prerequisites : Technical English &Communication skills -17HS1205 **Continuous Evaluation:** 30

Semester End Evaluation: 70

Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Be proficient in pronunciation of speech sounds including accentuation

CO2: Enhance the awareness of the elements of listening comprehension

CO3: Develop the abilities of rational argumentation and skills of public speaking

CO4: Be aware of the elements of professional communication

CO5: Be exposed to the items of various competitive exams

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1				H										
CO 2				H										
CO 3				H										
CO 4				M										
CO5				M										

(L-Low, M-Medium, H-High)

UNIT I

Elements of Spoken Expression and processes of Listening comprehension:

- Speech Mechanism
- Articulation of vowels and consonants
- Patterns of Accentuation
- Types and processes of Listening comprehension

UNIT II:

Patterns of Substantiation and Refutation in Public Speaking:

- Group Discussion
- Pyramid Discussion
- PNI

- Seminar Talk and Power Point Presentation

UNIT III: Professional Communication:

- Self Affirmation
- Advanced Composition including Memo and e-mail
- Résumé Preparation
- Elements of Non-Verbal Communication

Text Books:

[1] Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011
[2] Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21st Impression, 2003

Reference Books:

[1] Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004
[2] Eclectic Learning Materials offered by the Department

E-resources and other digital material

[1] ODll Language Learner's Software, 27-6-2012 Orell Techno Systems ,
[2] Visionet Spears Digital Language Lab software Advance Pro , 28-01-2015
[3] *www.natcorp.ox.ac.uk*, British National Corpus, accessed on 28-11-2017

17MC1407A ENVIRONMENTAL STUDIES

Course Category: Institutional Core **Credits**: 0

Course Type : Theory, Mandatory course **Lecture/Tutorial/ Practice**: 2 /0/ 0

Prerequisites: **Continuous Evaluation**: 100

Concern on Conservation and Preservation of Environment **Semester end Evaluation**:00

Total Marks:100

Course Outcomes:

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

CO1: Identify the various natural resources, analyze and explore degradation management

CO2: Understand the Ecosystems and need of Biodiversity

CO3: Examine the Problems related to Environmental pollution and its management

CO4: Make use of IT tools to analze social issues, Acts associated with Environment

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	L						H						L	
CO2			H				H	H					L	
CO3				L			H	H					L	
CO4					L	L	H					H	L	

(L-Low, M-Medium, H-High)

UNIT - I

The Multidisciplinary Nature of Environmental Studies

Definition, scope and importance, Need for public awareness

Natural Resources

Renewable and Non-renewable Resources:

Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

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

(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

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

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources
Equitable use of resources for sustainable lifestyles.

UNIT – II

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 the following ecosystem:

(a) Forest ecosystem
(b) Grassland ecosystem
(c) Desert ecosystem
(d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation

Introduction, definition: genetic, species and ecosystem diversity.
Biogeographically classification of India.
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
Biodiversity at global, National and local levels.
India as a mega-diversity nation.
Hot-spots of biodiversity.
Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
Endangered and endemic species of India.
Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution

Definition
Causes, effects and control measures of

a) Air Polution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal p[olution
g) Nuclear Polution

Solid waste management: Causes, effects and control measures of urban and industrial wastes.
Role of an individual in prevention of pollution.
Disaster management: Floods, earthquake, cyclone and landslides.

UNIT - IV

Social Issues and the Environment

From unsustainable to sustainable development.
Urban problems related to energy.
Water conservation, rain water harvesting, watershed management.
Resettlement and rehabilitation of people; its problems and concerns.
Environmental ethics: Issues and possible solutions.
Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.
Consumerism and waste products.

Environment 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.

Human Population and the Environment
Population growth, variation among nations.
Population explosion—Family Welfare Programme.
Environment and human health.
Human rights.
Value education.
HIV/AIDS.
Women and Child Welfare.
Role of Information Technology in environment and human health.

Field Work/ Case Studies {NOT TO BE INCLUDED IN SEMESTER END EXAMS}
Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain.
Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.
Study of common plants, insects, birds.
Study of simple ecosystems—pond, river, hill slopes, etc.

Text Books:
[1] Text book for **ENVIRONMENTAL STUDIES** for under graduate courses of all branches of higher education – Erach Bharucha -- For University Grants Commission. First edition 2004.

Reference Books
[1] Anjaneyulu Y. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad 2004

E-resources and other digital material
[1] collegesat.du.ac.in/UG/Envinromental%20**Studies**_ebook.**pdf**

17ME3501 - APPLIED THERMODYNAMICS

Course Category: Programme Core
Course Type : Theory
Prerequisites:
17ME3303 Basic Thermodynamics

Credits: 4
Lecture/Tutorial/ Practice: 3/1/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:
CO1: Explain the principles of boilers and analyse the performance of nozzles
CO2: Analyse the performance of steam turbines, condensers and Brayton cycle
CO3: Analyse the performance of reciprocating and rotary compressors
CO4: Apply thermodynamic principles in the refrigeration and air conditioning systems

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	M											M	
CO2	M	H											M	
CO3	M	H											M	
CO4	M	M											M	

(L-Low, M-Medium, H-High)

UNIT - I

STEAM BOILERS: Function, classification, working of Cochran boiler, Babcock and Wilcox boiler, Benson boiler and Advantages of Super-critical boilers, Mountings & Accessories.

STEAM NOZZLES: Types of nozzles, isentropic flow through nozzles, Effect of friction, Nozzle efficiency, Critical pressure ratio and maximum discharge, calculation of throat and exit areas using Mollier Diagram

UNIT - II

STEAM TURBINES: Types of steam turbines, Impulse turbines, pressure and velocity compounding, velocity diagrams, work output, power, blade efficiency and stage efficiency, Reaction turbines, velocity diagrams, degree of reaction, work output, power, blade efficiency and stage efficiency, Governing of turbines, Overall efficiency and reheat factor

STEAM CONDENSERS: Jet and Surface condensers, Condenser vacuum and vacuum efficiency, Condenser efficiency, Thermodynamic analysis, Air pump

GAS POWER CYCLES: Open and closed Brayton cycle, Effect of regeneration, reheat and intercooling

UNIT – III

RECIPROCATING AIR COMPRESSORS: Effect of clearance volume, compression ratio, volumetric efficiency, indicated power, single-stage and multi- stage compressors and effect of inter-cooling, optimum intermediate pressure in a two-stage compressor

ROTARY COMPRESSORS:

Classification of rotary compressors, working principle of centrifugal compressor, velocity vector diagrams, work done by impeller, isentropic efficiency, working principle of axial flow compressor,

Degree of reaction, polytropic efficiency, centrifugal compressor versus axial flow compressor

UNIT - IV

REFRIGERATION: Methods of refrigeration, working of refrigerator and heat pump, refrigerating effect, COP, vapor compression refrigeration system, influence of various parameters on cycle performance

PSYCHROMETRY AND AIR CONDITIONING: Psychrometric properties, psychrometric relations, psychrometric chart, psychrometric processes, Comfort conditions, summer and winter air conditioning systems.

Text Books:

[1] Mahesh M. Rathore–Thermal Engineering‖ Fourth Edition, Tata- McGraw-Hill, 2010
[2] R.K. Rajput ―Applied thermodynamics‖, second edition, Lakshmi Publications, 2014

Reference books:

[1] P.K. Nag ―Basic and Applied Thermodynamics‖, second edition ,Tata McGraw Hill,2009
[2] C.P. Arora ―Refrigeration and Air Conditioning‖ third edition, Tata McGraw Hill, 2009

E-resources and other digital material:

[1] Prof. T.Sundararajan, Prof. U.S.Premananda Shet and Prof. J.M.Mallikarjuna, IITMadras, Applied Thermodynamics, [English], Web
Available: http://nptel.ac.in/syllabus/112106133/
[2] Prof. Ravi Kumar, IIT Roorkee, Steam and Gas Power Systems, [English], Web
Available: http://nptel.ac.in/syllabus/112107216/
[3] Prof.M.Ramgopal, IIT Kharagpur, Refrigeration and Air Conditioning, [English], Web Available: http://nptel.ac.in/syllabus/112105129/
[4] Dr.RaviKumar IITRoorkee, Refrigeration And Air-conditioning[English],Web
Available : https://onlinecourses.nptel.ac.in/noc18_me46/preview

Note: Use of Steam Tables and Refrigeration and Air-Conditioning Tables are permitted in Examinations.

17ME3502 - DESIGN OF MACHINE ELEMENTS

Course Category: Programme Core
Course Type : Theory
Prerequisites:
17ME1104A Engineering Mechanics - I
17ME1204 Engineering Mechanics - II
17ME3302 Mechanics of Materials
17ME 3306 Kinematics of Machinery

Credits: 4
Lecture/Tutorial/ Practice: 3 /1/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Demonstrate knowledge about the design fundamentals and design procedure of machine elements
CO2: Design power screws and apply fatigue failure criteria for machine components under various loading conditions
CO3: Design permanent fasteners such as the riveted, welded joints under various loading conditions
CO4: Design temporary joints such as bolted joints and suspension systems such as helical springs.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	H											M
CO2	M	H	H											M
CO3	M	H	H											M
CO4	M	H	H											M

(L-Low, M-Medium, H-High)

UNIT - I

Basics: Phases of design, Types of designs, standardization in design, preferred numbers and significance

Design for Static Strength: Simple Stresses - Combined stresses - Torsion and bending stresses - stress strain relation, various theories of failure - Factor of safety and its importance in design.

UNIT - II

Design for Fatigue Strength: Stress concentration - Theoretical stress concentration factor - Fatigue stress concentrations factor, Design for fluctuating stresses, Fatigue strength and endurance limit, Goodman diagram, Soderberg line.

Power Screws: Types - Mechanics of power screws, efficiency, self locking of screw and stresses in screw.

UNIT – III

Fasteners:

Riveted joints: Terminology, Design of Boiler Joints, Lozenge joint, Design of joints under eccentric loading.

Welded joints: Eccentrically loaded welded joints.

UNIT – IV

Bolted joints: Design of bolted joints under eccentric loading

Springs: Introduction, Materials, Types of springs, Helical springs under axial load, Fatigue loading

Text Books:

[1] V B Bhandari, ―Design of machine elements‖, Fourth Edition, Tata McGraw Hill Education Private Limited, 2017.
[2] P.C. Sharma & D.K. Agarwal, ―A Text Book Of Machine Design‖ SK Kataria & Sons, 2013

Reference books:

[1] R.S Khurmi & J.K. Gupta, ―A Text book of Machine Design‖ Fourteeenth Edition, S.Chand & Co Ltd,2015
[2] Robert L.Norton,―Machine Design- An Integrated Approach‖,Fifth Edition, Pearson Education, 2018.
[3] P. Kannaiah, ―Machine Design‖, Second Edition, Scitech Publications Private Limited, 2011.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

[1] Mahadevan & Balaveera Reddy, ―Design data book‖, - CBS Publishers
[2] V.B.Bhandari, ―Design data book‖, Tata McGraw Hill book Co
[3] Design data book, P.S.G. College of Technology, Coimbatore

E-resources and other digital material:

[1] http://nptel.ac.in/courses/112/105/112105124/
[2] http://nptel.ac.in/courses/112/105/112105125/
[3] http://nptel.ac.in/courses/112/106/112106137/

17ME 3503 - MACHINE TOOLS AND METAL CUTTING

Course Category: Programme Core
Course Type : Theory
Prerequisites:
17 ME 3304 Manufacturing Processes
17 ME 3302 Mechanics of Materials

Credits: 4
Lecture/Tutorial/ Practice: 3 /1/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Explain the constructional features and operations of Lathe.

CO2: Illustrate the principles and operations of Drilling and Milling machine tools.

CO3: Differentiate Shaping, Planing, Grinding and Broaching machine tools.

CO4: Explain the fundamental concepts and mechanics of Metal Cutting.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H													L
CO2	H													L
CO3	H													L
CO4	M												L	L

(L-Low, M-Medium, H-High)

UNIT - I

KINEMATIC CONFIGURATION OF MACHINE TOOLS: Introduction, Primary and Auxiliary Motions in Machine Tools, Parameters. Defining working motions of a Machine Tool.

LATHE: Constructional details, specifications, classification of lathes.

LATHE MECHANISMS: Spindle speed Mechanisms in Belt driven and All Geared Head stock, Apron and Half-nut mechanisms, Lathe accessories, Lathe Operations.

UNIT – II

DRILLING MACHINES: Types and specifications, Spindle feed mechanism, drilling operations, drilling time.

MILLING MACHINES: Working Principle, Size and Specification, Up and Down Milling, Types of milling machines, Description and working of Universal Milling machine, Milling operations, Milling cutters, Indexing methods and Indexing Head, related problems.

UNIT – III

SHAPING AND PLANING: Constructional details, types of Shapers and Planers, specifications, operations, tool holding and work holding devices, quick return mechanism and automatic feed mechanisms.

GRINDING: General Principles, Wheel materials, Selection and specifications, Truing and Dressing of grinding wheels, types of grinding, types of grinding machines. Honing, Lapping and Burnishing operations.

BROACHING: Introduction to Broaching, broaches, broaching methods and Machines.

UNIT – IV

THEORY OF METAL CUTTING: Introduction, Basic elements of machining, Nomenclature of single point cutting tool, Tool Geometry, basics of orthogonal and oblique cutting, Mechanics of chip formation, Types of chips. Determination of shear angle and chip thickness ratio, stress and strain in the chip, velocity relations, Merchants theory of orthogonal cutting forces, related simple problems. Heat Generation and cutting tool temperature and its measurement, cutting fluids - types and required characteristics. Cutting tool materials: Requirements of Tool materials and types, Tool wear, Tool life and Tool life criteria.

Text Books:

[1] Workshop Technology Vol.II by HazraChowdary, 11th Edition,2002.
[2] Production Engineering by P.C. Sharma, S.Chand& Co. 10th Edition,2008

Reference books:

[1] Materials and Processes in Manufacturing by E.Paul De Garmo, J.T.Black and Ronald A.Kohser. 11th Edition, 2008.
[2] P. N. Rao, ―Manufacturing Technology – vol.2: Metal Cutting and Machine Tools‖, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 3 rd edition, 2013.
[3] Manufacturing Science by Ghosh &Mallick, 2nd Edition, John Wiley & Sons, New York, 1986.

E-resources and other digital material:

[1] https://openoregon.pressbooks.pub/manufacturingprocesses45/
[2] www.britannica.com/EBchecked/topic/463000/planer
[3] www.americanmachinist.com/
[4] http://www.machinetools.net.tw/

17ME2504 A - ROBOTICS

Course Category: Open Elective
Course Type : Theory
Prerequisites:
Engineering Mechanics,
Kinematics of Machines
Basic Electronics

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

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

CO1: Identify the basic components and classify the Robots.

CO2: Analyze the Robot end effecter interface and Machine vision functions.

CO3: Explain the working principles of various Robot sensory devices.

CO4: Develop transformations, kinematics & programming methods for robot manipulator.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	L				L				L					L
CO2	H				M				H					H
CO3	H				M				H					M
CO4	H	M			H				H					H

(L-Low, M-Medium, H-High)

UNIT – I

Introduction to Robotics: major component of a robot, robotic like devices, classification of robots – Classification by coordinate system and by control method, Precision of movement,
Specifications of robots: fixed versus flexible automation, economic analysis, Overview of robot application.

UNIT – II

Robot end Effectors: Introduction, end effectors, types of end effectors, grippers, classification of grippers, Gripper mechanisms, Other types of grippers-Vacuum cups, Magnetic grippers, adhesive grippers and miscellaneous types. Tool as end effectors, Interfacing, considerations in gripper selection and design, remote centered devices.

Machine Vision: Introduction, Functions of machine vision: Sensing and digitizing the image data, Image processing and analysis and Applications of machine vision.

UNIT – III

Robotic sensory devices: Objective, Non-optical position sensors–potentiometers, synchros, optical position sensors – opto interrupters, optical encoders (absolute & incremental).
Proximity sensors: Contact type, non contact type – reflected light scanning laser sensors.

Touch & slip sensors: Tactile sensors – proximity rod & photo detector sensors, slip sensors – Forced oscillation slip sensor, interrupted type slip sensors

UNIT – IV

Transformations and Kinematics: Objectives, homogenous coordinates, Transformations - translational & rotational with simple problems. Forward solution - establishing link co-ordinate frames, Denavit Hartenberg procedure. Inverse (or) back solution. Direct approach.

Robot programming: Methods of Robot programming wait signal & delay commands, branching in Robot programme, Introduction to Robot languages: AL, AML, RAIL, RPL, VAL, Robot language structure.

Text Books:

[1] Robotic Engineering by Richard D.Klafter, Prentice Hall, Tata Mc Graw-Hill, 1995. 3rd Edition.
[2] Industrial Robotics by Mikell P.Groover, TMH

Reference books:

[1] Introduction to Robotics – John J. Ceaig, Addison Wesley,3rd Edition
[2] Robotics – K. S. Fu, Gonzalez & Hee, Tata Mc Graw-Hill, 1995. 3rd Edition.
[3] Robotics for Engineers by Yoram Koren. Tata Mc Graw-Hill, 1995. 3rd Edition.

E-resources and other digital material:

[1] http://nptel.iitm.ac.in/courses.php?branch=Mechanical
[2] http://academicearth.org/courses/introduction-to-robotics
[3] http://nptel.iitm.ac.in/video.php?courseId=1052

17ME2504B – HYDRAULIC AND PNEUMATIC SYSTEMS

Course Category: Open Elective
Course Type : Theory
Prerequisites:

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Demonstrate the working Principles of Hydraulic pump and actuators

CO2: Identify the working of different Control valves and Hydraulic Circuits

CO3: Interpret basic Principles and applications of Pneumatic Systems

CO4: Identify faults in the hydraulic systems and maintenance of the hydraulic system.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H		M						M				L	L
CO2	H		M		M				M				L	L
CO3	H		M		M				M				L	L
CO4	H		M		M				M				L	L

(L-Low, M-Medium, H-High)

UNIT - I

Introduction: Fluid Power, Basic Law, Application of Fluid Power, Advantages of Fluid Power Systems, Types of Fluid Power Systems.

Hydraulic Systems: Pumps – Gear Pumps, Vane Pumps, Piston Pumps. Selection and Specification of Pumps.

Hydraulic Actuators: Linear Actuators - Axial type and Radial type, Rotary Actuators - Gear type and vane type.

UNIT – II

Control and Regulation Elements: Pressure Control Valves - spring loaded pressure relief valve, compound relief valve, unloading valve, sequence valve, counterbalance valve, pressure reducing valve. Flow Control Valves - Non-pressure compensated, Pressure compensated. Direction Control Valves - Sliding spool Valves, check valve, 2 way valves, 3 way valves and 4 way valves.

Hydraulic Circuits: Reciprocation, Quick Return, Sequencing, Synchronizing Circuits, Industrial Circuits - Punching Press Circuit, Milling Machine Circuits

UNIT – III

Introduction to Pneumatic Systems: Pneumatic fundamentals, Pneumatic Valves - Directional control valves - check valve, 2 way valves, 3 way valves and 4 way valves. Flow control valve - OR type, AND type, Quick exhaust valve and time delay valve.

Pneumatic Circuits: Pneumatic circuits- Basic pneumatic circuit, Quick exhaust circuit, feed control circuit and Time delay circuit.

UNIT – IV

Hydraulic Accumulators: Accumulators, Types of Accumulators, Accumulator Circuits – Leakage Compensation, Auxiliary Power Source, Emergency Source of Power

Maintenance of Hydraulic Systems: Maintenance of Hydraulic Systems, Trouble Shooting of Hydraulic System.

Text Book:

1. R. Srinivasulu, ―Hydraulic and Pneumatic Controls‖, 2nd edition, TMH, 2009.
2. Antony Espossito, "Fluid power with Applications", Prentice Hall, 1980

Reference books:

1. Andrew Parr, "Hydraulics and Pneumatics", (HB), Jaico Publishing House, 1999
2. Bolton. W. "Pneumatic and Hydraulic systems", Butterworth - Heinneman, 1997

E-resources and other digital material:

1. http://www.efluids.com/
2. http://fluid.power.net/
3. www.hydraulicspneumatics.com/
4. www.waterengr.com/
5. www.pumps.org/

17ME2505 A- PROJECT MANAGEMENT

Course Category: Open Elective
Course Type : Theory
Prerequisites:

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand the significance of project management its objectives and various phases involved in project management life cycle.
CO2: Gain knowledge regarding project feasibility study and various Organizational issues.
CO3: Able to apply various tools like CPM & PERT in project management.
CO4: Gain knowledge in risk management and role of IT in project management.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M											H		H
CO2	M											H		H
CO3	M											H		H
CO4	M											H		H

(L-Low, M-Medium, H-High)

UNIT - I

Basics of Project Management: Introduction, Evolution of project management, Objectives of project management, Types of project, Types of project delays, Benefits of project Management, Stake holders of a project.

Project Management Life cycle: Phases of Project Management Life Cycle, Role of a Project Manager (PM).

UNIT - II

Project Feasibility study: Introduction, Pre-Feasibility Study, Types of feasibility, Steps of feasibility study.

Project Organizational Structures: Introduction, Concept of Organizational Structure, Essential qualities of a project manager, Organizational structure for projects, Project management offices.

UNIT – III

Techniques of Project Management: Introduction, Guidelines for network construction, Critical path method, Gantt chart, Project Evaluation and review technique.

Crashing of Project network: Introduction, General guidelines for network crashing, Types of crashing.

UNIT – IV

Project Risk Management and failure: Introduction, Types of Risk, Steps in Risk Management, Risk Assesment, Project failure-causes of project failure.

Project Management Information System: Introduction, Project Management Information System (PMIS), Planning of PMIS.

Text Books:

[1] P. Panneerselvam, R. Senthilkumar, ―Project Management‖ PHI 2009.
[2] Ramakrishna & Kamaraju ― Essentials of Project Management‖ Kindle Edition PHI, 2010

Reference books:

[1] Harold Kerzner ―Project Management- A system approach to planning, scheduling & Controlling‖ Eleventh Edition, wiley.
[2] Thomas Erickson & P. V. Khatri ― Project Management‖ Global Vision Publishing House (2015).

E-resources and other digital material:

[1] https://project-management.com/top-10-main-causes-of-project-failure/
[2] https://www.brighthubpm.com/project-planning/44058-the-project-management-information-system-pmis-described/
[3]https://www.usbr.gov/excellence/Finals/FinalIntroPM.pdf
[4] www.manage.gov.in/studymaterial/PM.pdf

17ME2505 B - RELIABILITY ENGINEERING

Course Category: Open Elective
Course Type : Theory
Prerequisites:

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO 1; Understand various concepts of mortality curve.

CO 2: Identify different types of failure distributions.

CO 3: Analysis the Knowledge of reliability prediction models.

CO 4: Evaluate the concepts of reliability management.

Contribution of Course Outcomes towards achievement of Program Outcomes:

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

Unit I:

Reliability Concept: Reliability function - failure rate - Mean time between failures (MTBF) -Mean time to failure (MTTF).

Reliability Life Testing –: a priori and a posteriori concept - mortality curve - useful life Availability – maintainability Hazard Rate – system effectiveness.

Unit II:

Reliability Data Analysis: Time to failure distributions – statistical and reliability concept of failure data analysis, equipment replacement policy.

Parametric Life time Distributions: Exponential, normal, Gamma, Weibull, Ranking of data - probability plotting techniques.

Unit III:

Reliability Prediction Models: Series and parallel systems - RBD approach - Standby systems -M/n configuration - Application of Baye‘s theorem - cut and tie set method - Markov analysis -FTA – Limitations.

Input Modeling: Introduction - steps to build a useful model of input data - data collection, identifying the distribution with data, input models without data, models of arrival processes.

Unit IV:

Reliability Management: Reliability testing - Reliability growth monitoring - Non parametric Methods - Reliability and life cycle costs –Reliability allocation - Replacement model.

Concept of risk- objective and scope of risk assessment- probabilistic Risk- risk perception and acceptability- PRA management- preliminary hazard analysis- HAZOP and HAZAN, FMEA and FMECA analysis, Fault tree Analysis, Reliability-based optimum design, Strength-based reliability.

Text books:

1. Srinath L. S., ―Reliability Engineering‖, East-West Press Pvt. Ltd., ISBN 81-85336-39-3. 2.

2. Bhadury B., Basu S. K., ―Terotechnology-Reliability Engineering and maintenance‖, Asian Books Private Limited, ISBN 81-86299-40-6.

3. Modarres, ―Reliability and Risk analysis ", Mara Dekker Inc., 1993.

Reference books:

1. John Davidson, –The Reliability of Mechanical system ", published by the Institution of Mechanical Engineers, London, 1988.
2. Smith C.O." Introduction to Reliability in Design ", McGraw Hill, London, 1976.
3. Singiresu S. Rao _Reliability Engineering‘ 1st Edition Pearson, 2014.

Web resources:

1. http://Life Data Analysis
2. http://nptel.ac.in/courses/10567/reliability
3. www.Reliability Growth Analysis.com
4. www.FMEA and FMECA Analysis.com

(Self-Learning Elective Course)

17ME 2506 A- UNCONVENTIONAL MACHINING PROCESSES

Course Category: Open Elective | **Credits**: 2
Course Type : Theory | **Lecture/Tutorial/ Practice**: 0 /0/ 0
Prerequisites: | **Continuous Evaluation**: 30
14 ME1106 Basics of Mechanical Engineering | **Semester end Evaluation**: 70
17ME3304 Manufacturing Processes | **Total Marks:** 100

Course Outcomes:

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

CO1: Understanding the principles of operation and process parameters of AJM, WJM and characteristics of Unconventional manufacturing processes

CO2: Understanding the principles of operation and process parameters of EDM, Wire cut EDM and USM

CO3: Understanding the principles of operation and process parameters of CHM, ECM, and ECG

CO4: Understanding the principles of operation and process parameters of LBM, PAM and EBM.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M		M								H			L
CO2	M		M								H			L
CO3	M		M								H			L
CO4	M		M								H			L

(L – Low, M- Medium, H – High)

UNIT – I

Introduction Unconventional Machining Processes:

Introduction to Unconventional Machining processes (UMP), Limitations of conventional manufacturing processes (CMP), Characteristics of Unconventional Machining processes, and Classification of Unconventional Machining processes, Differences between Conventional Manufacturing Processes and Unconventional Machining processes.

Abrasive Jet Machining (AJM): Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Abrasive Jet Machining process

Water Jet Machining (WJM): Need, Selection, Principles of operation, process parameters, equipment, merits, demerits and applications of water Jet Machining process.

UNIT – II

Ultrasonic Machining: Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Ultrasonic Machining process, tool feeding mechanisms.

Electric Discharge Machining: Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Electric Discharge Machining process, properties of dielectric fluids, RC circuit, various methods of flushing of dielectric fluid, Wire cut E D M process.

UNIT – III

Chemical Machining: Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Chemical Machining, Electro Chemical Machining-Effect of Insulation on the tool.

Electro Chemical Grinding process: Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Electro Chemical Grinding process.

UNIT – IV

Beam & Arc Machining: Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Laser Beam Machining, Plasma Arc Machining

Electron Beam Machining processes: Need, Selection, Principles of operation, process parameters, characteristics, equipment, merits, demerits and applications of Electron Beam Machining processes.

Text Books:

1. P C Pandey and H S Shan, –Modern machining processes‖, Ist edition, 1980, TMH.
2. Rahul Jain, –Unconventional Manufacturing Processes‖, 3rd edition, 2015, S K Kataria & Sons, New Delhi.
3. R. K Jain. ―Production Technology ―Eighteenth Edition, 2014, Fourth Reprint: 2018. Khanna Publishers.

Reference books:

1. Amitabha Ghosh and A K Mallik, ―Manufacturing Science‖, 2nd edition, East West Press

E-resources and other digital material:

1. http://www.waterjets.org/index.php?option=com_content&task=category&sectionid=4&id=46&Itemid= 53
2. http://www.ignou.ac.in/upload/modern.pdf
3. http://nptel.iitm.ac.in

(Self-Learning Elective Course)

17ME2506 B - WORK STUDY

Course Category: Open Elective
Course Type : Theory
Prerequisites:

Credits: 2
Lecture/Tutorial/ Practice: 0 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand the principles of method study
CO2: Understand the principles of motion study
CO3: Apply the methods of Work measurement
CO4: Analyze and evaluate the concept of job evaluation and incentive Schemes

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M								H		H	H		M
CO2	M								H		H	H		M
CO3	M	M							H		H	H		M
CO4	M	M							H		H	H		M

(L-Low, M-Medium, H-High)

Unit I

Work study: Purpose of work study, its objectives, procedure and applications;
Method study: Definition and basic procedure, selection of job, various recording techniques like outline process charts, flow process charts, man machine charts, two handed process charts, string diagram, flow diagram, multiple activity chart, critical examination, development, installation and maintenance of improved method;

Case study: How can work study improve productivity?

Unit II

Motion Study: Principles of motion economy and their application. Rules for motion economy (related to use of human body, arrangement of work place, tools and equipment, etc.).
Design of Tools and Equipment: Arrangement of workplace, micro motion study, simo chart, cyclographs and Chrono-cyclographs Methods Time Measurement (MTM), Method development using tools, work simplification Programme.

Case study: Effective Time and Motion Study application in Construction Projects

UNIT III

Work measurement: Introduction & definition, objectives; time study: basic procedure, equipment‘s needed, breaking a job into elements; numbers of cycles to be timed; rating and methods of rating, allowances, and calculation of standard time.

Case study: “Productivity Improvement by Work Measurement Techniques”

Work sampling: Basic procedure, design of work sampling study conducting work sampling study and establishment of standard-time.

Unit IV

Job evaluation and merit rating: Job evaluation methods, selection of evaluation plan, job rating, merit rating—types and methods.

Wages and incentives: Real and money wages, incentive types, incentive plans, incentives for Indirect labour, operating cost of incentive schemes.

Case study: "Incentives Packages and Employees' Attitudes to Work"

Text B**ook:**

1. ILO; work-study; International Labour Organization.
2. Work study and Ergonomics' S.Dalela, Sourabh Chand Publicaction.

References:

1. Barnes RM; Motion and Time Study; Wiley publishers
2. Megaw ED; Contemporary ergonomics; Taylor & Fracis Currie RM; Work study; BIM publications

E- Resources and other digital material:

1. http://nptel.ac.in/courses/1034/work study.
2. http://nptel.ac.in/courses/1062/work sampling.
3. www.job evaluation.com
4. www.work study.com

17TP1507 - PERSONALITY DEVELOPMENT

Course Category: Institutional Core
Course Type : Learning by Doing
Prerequisites:

Credits: 1
Lecture/Tutorial/ Practice: 0 /0/ 2
Continuous Evaluation: 100
Semester end Evaluation: 00
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand the corporate etiquette
CO2: Make presentations effectively with appropriate body language
CO3: Be composed with positive attitude
CO4: Understand the core competencies to succeed in professional and personal life

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L – Low, M- Medium, H – High)

UNIT – I

1. Self-Introduction
2. Shaping Young Minds – A Talk by Azim Premji (Listening Activity)
3. Self – Analysis, Developing Positive Attitude
4. Perception – Importance of analytical thinking

UNIT – II

1. Communication Skills – Need and Methods
2. Body-Language-I; How to interpret and understand other‘s body language
3. Body Language – II; How to improve one‘s own Body Language
4. Anger Management

UNIT – III

1. Stress Management
2. Time Management – Methods of using time effectively
3. Social , Business & Dining Etiquette
4. Telephone and Email Etiquette

UNIT-IV

1. Standard Operation Methods - Note Making & Note Taking
2. Minutes Preparation
3. Email Writing
4. Email – Practice Session
5. Letter Writing – Formal & Informal

UNIT – V

1. Team Building
2. Leadership Qualities
3. Six Thinking Hats

UNIT – VI

1. Vocabulary
2. Correction of Sentences
3. Sentence Completion – Course of Action
4. Sentences Assumptions

UNIT – VII

1. Sentence Arguments
2. Reading Comprehension-Practice work
3. Group Discussion
4. Group Discussion – Practice Session

UNIT-VIII

1. Resume Preparation
2. Interview Skills
3. Mock Interviews

Methodology: Audio—Visuals / Hand Outs (Compiled/Created by Training Division, T&P Cell, VR Siddhartha Engineering College), Board & Chalk and Interactive Sessions.

17ME3551- FUELS AND I.C.ENGINES LABORATORY

Course Category: Programme Core — Credits: 1.5
Course Type: Laboratory — Lecture-Tutorial-Practice: 0-0-3
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Prerequisites: Knowledge on working of Fuels & I.C.Engines.

Course Outcomes:

Upon successful Completion of the course, the student will be able to:
CO1: Measure the thermal properties of different fuels & lubricants
CO2: Determine the efficiency of Compressor and Blower
CO3: Develop the performance curves and heat balance sheet for IC Engines
CO4: Develop the valve and port timing diagrams of two and four stroke Engines.
CO5: Calibrate a pressure gauge for accuracy

Contribution of Course Outcomes towards achievement of Program Outcomes

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M			H		H							M	
CO2	M			H									M	
CO3	M			H		H							M	
CO4	M			H									L	
CO5	M			H									L	

(L-Low, M-Medium, H-High)

Course Contents: Any Ten of the following:

Fuels Laboratory:

1. To determine the viscosity of the given sample of oil at various temperatures in Redwood standard seconds using Redwood Viscometer.
2. To test the given pressure gauge using Dead weight pressure gauge tester.
3. To draw the port/valve time diagram of petrol/diesel engine.
4. To determine the calorific value of the given solid fuel by Bomb Calorimeter
5. To determine the Flash and Fire Points of the given oil by Abel's Apparatus.
6. To determine the calorific value of the given gaseous fuel by Junker's Gas Calorimeter
7. To study assembling and disassembling of Two stroke, single cylinder petrol engine

I.C.Engines Laboratory:

1. To conduct a performance test on a four stroke, single cylinder Diesel engine With Band brake Dynamometer.
2. To conduct a performance test on twin cylinder diesel engine with electrical Dynamometer.
3. To conduct a test on Air compressor to determine the volumetric efficiency and isothermal efficiency at various delivery pressures.
4. To measure the discharge of air through the blower test rig.

5. To conduct a performance test on a four stroke, single cylinder Petrol/LPG engine with Eddy current dynamometer..
6. To Prepare Heat Balance sheet on single cylinder Diesel/petrol engine.
7. To conduct a performance test on a four stroke, single cylinder Diesel engine with Band brake Dynamometer using Bio-Diesel.

Reference: Internal Combustion Engines - V. Ganesan, TMH Pub.

17ME3552 - SM & FM LABORATORY

Course Category: Programme Core
Course Type : Laboratory
Prerequisites:
17ME1104A Engineering Mechanics - I
17ME1204 Engineering Mechanics - II
17ME 3404 Fluid Mechanics & Hydraulic Machines
17ME 3302 Mechnics of Materials

Credits: 1.5
Lecture/Tutorial/ Practice: 0 /0/ 3
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks: 100

Course Outcomes:

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

CO1: Determine Young's modulus by conducting various tests on Mild Steel
CO2: Determine hardness and Tensile, compressive, shear and impact strengths as per IS code of Practice
CO3: Determine rigidity modulus by conducting torsion test on Mild Steel
CO4: Determine the coefficient of ischarge for Venturimeter, orifice, orificemeter & mouthpiece
CO 5: Determine the Friction factor for a given pipe
CO6: Determine the performance characteristics of Centrifugal pumps, Reciprocating Pumps and Gear pumps

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

Strength of Materials Lab:

1. Determination of Young's modulus for Mild Steel by conducting Tension test on UTM
2. Load vs Deflection - Determination of Young's modulus on cantilever beam and simply supported beam.
3. Compression test- Determination of compressive strength of Concrete block or Wood
4. (a) Rockwell Hardness test - Determination of Hardness Number for different metal specimens such as mild steel, cast iron, Brass, Aluminum (b) Brinnell's Hardness Test
5. Impact Test - (a) Charpy and (b) lzod: Determination of impact strength of mild steel and cast iron specimens
6. Torsion test - Determination of Modulus of Rigidity of the material.
7. Double shear Test - Determination of shear strength of mild steel specimens

Fluid Mechanics Lab:

1. Orifice / mouthpiece - Determination of coefficient of discharge
2. Venturimeter / Orifice meter - Determination of coefficient of discharge
3. Pipe friction - Determination of friction factor and size of roughness of a given pipe.
4. Single - stage centrifugal pump - To draw the operating characteristics of the pump and to determine the designed discharge and designed head from it.
5. Single - acting reciprocating pump - To draw the operating characteristic curves at constant speed and determination of efficiency.
6. Gear pump - To draw the operating characteristic curves and determination of overall efficiency

Text Books & References:

[1] James M. Gere and Barry J. Goodno, ―Mechanics of Materials‖, Seventh edition, CENGAGE Learning, 2009

[2] R.K.Bansal, ―Fluid Mechanics & Hydraulic Machines‖ Fifth edition, Laxmi Publishers, 2012

17ME3601 - DESIGN OF TRANSMISSION SYSTEMS

Course Category: Programme Core
Course Type : Theory
Prerequisites:
17ME1104A Engineering Mechanics - I
17ME1204 Engineering Mechanics - II
17ME 3306 Kinematics of Machinery
17 ME 3302 Mechanics of Materials
17 ME 3502 Design of Machine Elements

Credits: 4
Lecture/Tutorial/ Practice: 3 /1/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Design shafts, keys and couplings under different loading conditions

CO2: Explain the philosophy of lubrication and design the journal and roller bearings

CO3: Design different types of clutches and brakes

CO4: Determine the key design parameters for transmission systems like spur and helical gears and IC engine components such as piston and connecting rod

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	H											M
CO2	M	H	H											M
CO3	M	H	H											M
CO4	M	H	H											M

(L-Low, M-Medium, H-High)

UNIT - I

Shafts: Design of solid and hollow shafts for strength – For Bending, Torsion, Combined bending and torsion and combined bending, torsion and axial loads.

Keys: Introduction, Design of square and flat keys

Shaft Couplings: Rigid couplings – Muff, split muff couplings, Flexible coupling

UNIT - II

Bearings and Lubrication: Lubrication, Types of lubrications, types of lubricants, properties of lubricants, types of Bearings, Bearing materials, Journal bearing design (using McKee‘s equation and Raymond and Boyd charts & tables)

Ball and Roller Bearings: Static load, Dynamic load, Equivalent radial load, selection of ball and roller bearings

UNIT – III

Brakes:- Introduction to Brakes, Types, Analysis and design of block brakes, band brakes, block and band brakes

Clutches: Analysis and design of simple and multiple disc clutches, cone clutches and centrifugal clutches, friction materials; comparison of brakes and clutches

UNIT – IV

Spur Gears: Terminology of spur gear, standard systems of Gear Tooth, Force analysis, Gear tooth failures, Lewis Equation.

Helical Gears: Terminology of helical gears, virtual number of teeth, Tooth proportions, force analysis, Lewis Equation.

I. C. Engine Components: Introduction, Design of trunk type piston and connecting rod

Text Books:

[1] V B Bhandari, ―Design of machine elements‖, Fourth Edition, Tata McGraw Hill Education Private Limited, 2017.

[2] P.C. Sharma & D.K. Agarwal, ―A Text Book Of Machine Design‖ SK Kataria & Sons, 2013

Reference books:

[1] R.S Khurmi & J.K. Gupta, ―A Text book of Machine Design‖ Fourteeenth Edition, S.Chand & Co Ltd,2015

[2] Robert L.Norton,―Machine Design- An Integrated Approach‖,Fifth Edition, Pearson Education, 2018.

[3] P. Kannaiah, ―Machine Design‖, Second Edition, Scitech Publications Private Limited, 2011.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

[1] Mahadevan & Balaveera Reddy, ―Design data book‖, - CBS Publishers

[2] V.B.Bhandari, ―Design data book‖, Tata McGraw Hill book Co

[3] Design data book, P.S.G. College of Technology, Coimbatore

E-resources and other digital material:

[1] http://nptel.ac.in/courses/112/105/112105124/

[2] http://nptel.ac.in/courses/112/105/112105125/

[3] http://nptel.ac.in/courses/112/106/112106137/

17ME3602 - HEAT TRANSFER

Course Category: Programme Core
Course Type : Theory
Prerequisites:
17ME3303 BTD
17ME3401 FM & HM

Credits: 4
Lecture/Tutorial/ Practice: 3 /1/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:
Upon successful completion of the course, the student will be able to:
CO1: Solve one dimensional steady state heat conduction problems.
CO2: Evaluate transient conduction problems and performance of heat exchangers.
CO3: Explain the convective heat transfer principles and use empirical relations to solve convective heat transfer problems.
CO4: Apply the Laws of Radiation to compute radiation heat transfer between bodies.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M												
CO2	M	M	M										L	
CO3	M	M											L	
CO4	M	M												

(L-Low, M-Medium, H-High)

UNIT – I

Introduction:

Modes and basic laws of heat transfer - steady and unsteady heat transfer, Fourier equation, thermal resistance, thermal conductivity of materials, general heat conduction equation, initial and boundary conditions.

Steady State Conduction:

Conduction through a single and multi-layered plane, cylindrical and spherical walls, conduction with heat generation - plane wall and cylinder with uniform heat generation, critical thickness of insulation.

Heat transfer from extended surfaces:

Steady flow of heat along a rod, heat dissipation from an infinitely long fin, fin insulated at the tip,

fin losing heat at the tip, fin performance, thermometric well.

UNIT – II

Transient Heat Conduction:

Transient conduction in solids with infinite thermal conductivity, time constant and response of a thermocouple. One dimensional transient heat flow in solids with finite conduction resistance using Heisler and Grober charts, transient heat flow in semi-infinite solids.

Heat Exchangers:

Classification of heat exchangers, performance analysis, overall heat transfer coefficient, fouling factor, LMTD approach, effectiveness and NTU approach.

UNIT – III

Forced Convection:

Convective heat transfer coefficient, boundary Layer concept, empirical relations for solving problems of forced convection over a flat plate, cylinder and sphere, analogy between momentum and energy transfer, empirical relations for solving problems of forced convection through circular tubes.

Free Convection:

Free convection problems in external flows (vertical, horizontal and inclined plates, vertical and horizontal cylinders, and spheres) using empirical relations.

Concepts of pool boiling and flow boiling regimes, film-wise and drop-wise condensation.

UNIT – IV

Radiation - Processes and properties:

Introduction, absorptivity, reflectivity and transmissivity, concept of Black body, spectral and spatial energy distribution, Plank‘s law, Stefan Boltzmann law, Wien‘s displacement law, Kirchhoff‘s law, gray body and selective emitters, intensity of radiation, Lambert‘s Cosine law.

Radiation Exchange between surfaces:

Heat exchange between black bodies, shape factor algebra, heat exchange between non black bodies– infinite parallel plates and concentric cylinders, small gray bodies, electrical network approach, radiation shields, combined radiation and convection heat transfer coefficient.

Text Books

[1] [2] R. C. Sachdeva, ―Fundamentals of Engineering Heat and Mass Transfer‖, New age publication, 2017.
[3] D. S. Kumar, ―Basics of Heat & Mass Transfer‖, S. K. Kataria & Sons, 2015.
[4] P. K. Nag, –Heat and Mass Transfer‖, Tata McGraw Hill, 2011.

Reference Books

[1] [2] N. Ozisik, ―Heat Transfer - A Basic Approach‖, TMH, 1985.
[3] J. P. Holman, ―Heat Transfer‖, Tata McGraw Hill, 2008.
[4] lncropera and Dewitt, ―Introduction to Heat Transfer‖, John Wiley, 2011.

E-Resources and other digital material

- IIT video lecturers (NPTEL): https://nptel.ac.in/courses/112101097/
- https://www.grc.nasa.gov/www/k-12/airplane/heat.html
- http://study.com/academy/lesson/heat-transfer-phase-changes.html
- https://www.tes.com/teaching-resource/heat-transfer-convection-11810446

NOTE: Heat and Mass Transfer Data Book is allowed in the examinations.

17ME4603 A - IC ENGINES & GAS TURBINES

Course Category: Programme Elective
Course Type : Theory
Prerequisites:
17ME3303 Basic Thermodynamics
17ME3401 Applied Thermodynamics

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

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

CO1: Explain the principle of working of S.I and C.I engines and their fuel supply systems.

CO2: Analyze the performance and combustion phenomena in I.C. Engines

CO3: Illustrate modern developments in IC Engines, alternate fuels and emissions, in IC Engines

CO4: Apply the thermodynamic principles in the working of gas turbines and propulsion Devices

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M											M	
CO2	M	H											M	
CO3	M	H											M	
CO4	H	M					M						M	

(L-Low, M-Medium, H-High)

UNIT - I

I.C.Engines: Engine nomenclature, Review and classification of I.C. Engines, working principles of S.I. and C.I. Engines - valve timing diagrams and port timing diagrams - Differences between S.I. & C. I. and 2 stroke & 4 stroke engines, principle and working Wankel engine

Fuel supply systems: S.I. Engines- Air-fuel mixture requirements, principle of Carburetion, Simple carburetor, improvements in simple carburetor ,C. I. Engines- Air fuel requirements, Fuel supply and injection systems, Bosch fuel pump and injector

UNIT - II

Testing of I.C.Engines: Indicator diagram, evaluation of Indicated Power, Brake power, Fuel consumption, SFC, Mechanical & thermal efficiencies, mean effective pressure, air-fuel ratio, Heat balance, Engine performance curves, Variables affecting engine performance for both S.I. & C.I. Engines. Numerical problems

Combustion in IC Engines: S.I. Engines- Normal combustion, abnormal combustion, C.I. Engines- Ignition delay, knock in C.I. engines, Knock rating of fuels- Octane number and Cetane number.

UNIT – III

Engine emissions and control: Exhaust emissions- HC, CO, Nox, Particulate and other emissions, Emission control methods- Thermal converter, catalytic converter, particulate traps, EGR, Euro and Bharat Norms.

Alternate fuels: Liquid fuels – Alcohols - Methanol, Ethanol, Alcohols for SI and CI engines, Gaseous fuels – Hydrogen, Natural gas, CNG and LPG, other possible fuels.

Developments in IC Engines: MPFI, GDI, CRDI and HCCI technologies

UNIT – IV

GAS TURBINES: Closed and open Brayton cycle gas turbines, analysis of closed cycle gas turbines compressor and turbine efficiencies, gas turbine cycles with intercooling, reheat and regeneration

JET AND ROCKET PROPULSION: Basic principles of jet propulsion, specific thrust, propulsive efficiency and overall thermal efficiency of a jet engine, concepts of turboshaft, turboprop, turbofan, principles of rocket propulsion, types of rocket propulsion-Solid and liquid rocket engines.

Text Books:

1 V.Ganesan ―I.C. Engines‖, 4th Edition, 2012, T.M.H Publications

2 Gupta .H.N, ―Fundamentals Of Internal Combustion Engines‖ 2nd edition 2013, Prentice-Hall Of India

3. Gas Turbines by V.Ganeshan

Reference books:

[1] P.W. Gill, J.H. Smith & Ziurys, ―Fundamentals of I.C.Engines‖, 1972, IBH & Oxford and IBH Pub.
[2] M.L. Mathur & R.P. Sharma, ―A Course in I.C. Engines‖, 8th edition 1990, Dhanpat Rai & Sons
[3] V.M. Domakundwar, ―A Course in Internal Combustion Engines‖ 2nd edition 2010, Dhanapat Rai Publications
[4] K.K.Ramalngam, ―Internal Combustion Engines‖, Scitech Publications 2011
[5] I. C. Engines by R.K.Rajput

E-resources and other digital material:

1. http://www.howstuffworks.com/engine.html
2. http://www.animatedengines.com/
3. www.vssut.ac.in/lecture_notes/lecture1429900545.pdf
4. http://freevideolectures.com/Course/88/Environmental-Air-Pollution/11
5. ftp://152.66.39.22/pub/bsc/Interan Combsution Engines-Temp.pdf

17ME4603 B - MANUFACTURING MANAGEMENT

Course Category: Programme Elective
Course Type : Theory
Prerequisites:

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:
CO1: Distinguish the different types production systems and various forecasting methods.
CO2: Develop a Master production schedule.
CO3: Apply an appropriate inventory model
CO4: Identify the variations and causes in a production process

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M										H			M
CO2	M										H			M
CO3	M										H			M
CO4	M										H			M

(L-Low, M-Medium, H-High)

UNIT - I

Production systems: Continuous and intermittent production. Mass and flow production, batch production, job order production, production functions. Production Planning & Control Functions**.**

Forecasting: Forecasting variables, forecasting procedure, and methods of forecasting: moving average, least squares, simple exponential smoothing, linear regression, correlation coefficient, problems.

UNIT - II

Aggregate planning and scheduling: Long range, intermediate range and short range plans, the aggregate planning problem, aggregate planning strategies**.**

Master scheduling: Master scheduling formation: inputs and outputs. Master scheduling methods.

UNIT – III

Materials Management and Inventory Control: Functions of materials management, purpose of inventories, types of inventories, relevant costs in inventory control, ABC, VED and XYZ analysis.

Economic order quantity (EOQ) models: Basic EOQ, economic production run length (ERL), quantity discounts, safety stock, problems, P & Q Systems of Control.

Materials requirement planning (MRP): Importance of MRP and CRP, MRP system inputs and outputs, bill of materials, MRP logic, MRPII, Just in Time Production Systems: Just-in-Time System: Evolution, Characteristics of JIT Systems, Continuous Improvement, The Kanban System, Calculation of number of Kanban‘s Requirements for implementation JIT – benefits of JIT.

UNIT – IV

Quality control: Tolerance limits of a process, control charts for variables: X and R charts. Control charts of attributes, p-chart, and c-chart.

Acceptance sampling: single sampling, double sampling and multi sampling plans for attributes, OC curves, Introduction to TQM, Deming's quality philosophy, Taguchi quality philosophy, introduction to e-Manufacturing.

Text Books:

[1] Joseph G. Monks ―Operations Management‖ 3rd Edition TMH,1987.

[2] Marthand Telsang –*Industrial Engineering and Production management"* S.Chand Publications.

Reference books:

[1] Dale H. Besterfield –Quality Control‖ Prentice Hall 1995

[2] Gerhard Greeff, Ranjan Ghoshal Oxford, Burlington, MA : Newnes, ― Practical E-Manufacturing and Supply Chain management‖ Copyright © 2004 Elsevier Ltd.

[3] Gopalakrishnan and Sudhakaresan ―Materials Management‖

E-resources and other digital material:

[1] www.transtutors.com

[2] www.prenhall.com

17ME4603 C- ADVANCED MECHANICS OF MATERIALS

Course Category: Programme Elective
Course Type : Theory
Prerequisites:
17ME1104A Engineering Mechanics - I
17ME3302 Mechanics of Materials

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:
CO1: Determine stress, strain and deformations for statically in-determinate members.
CO2: Determine and analyze stresses and strains for pressure vessels & rotating discs.
CO3: Analyze the concept to determine stresses in curved beams.
CO4: Evaluate shear centre for symmetric sections.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M	L											M
CO2	M	H	M											M
CO3	M	H	M											M
CO4	M	H	M											M

(L-Low, M-Medium, H-High)

UNIT – I

STATICALLY INDETERMINATE BARS: Analysis of bars of composite sections, Temperature stresses in composite sections.
STATICALLY INDETERMINATE BEAMS: Types of beams, fixed beams, Analysis by the differential equations of the Deflection curve, Macaulay‘s Method, Moment Area Method.

UNIT - II

CONTINUOUS BEAMS: Clapeyron‘s theorem of three moments, Beams with overhang and fixed ends, Beams with constant and varying moments of inertia.
ENERGY METHODS: Strain energy, Castigliano‘s theorem, statically indeterminate beams, Applications of Castigliano‘s theorem.

UNIT – III

THICK CYLINDRICAL AND SPHERICAL PRESSURE VESSELS: Stresses in a thick cylindrical shell, Stresses in compound thick cylinders, Initial difference in radii at the junction of the compound cylinder for Shrinkage, Stresses in thick spherical shells.
CENTRIFUGAL STRESSES: Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniform strength.

UNIT – IV

CURVED BEAMS: Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook with trapezoidal cross-section.
SHEAR CENTER: Shear centre, determination of shear centre for channel section, determination of shear centre for I – section.

Text Books:

[1] R.K.Bansal, ―Strength of Materials‖ Fifth edition, Laxmi Publishers, 2012
[2] Dr. Sadhu Singh,‖Strength of Materials‖, Ninth edition, Khanna Publishers, 2007.

Reference books:

[1] R.K. Rajput,―Strength of Materials‖,First Edition, S.Chand & Company, 2006.
[2] S.S.Rattan, ―Strength of Materials‖, Second Edition,Tata McGraw Hill Education Private Limited, 2012.
[3] Surendra Singh,―Strength of Materials‖, First Edition, S.K.Kataria & Sons.

E-resources and other digital material:

[1] Prof. S.K.Maiti, IIT Bombay, Advanced Strength of material, [English], Web
https://nptel.ac.in/courses/112101095/
http://www.nptelvideos.in/2012/12/advanced-strength-of-materials.html
[2] James M. Gere and Barry J. Goodno, ―Mechanics of Materials‖, Eighth edition, CENGAGE Learning, 2009
https://www.academia.edu/31679740/Mechanics_of_Materials_8th_Edition

17HS1604 - ENGINEERING ECONOMICS AND FINANCE

Course Category: Institutional Core
Course Type : Theory
Prerequisites:

Credits: 2
Lecture/Tutorial/ Practice: 2 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand various forms of organizations and principles of management
CO2: Understand the various aspects of business economics
CO3: Perceive the knowledge on Human resources and Marketing functions
CO4: Evaluate various alternatives economically

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT - I

Forms of Business Organization: Salient Features of Sole Proprietorship, Partnership, Joint Stock Company, Co-operative Society and Public Sector.

Management: Introduction to Management, Functions of Management, Principles of Scientific Management, Modern Principles of Management.

UNIT - II

Introduction to Economics: Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility.

Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity.

Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function.

UNIT – III

Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management.

Marketing Management: Concept of Selling And Marketing – Differences, Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales Promotion, Types of Distribution Channels, Marketing Research, Break-Even Analysis.

UNIT – IV

Financial Management: Functions of Financial Management, Time value of money with cash flow diagrams, Concept of Simple and Compound Interest.

Depreciation: Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year‘s Digits Method –Problems.

Economic Alternatives: Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method - Problems.

Text Books:

[1] M. Mahajan Industrial Engineering and Production Management Dhanpat Rai Publications 2nd Edition.

[2] Martand Telsang‖ Industrial & Business Management‖ S.Chand publications.

Reference books:

[1] R.Paneer selvam ―Production and Operations Management‖ PHI

[2]Philip Kotler & Gary Armstrong ―Principles of Marketing‖ ,pearson prentice Hall,New Delhi,2012 Edition.

[3] IM Pandey, ―Financial Management‖ Vikas Publications 11th Edition

[4] B.B Mahapatro, ―Human Resource Management‖.,New Age International ,2011

E-resources and other digital material:

[1]https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/

[2]https://keydifferences.com/difference-between-personnel-management-and-human-resource-management.html

[3] http://productlifecyclestages.com/

[4] https://speechfoodie.com/cash-flow-diagrams/

17ME2605 A - MECHATRONICS

Course Category: Open Elective **Credits**: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /0/ 0
Prerequisites: **Continuous Evaluation**: 30
17ME3404 Electrical and Electronic Engineering, **Semester end Evaluation**:70
17ME3305 Kinematics of Machines **Total Marks:**100

Course Outcomes:
Upon successful completion of the course, the student will be able to:
CO1: Summarize the working principles of various Sensors and Transducers.
CO2: Develop system models & transfer function for Mechanical, Electrical, Fluid & Thermal systems.
CO3: Summarize the working principle of different controllers such as Proportional, Derivative, Integral, PI, PD and PID.
CO4: Analyze various case studies related to Mechatronics systems.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	L	L			M				M					M
CO2	H	H			M				M					M
CO3	H	L			H				H					M
CO4	H	L			M				H					M

(L-Low, M-Medium, H-High)

UNIT – I
Introduction to Mechatronics
Sensors & Transducers: Introduction, performance terminology, Classification of sensors: Potentiometer sensor, strain gauged element, Capacity element, LVDT, Optical Encoders, Tachogenerator and stain gauge load cell, Selection of sensors.

Signal Conditioning: Introduction data acquisition – Quantizing theory, Analog to digital conversion, digital to analog conversion. Operational amplifiers: Inverting amplifier, Summing amplifier, Integrating amplifier, Difference amplifier, filtering process

UNIT – II
Basic System Models: Modeling of one and two degrees of freedom Mechanical, Electrical, Fluid and thermal systems. Block diagram representations for these systems.

System Transfer functions: The Transfer function, Laplace transforms, First order systems, Second order systems, systems in series, systems with feedback loops.

UNIT – III
Closed loop controllers: Continuous and discrete processes, control modes, Two step, Proportional, Derivative, Integral, PID controllers.

Digital logic: Logic gates, Applications of logic gates: digital comparator, coder. SR flip-flop.

UNIT – IV

PLC : Introduction, basic structure, I/P, O/P, processing, programming, ladder diagrams, timers, internal relays and counters, data handling, analogue input and output, selection of PLC.

Design: Designing Mechatronics systems, possible design solutions, case studies of Mechatronics systems – i) Car park barriers ii) Car engine management iii) Bar code- reader

Text Books:

[1] Mechatronics Electronic control systems in Mechanical and Electrical Engineering by W. Bolton, PEARSON , 4th Edition,2011.

Reference books:

[1] Dr. Sadhu Singh,‖Strength of Materials‖, Ninth edition, Khanna Publishers, 2007.
[2] Mechatronics by Mahalik,1st Edition,2003 TMH.
[3] Introduction to Mechatronics – David and Alcaitore Michael B.Histand TMH, 4th Edition, 2006.

E-resources and other digital material:

[1] http://www.engr.sjsu.edu/sjlee/vendors.htm
[2] www.engr.colostate.edu/~dga/mechatronics/resources.html
[3] www.NI.com
[4] www.cambridgemechatronics.com/contact/terms
[5] www.pdf-free-download.com/mechatronics-labs.pdf
[6] mechatronics.me.wisc.edu

17ME2605 B - ADDITIVE MANUFACTURING

Course Category: Open Elective **Credits**: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: 3/0/0
Prerequisites: 17ME1105 Engineering Graphics **Continuous Evaluation**: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Outline the importance and application of AM models in engineering design

CO2: Develop various layered models using different AM methods

CO3: Illustrate the methodology to manipulate the STL file for improved part accuracy

CO4: Analyze the process optimization in AM and its related processes

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1					L				L					M
CO2					H				M					H
CO3					H				H					H
CO4					H				H					H

(L-Low, M-Medium, H-High)

UNIT-I

Introduction: Rapid prototyping, History of RP system, Survey of applications, Growth of RP industry and classification of RP system.

Stereo Lithography System: Principle, Process parameter, Process details, Data preparation, Data files and machine details & Applications.

UNIT II

Laminated Object Manufacturing (LOM): Principle of Operation, LOM materials, Process details & Applications.

Solid Ground Curing (SGC): Principle of operation, Machine details & Applications.

Fused Deposition Modelling (FDM): Principle, process parameter, Path generation & Applications.

UNIT –III

Laser Engineering Net Shaping (LENS): Principle, process parameter, Path generation & Applications

Software for RP: STL files, importance of Magics software, STL file manipulation

UNIT IV

Process Optimization in RP: Factors influencing accuracy, Data preparation error, Part building error, Error in finishing, Influence of build orientation.

Allied Process: Surface digitization and Surface generation from point cloud, Surface modification.

Text Books:

[1] C K Chua, K F Leong, C S Lim; Rapid prototyping 3e, Principles & Application, Cambridge University press, 2010
[2] Paul F.Jacobs – ―Stereo lithography and other RP & M Technologies‖, SME, NY 2011

Reference books:

[3] Pham, Duc, Dimov, S.S. ‐Rapid Manufacturing‖ The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer, 2001.

E-resources and other digital material:

Web Resources:

[1] http://www.additive3d.com/rp_int.htm
[2] https://www.rolanddga.com/applications/rapid-prototyping
[3] http://www.emeraldinsight.com/journal/rpj
[4] http://additivemanufacturing.com/
[5] http://www.eos.info/additive_manufacturing/for_technology_interested

NPTEL Videos:

[1] https://www.youtube.com/watch?v=oMQWGBgNCtg
[2] https://www.youtube.com/watch?v=s3gHHeD6cv8
[3] https://www.youtube.com/watch?v=BUfh5wxj3qA
[4] https://www.youtube.com/watch?v=PDLOmoQj4H0
[5] https://www.youtube.com/watch?v=C-SQEpOK5w4
[6] https://www.youtube.com/watch?v=eKk2vRysioE
[7] https://www.youtube.com/watch?v=uAt2xD1L8dw

17TP1606 - QUANTITATIVE APTITUDE

Course Category: Institutional Core
Credits: 1
Course Type : Learning by Doing
Lecture/Tutorial/ Practice: 0 /0/ 2
Prerequisites:
Continuous Evaluation: 100
Semester end Evaluation: 00
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Effectively organize, summarize and present information in quantitative forms including tables

CO2: Be able to use mathematical based reasoning and be able to evaluate alternatives and make decisions

CO3: Be able to think and reason logically and critically in any given situation

CO4: Application of logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L – Low, M- Medium, H – High)

UNIT I:

1. Number system
2. HCF & LCM,
3. Average,
4. Percentages,
5. Profit & Loss

UNIT II:

1. Ratio & Proportion,
2. Partnership,
3. Chain Rule,
4. Time & Distance,
5. Time & Work

UNIT III:

- Pipes & Cistern,
- Problems on Trains,
- Problems on boats &Steams,
- Allegation,
- Simple interest and compound interest.

UNIT IV:

- Area, Volume and Surface areas,
- Races & Games of skills,
- Calendar & Clock,
- Stocks & Shares,
- Permutations & Combination,
- Probability.

Learning Resources: Quantitative Aptitude by R.S.Aggarwal

17MC1607 – BIOLOGY FOR ENGINEERS

Course Category: Institutional core
Course Type : Theory
Prerequisites:

Credits: 0
Lecture/Tutorial/ Practice: 2 /0/ 0
Continuous Evaluation: 100
Semester end Evaluation:00
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Explain the fundamental principles of Biology that lead to major discoveries
CO2: Identify the functions of different types in bio-molecules
CO3: Explain mechanisms underlying the working of molecular biological processes including enzyme catalysis, metabolic pathways, gene expression
CO4: Understand metabolism to analyze biological processes

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M					L			L					
CO2	M					L			L					
CO3	M					L			L					
CO4	M					L			L					

(L – Low, M- Medium, H – High)

Course Content

Unit-I Introduction and Classification of Living organisms

Introduction:

Fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Biology as an independent scientific discipline. Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.

Classification:

Classification of living organisms based on (a) Cellularity- Unicellular or multicellular(b)Ultrastructure-prokaryotes or eukaryotes. (c) Energy and Carbon utilization-Autotrophs, heterotrophs, lithotrophs

(d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat- acquatic, terrestrial (e) Molecular taxonomy- three major kingdoms of life.

Unit-II Biomolecules and Enzymes

Biomolecules:

Biomolecules: Structures of sugars (Glucose and Fructose), starch and cellulose. Nucleotides and DNA/RNA. Amino acids and lipids. Proteins- structure and functions- as enzymes, transporters, receptors and structural elements.

Enzymes:

Enzyme classification. Mechanism of enzyme action. Enzyme

kinetics and kinetic parameters.

Unit-III Genetics and Gene information Transfer

Genetics:

–Genetics is to biology what Newton‘s laws are to Physical Sciences‖ Mendel‘s laws, Concept of segregation and independent assortment. Concept of allele. Concepts of recessiveness and dominance. Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring.

Information Transfer:

DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Unit-IV Metabolism and Microbiology

Metabolism:

Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. Breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions.

Microbiology:

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms. Microscopy.

Text Books:

[1] Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S.A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

[2] Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

[3] Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

[4] Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher, Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

E-resources and other digital material:

[1] https://bee.cals.cornell.edu/sites/bee.cals.cornell.edu/files/shared/documents/Car eer_Bee_Final-for Web.pdf

[2] https://www.teachengineering.org/subjectareas

17ME3651- MACHINE TOOLS LABORATORY

Course Category : Programme Core **Credits:** 1.5
Course Type : Practical **Lecture/Tutorial/Practice:** 0/0/3
Prerequisites: 17ME1253 Workshop practice **Continuous Evaluation:** 30
17ME3503 Metal cutting and Machine Tools **Semester End Evaluation:** 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:
CO1: Illustrate1athe machine constructional details and perform various 1athe operations.
CO2: Plan drilling, reaming, counter boring and counter sinking on drilling machine
CO3: Summarize milling machine constructional details and perform different milling operations.
CO4: Plan Shaping, Planning and Slotting operations.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1			H	H										H
CO 2			H	H										H
CO 3			H	H										H
CO 4			H	H										H

(L-Low, M-Medium, H-High)

Course content

1. Lathe:

Step Turning, Taper Turning, Knurling, Threading, Drilling and Boring.

2. Drilling:

Drilling, Reaming, counter boring and counter sinking on drilling machine.

3. Milling:

Manufacturing of Key-way, concave & convex, dovetail cutting, T-slot cutting and Spur Gears by using Milling machine.

4. Shaping:

Making models by involving production of flat surface, External keyway cutting, Step cutting and internal keyway cutting on shaping machine.

5. Planing and Slotting:

(a) Plain surface finishing performed by planning machine

(b) Making of round to square shape, internal keyways and external keyways by Slotting Machine.

6. Tool and cutter grinding and centerless grinding Machine

(a) Grinding of Single Point Cutting Tools and Multi point cutting tool cutters and drill bit grinding by Tool and Cutter grinding machine.

(b) Finishing of cylindrical jobs by using centerless grinding Machine

Text Books:

[1] S.K.HajraChowdary, A.K. HajraChowdary, NirjharRoy,‖Elements of Workshop Technology, Vol.II‖.Media Promoters and Publishers Pvt.Ltd, Mumbai,Scitech Publications, Chennai, 2013

17ME3652 – HEAT TRANSFER LABORATORY

Course Category : Programme Core **Credits:** 1.5
Course Type : Laboratory **Lecture/Tutorial/Practice:** 0/0/3
Prerequisites: 17ME3303-Basic Thermodynamics **Continuous Evaluation:** 30
17ME3501-Applied Thermodynamics, **Semester End Evaluation:** 70
17ME3602-Heat transfer **Total Marks:** 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Determine thermal conductivity of materials
CO2: Determine convection heat transfer coefficient
CO3: Evaluate Emissivity of a grey body
CO4: Determine overall heat transfer coefficient in heat exchangers
CO5: Determine COP of Refrigeration and Air conditioning systems
.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1			M	H	L								M	
CO 2			M	H	L								M	
CO 3			M	H	L								M	
CO 4			M	H	L								M	
CO 5			M	H	L								M	

(L-Low, M-Medium, H-High)

Any --- Experiments of the following

1. Measurement of Thermal conductivity of metal rod
2. Thermal conductivity of insulating powder
3. Heat transfer through a lagged pipe apparatus
4. Heat transfer from pin fin in forced convection
5. Determine Forced convection heat transfer coefficient through a duct
6. Heat transfer from pin fin in natural convection
7. Determine overall heat transfer coefficient in Parallel flow and counter flow heat exchangers.
8. Determine overall heat transfer coefficient in Cross flow heat exchanger
9. Determine the value of Stefan Boltzmann constant
10. Emissivity measurement of a grey body
11. COP of Vapour Compression Refrigeration cycle
12. COP of Air conditioning system
13. User defined Design based experiment

17ME5653 – ENGINEERING PROJECT FOR COMMUNITY SERVICES

Course Category : Institutional core
Course Type : Practical
Prerequisites:

Credits: 2
Lecture/Tutorial/Practice: 0/1/2
Continuous Evaluation: 30
Semester End Evaluation: 70
Total Marks: 100

CO1: Identify the problem, define objectives and scope of the project work

CO2: Carryout Team work

CO3: Prepare and present a comprehensive report of the project work

CO4: Apply the principles of Thermal Engineering to solve problems

CO5: Solve Engineering problems using the concept of design and manufacturing

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1												H		
CO2									H					
CO3								M		H				
CO4	M	H		M	M			M					H	
CO5	M	H		M	M			M						H

17ME 3701 - COMPUTER AIDED MANUFACTURING

Course Category: Program Core **Credits:** 4
Course Type: Theory& Practice **Lecture/Tutorial/ Practice:** 3 /0/ 2
Prerequisites: 17ME1104A- Engineering Mechanics **Continuous Evaluation:** 30
17ME3503– Machine Tools and Metal Cutting **Semester End Evaluation:** 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Summarize the concepts of NC machine tools, their classification, applications, Advantages & Disadvantages

CO2: Explain the concepts of CNC, DNC, Adaptive control and Manual part programming

CO3: Apply the fundamentals of A P T Language and Group Technology

CO4: Distinguish the concepts of CAPP, FMS, CIMS and Industry 4.0

Contribution of Course outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M		M		M									M
CO2	M	M	M		M									H
CO3	M	M	M		H									H
CO4	M		M		M									M

(L – Low, M - Medium, H – High)

UNIT - I

Numerical Control in Production Systems: Introduction, Historical background, role of computers in manufacturing, components of NC Systems, Need for numerical control, Classification of NC systems, NC coordinate system, NC Applications, Advantages and disadvantages of NC machines, Recent trends in NC systems.

UNIT - II

Computer Control of NC Machines: Introduction, Principles of operation of CNC, Features of CNC, Developments in CNC systems, Direct Numerical Control (DNC), Types of DNC, Advantages of CNC and DNC, Adaptive Control Machining. Manual Part Programming: Introduction, Manual Part Programming, Codes & Concepts, Cutter Length Compensation, Cutter Radius Compensation, Canned Cycles, Simple Programming Examples.

UNIT - III

Computer Assisted Part Programming: Advantages of Computer Assisted Part Programming, APT Language, Geometry, Motion Commands, Macros, Simple Programming Examples. Group Technology: Introduction, Part Families, Parts Classification and Coding, Different parts classification and coding systems, Cellular Manufacturing, Composite Part Concept, Benefits of Group Technology.

UNIT – IV:

Computer Aided Process Planning: Types of Computer Aided Process Planning, Retrieval type of Process Planning Systems, Generative Process Planning Systems, Benefits of CAPP.

Flexible Manufacturing Systems: Introduction, Types of Flexible Manufacturing Systems, FMS Layout configurations, Automated Guided Vehicle Systems and its working principles, control and safety aspects of A G V S, FMS Applications and Benefits, Introduction to Computer Integrated Manufacturing Systems (CIMS)and Industry 4.0.

Course content for Practice part

Manual Part Programming

Turning:

a. Step turning
b. Taper turning
c. Profile turning

Milling:

a. Linear & Circular interpolation
b. Mirror imaging using sub program
c. Pocketing
d. Tool radius compensation
e. Drilling of holes

Text Books:

[1] P. N. Rao, T. K. Kundra& N. K. Tiwari, ‐Numerical Control & Computer Aided Manufacturing‖, Tata Mc- Graw Hill Publishers, New Delhi, 2008.
[2] Mikell P. Groover, ―CAD/ CAM‖, Prentice Hall of India, 3rd Edition, Delhi, 1995.

Reference books:

[1] Mikell P. Groover, ―Automation, Production Systems and CIM‖, Prentice Hall of India, 2nd Edition, New Delhi, 1995.
[2] YoramKoren, ― Computer Control of Manufacturing Systems‖, Mc- Graw Hill International Publishers, Singapore, 2010.
[3] N. K. Mehta, ―Machine Tool Design and Numerical Control‖, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

E-resources and other digital material:

[1] http://nptel.iitm.ac.in
[2] http://www.engr.sjsu.edu
[3] http://web.iitd.ac.in
[4] http://www.enotes.com/computer-aided-design-cad-cam
[5] www.britannica.com/EBchecked/topic/130575/computer -aided-manufacturing
[6] http://en.wikipedia.org/wiki/Computer-aided_design#overview

17ME4702/A – ELECTRIC AND HYBRID VEHICLES

Course Category: Programme Elective
Course Type : Theory
Prerequisites:
17ME3404 Electrical and Electronics Engineering

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

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

CO1: Explain knowledge about hybrid and electric vehicles.

CO2: Identify various energy resources used for hybrid vehicles.

CO3: Select suitable electric motor for hybrid vehicle

CO4: Apply the concept of power electronics for Hybrid Vehicles.

Contribution of Course Outcomes towards achievement of Program Outcomes

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

(L-Low, M-Medium, H-High)

UNIT - I:

Introduction to hybrid vehicles

History of electric vehicle, history of hybrid electric vehicle, history of fuelcell vehicle, advantages and limitations, air pollution and global warming, Electric vehicle drive train: EV transmission configurations, transmission components, ideal gearbox, types of hybrid electric vehicles

UNIT- II:

Energy sources for hybrid vehicles

Battery: principle and types, Li-ion battery, ultra capacitor, fuel cells: operating principles of PAFC,PEM, MCFC,SOFC, DMFC,PCFC,ZAFC, Alkaline and Regenerative cells.

UNIT- III:

Electric machines for hybrid vehicles

Permanent magnet synchronous motor, switched reluctance motor, induction motor, permanent magnet brushless DC motor, regenerative braking system.

UNIT-IV:

Power electronics for hybrid vehicles: Introduction to digital and Analog Inputs, Basic switches: diode, power transistor, power MOSFET, inverters, charging of hybrid electric vehicle.

Text Books:

[1] IqbalHusain,ELECTRICandHYBRIDVEHICLES,DesignFundamentals,CRCPress,2003.
[2] MehrdadEhsani, YiminGao, Ali Emadi, –Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals‖, CRC Press, 2010.
[3] Ali Emadi, Advanced Electric Drive Vehicles, CRC Press,2015.

Reference Books:

[1] SandeepDhameja, ―Electric Vehicle Battery System
[2] Rand D.A.J, Woods, R & Dell RM Batteries for Electric vehicles

E-resources and other digital material:

[1] https://swayam.gov.in/courses/-electric-vehicles

17ME 4702/B - METAL FORMING

Course Category: Programme Elective
Course Type : Theory
Prerequisites: 17ME3302Mechanics of Materials

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO 1: Summarize the fundamental concepts of metal forming.
CO 2: Distinguish the various process parameters and applied loads in forging and sheet metal working.
CO 3: Analyze Rolling and Extrusion processes and associated parameters.
CO4: Analyze Drawing and various High Energy Rate forming processes.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	M											H
CO2	M	H	M											H
CO3	M	H	M											H
CO4	M	H	M											H

(L-Low, M-Medium, H-High)

UNIT – I:

Fundamentals of Metal Forming: Classification of forming processes- classification, mechanisms of metal forming: slab method, Upper and lower bound analysis, Deformation energy method, temperature of metal working, hot working, Warm working, cold working friction and lubricants. Formability limits, Strain rates in metal forming Development of metallurgical structure during deformation Flow curves Plastic stress-strain relationship - plastic work - the principle of normality -incremental plastic strain. Strain rate - super plasticity

UNIT – II:

Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging. Problems on flow stress, true strain and forging load.

Press tool design: Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive dies, blanking, punching, problems on Blanking and punching force, clearances, Elastic recovery and shear.

Sheet metal forming: Forming methods, bending, stretch forming, Spinning.

UNIT – III:

Rolling: Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations, Problems.

Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubesand production of seamless pipes. Problems on extrusion load.

UNIT – IV:

Drawing: Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing .Problems on draw force. Cup drawing

Advanced Metal forming processes: Electromagnetic forming. Explosive Forming, Electrohydraulic forming.

Miscellaneous Forming Processes: Coining, Thread Rolling, Tube piercing,

Text Books:

[1] Manufacturing Science- AmitabhaGhosh , Asok Kumar Mallik, EWP
[2] Mechanical Metallurgy by G. E. Dieter, McGraw-Hill.
[3] Fundamentals of Metal Forming Processes – B.L. Juneja

E-resources and other digital material:

[1] Metal Forming: Fundamentals and Applications by TaylanAltan (ASM Series in Metal Processing)
[2] Introduction to Industrial Mechanical Working Process by G. W. Rowe
[3] Materials & Processes In Manufacturing By E.Paul De Germo, J T Black & Ronald A Koshav
[4] Modern Control Engineering by Ogata, PHI Publ. Prentice-Hall of India Pvt. Ltd.
[5] Manufacturing Technology (Foundry, Forming and Welding) by P. N. Rao, TMH.

17ME 4702/C- FINITE ELEMENT METHOD

Course Category: Programme Elective
Course Type : Theory
Prerequisites: 17ME3302Mechanics of Materials, 17ME3602Heat Transfer
,

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO 1: Apply the philosophy of FEM and solve 1-D bar problems.
CO 2: Apply finite element formulation for planar truss and beam problems.
CO 3: Apply FEM to 2-D plane-stress, plane-strain and axisymmetric problems, and perform 1-D numerical integration.
CO4: Apply FEM to 1-D steady state heat transfer and understand FE formulation for free vibrations of 1-D bar problems

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	L		M								M	M
CO2	M	H	L		M								M	M
CO3	M	H	L		M								M	M
CO4	M	H	L		M								M	M

(L-Low, M-Medium, H-High)

UNIT – I:

Fundamental concepts: Introduction, stresses and equilibrium, boundary conditions, strain-displacement relations, stress-strain relations for plane stress, plane strain, 2-D axisymmetric and three-dimensional cases, potential energy and equilibrium; the Rayleigh-Ritz method, Galerkin‘s method.

Basic concepts of F.E.M. and one dimensional problems : Fundamental concepts, Finite Element Modeling, Coordinates and Shape functions, The Potential Energy Approach, Stiffness Matrix and Load Vector, Assembly of the global stiffness matrix and load vector, Properties of global stiffness matrix, The Finite Element equations; Treatment of boundary conditions, Examples of Axially Loaded members.

UNIT – II:

Analysis of plane trusses: Introduction, Plane Trusses, Local and Global Coordinate systems, Element Stiffness Matrix, Treatment of boundary conditions, Stress Calculations, Example of plane Truss with three members.

Analysis of beams: Introduction, Potential Energy Approach, Element stiffness matrix for two node planar beam element, load vector, boundary conditions, simple beam problems.

UNIT – III:

Two dimensional problems : Introduction, Plane Stress and Plane Strain, Finite Element Modeling, Constant Strain Triangle (CST); Potential Energy Approach, derivation of Element Stiffness matrix, derivation of force vector for body forces and linearly varying pressure load, Problem modeling and boundary conditions.

Finite element formulation for an axisymmeric linear triangular element, Derivation of element stiffness matrix, derivation of force vector for body forces and uniformly distributed pressure load. Numerical integration: One-dimensional Integrals using one-point formula, One-dimensional Integrals using two-point formula

UNIT – IV:

One-dimensional steady state heat transfer analysis: Introduction, One dimensional steady state heat conduction, boundary conditions: specified temperature, convection and heat flux, Galerkin‘s approach for heat conduction, One dimensional heat transfer in thin fins.

Free vibration analysis: Hamilton‘s principle, solid body with distributed mass, derivation of element mass matrix: linear one-dimensional bar element, truss element, beam element, Evaluation of eigenvalues and eigenvectors, Natural frequencies of a stepped bar with one end fixed and other end free boundary conditions.

Text books:

[1] Introduction to Finite Elements in Engineering by T. R. Chandrupatla and A. D. Belegundu, 3rd Edition, PHI Learning Private Limited, 2011.

Reference books:

[1] Singiresu S. Rao, ―The Finite Element Method in Engineering‖, Fifth edition, Butterworth-Heinemann, 2011.
[2] Applied Finite Element Analysis – Larry J. Segerlind, John Wiley and Sons, Second Edition, 1984
[3] Finite Element Analysis by P. Seshu, PHI Learning Private Limited, 2008.

E-resources and other digital material:

[1] https://en.wikipedia.org/wiki/Finite_element_method
[2] http://reference.wolfram.com/applications/structural/FiniteElementMethod.html
[3] https://www.youtube.com/watch?v=oNqSzzycRhw
[4] https://www.youtube.com/watch?v=NYiZQszx9cQ&list=PLA4CBD0C55B9C3878

17ME4703/A - JET AND ROCKET PROPULSION

Course Category: Programme Elective
Credits: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: 3/0/0
Prerequisites: **Continuous Evaluation**: 30
17ME3303 Basic Thermodynamics **Semester end Evaluation**: 70
17ME3501 Applied Thermodynamics **Total Marks:** 100

Course Outcomes:

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

CO1: Explain the working of Gas Turbine and methods to improve efficiency and also determine the efficiencies of axial flow compressors.

CO2: Evaluate the performance of axial flow turbines and identify their applications.

CO3: Analyse the performance of jet propulsion system.

CO4: Outline the principle of operation of Rocket Propulsion Systems.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1		L	M										L	
CO2		L	M										L	
CO3		L	M		L								L	
CO4					L									

(L-Low, M-Medium, H-High)

UNIT – I:

INTRODUCTION: Classification, working principle of Gas turbines, open and closed cycles, methods to improve performance of the ideal cycle, compressor and turbine efficiency, cycle efficiency, polytropic efficiency.

AXIAL FLOW COMPRESSORS: Principle of operation, stage velocity triangles, work input to the compressor, work done factor, Compressor stage efficiency, Degree of Reaction, Surging, choking and stalling.

UNIT – II:

AXIAL FLOW TURBINES: Working principle, Velocity triangles of single stage turbine, Work output, Blade and stage efficiencies, Degree of Reaction - fifty percent reaction stage.

APPLICATIONS OF GAS TURBINES: Typical applications of gas turbines - electric power generation applications - marine application, locomotive applications, automotive applications - aircraft applications - process applications, additional features of gas turbine engines - trends in future development.

UNIT – III:

JET PROPULSION: Introduction, Air breathing jet engines, classification - Ram jet, Pulse jet, Turbo jet, Turbo prop, Thrust, Efficiency - Ram, thermal, transmission, overall. Effect of forward speed, altitude, thrust augmentation - after burning, water alcohol mixtures, bleed burn cycle.

UNIT – IV:

ROCKET PROPULSION: Principle, classification - chemical, rocket-solid propellant, liquid propellant, advantages, free radical, nuclear, electro dynamic, plasma, photon propulsion.

Text Books:

[1] Gas Turbines - Ganesan V., TMH.
[2] Gas turbines and propulsive systems - Khajuria P.R., Dubey S.P., Dhanpat Rai Pub.
[3] Gas turbines and Jet & Rocket propulsion - Mathur M.L., Sharma R.P. Standard Pub.

Reference books:

[1] Gas Turbine Theory - Cohen H., Rogers G. and Saravanamuthu H., John Wiley.
[2] Turbines, Compressors and Fans - Yahya S.H, Tata McGraw-Hill.
[3] Aero-thermodynamics of gas turbine and rocket propulsion - Gordon Oates, AIAA Education series.

E-resources and other digital material:

[1] http://nptel.ac.in/courses/101101002/
[2] http://nptel.ac.in/courses/112104117/13
[3] https://powergen.gepower.com/plan-build/products/gas-turbines/index.html

17ME4703/B - METROLOGY

Course Category: Programme Elective **Credits**: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /0/ 0
Prerequisites: **Continuous Evaluation**: 30
17ME 1106 - Basics of Mechanical Engineering **Semester end Evaluation**:70
17PH 1202C – Physics for Engineers **Total Marks:**100

Learning Outcomes: At the end of the course the students will be able to
CO1: Evaluate various devices for linear and angular measurements.
CO2: Summarize the system limits, fits, tolerances, interchangeability and gauge design.
CO3: Distinguish knowledge on various surface roughness measuring instruments.
CO4: Demonstrate the interferometer, CMM and form measuring instruments.
.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H													L
CO 2	H	M	M											M
CO 3	M													L
CO 4	M													L

(L-Low, M-Medium, H-High)

UNIT – I:

Metrology : Introduction , elements of engineering measurements, standards of length ; end and line standards, slip gauges , angle gauges, sine bars, spirit levels, bore gauges, straight edges

UNIT – II:

Limits, fits and gauges: Theory of limits, Fits, Tolerances and their selection, Hole Basis and shaft basis systems, IS system of limits & fits, Simple problems. Interchangeability, Selective Assembly, Limit gauges, Taylor‘s Principle of limit gauging, plug gauges, Ring gauges and their applications.

UNIT – III:

Comparators: Mechanical comparators- Read comparator, Sigma comparator, Solex pneumatic gauge, Electrical & Electronic comparator, projectors, Tool Maker‘s Microscope, Auto collimator and angle dekkor **Measurement of surface finish**: Surface texture, roughness, waviness, Indian standard terminology, Various methods of measuring surface finish, Tomlinson surface meter and Taylor Hobson Talysurf.

UNIT **– IV:**

Advances in Metrology: Basic concept and advantages of lasers, laser interferometers, types, DC and AC laser interferometers, applications. Basic concept of CMM, types of CMM, constructional features, and applications.

Form Measurement: Principles and methods of straightness, flatness measurement, thread measurement and gear measurement.

Text books:

[1] Metrology - R.K.Jain, Twenty First Revised edition. 2015, Khanna publishers
[2] A Textbook of Metrology by M Mahajan, 2nd edition 2011, DhanpathRai Publications.
[3] Mechanical Measurements & Control Engineering by D. S. Kumar, 6th Edition, 2002, Metropolitan Book company Ltd.

Reference Books:

[1] Engg.Metrology – D.M.Antony
[2] A Text book of Engg.Metrology – I.C.Gupta., 7th Edition, Dhanapathrai publications
[3] Hand Book of Industrial Metrology – ASTME.
[4] Mechanical Measurements by T. G. Beckwith, Roy D. Marangoni, John H. Lienhard V.6th edition.2009, Pearson Prentice Hall

E-resources and other digital material:

[1] http://www.metrologymetro.com
[2] http://www. emtoolbox.nist.gov/.
[3] http://en.wikipedia.org/wiki/Metrology#Basics

17ME4703/C – COMPUTER GRAPHICS AND GEOMETRICAL MODELING

Course Category: Programme Elective
Course Type : Theory
Prerequisites:
17ME1105 Engineering Graphics
17ME1101 Matrices and Differential Calculus

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

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

CO1: Identify the importance of graphic primitives
CO2: Analyze the polygon interfacing and clipping algorithms
CO3: Develop parametric and Non-parametric representation of graphic entities
CO4: Apply the Graphic transformations and Windowing techniques

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M				M				M					M
CO2	H				M				H					M
CO3	H	M			H				M					H
CO4	H	M			H				H					H

(L-Low, M-Medium, H-High)

UNIT – I:

Graphic Primitives: Introduction, Display devices, Primitive operations, The Display-File Interpreter, Normalized Device Coordinates, Display-File structures.

Point Plotting Techniques: Coordinate system, Incremental methods

Line Drawing Algorithms: DDA algorithm, Bresenham‘s line drawing algorithm, Mid-point Circle algorithm.

UNIT – II:

Line Drawing Displays: Introduction, Principles of CRT, LCD display systems, Inherent-Memory devices, the storage-Tube display, The Refresh Line-Drawing Display.

Polygons: Introduction to Polygons, Polygon representation, Polygon Interfacing Algorithms, Filling Polygons.

Clipping: Introduction to Clipping, Cohen-Sutherland Algorithm and Clipping of Polygons.

UNIT – III:

Introduction to CAD: Fundamentals of CAD, Design process, Applications of Computer for design, Benefits of CAD, Design Workstation, Graphic terminal.

Wire frame Modeling: 2D wire frame modeling, 3D Wire frame modeling, Wire frame models, Entities and their definitions. Parametric and non-parametric representations of curves.

Surface Modeling: Surface modeling and entities, Algebraic and geometric form, Parametric space of Surface, Blending functions, Parametric representation of surfaces like Ruled surface, Surface of revolution.

UNIT – IV:

Solid Modeling: Solid models, Solid entities, Solid representation, Sweep representation, Constructive Solid Geometry (CSG) and Boundary representation (B-rep).

Geometric Transformations: Co-ordinate System used in Graphics, 2D Transformations (Scaling, Translation, Rotation and reflection), Homogeneous Transformations, Combination Transformations, 3D Transformations (Coordinate Transformations, Rotation about an arbitrary point) and Inverse Transformations.

Windowing: Windowing, Viewport and Viewing Transformation.

Text Books:

[1] CAD/CAM by Mikel P. Groover and Emory W.Zimmers, Prentice Hall of India, Delhi, 3rd Edition - 2007.
[2] Computer Aided Design and Manufacture by C.B.Besant, and C.W.K.Lui, Affiliated East –West Press Pvt Ltd, New Delhi. 3rd Edition -2007.
[3] Computer graphics by Steven Harrington

Reference books:

[1] CAD/CAM by Ibrahim Zied, 5th Re print -2002. TMH.
[2] Procedural elements for Computer Graphics by Rogers.
[3] Principles of Interactive Graphics by Newman and Sproull.

E-resources and other digital material:

[1] http://en.wikipedia.org
[2] http://www.learnerstv.com
[3] http://www.caddprimer.com/
[4] http://www.compinfo-center.com/cad/cad.htm
[5] http://www.srikumar.com/cad/cad.html
[6] http://www.tenlinks.com/CAD/reference/directories.htm

17ME4704/A- COMPUTATIONAL FLUID DYNAMICS

Course Category: ProgrammeElective **Credits**: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: : 3 /0/ 0
Prerequisites: **Continuous Evaluation**: 30
17ME 3303 Basic Thermodynamics **Semester end Evaluation**: 70
17ME 3401 Fluid Mechanics and Hydraulic machines **Total Marks:** 100

Course Outcomes:
Upon successful completion of the course, the student will be able to:
CO1: Analyze the philosophy of CFD and derive governing equations of fluid flow
CO2: Analyze the principles of discretization
CO3: Formulate solution techniques for parabolic and hyperbolic equations
CO4: Apply some of the popular FD techniques in the solution of fluid flow problem

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M	L										M	
CO2	H	M	L		M								M	
CO3	M	H	L		M								M	
CO4	M	H	L		M								M	

(L-Low, M-Medium, H-High)

UNIT- I:
Importance and applications of CFD, Models of flow, governing equations of fluid flow – Navier Stokes and Euler‘s equations: Continuity, Momentum and Energy equations in differential form, Physical boundary conditions.

UNIT – II:
Classification of partial differential equations, Discretization techniques- FDM, FEM, FVM, Finite Difference equations- Taylor series, order of accuracy, forward, backward and central differences for first order and second order differential equations.

UNIT- III:
Difference equations, Explicit and Implicit approaches, Thomas Algorithm (TDMA). Analysis of stability, VN stability criteria for parabolic (1-D unsteady heat equation) and Hyperbolic (1st order wave equation) equations, Courant number.

UNIT- IV:
Simple CFD techniques: Lax-Wendroff technique, MacCormack‘s technique and Iterative and Relaxation techniques. Pressure correction technique, staggered grid, SIMPLE algorithm, Boundary conditions for pressure correction method.

Text Books:

[1] Computational Fluid Dynamics - Basics with Applications - John. D. Anderson, JR. McGraw Hill Education (India) Edition 2012.
[2] Computational Fluid Dynamics - T. J. Chung, Cambridge University Press, 2nd Edition, 2014.

References:

[1] Introduction to computational fluid mechanics - Niyogi, Chakravarty, Laha, Pearson pub. 1st Edition, 2009.
[2] Numerical heat transfer and fluid flow - S.V. Patankar, Hemisphere Pub., 1st Edition.
[3] Computational Fluid flow and Heat transfer - K. Muralidhar and T. Sundararajan-, Narosa Pub. 2nd Edition, 2003.

E-resources and other digital material:

[1] http://ocw.mit.edu/courses/mecharlical-engineering/2-29-numerigal-fluid-mechanics-fall2011/
[2] http:/inptel.ac.in/courses/112105045/ (IIT Kharagpur)
[3] http://nptel.ac.in/courses/112107080/ (IIT Roorkee)
[4] http://nptel.ac.in/courses/112104030/ (IIT Kanpur)
[5] littp://www.nptelvideos.in/2012/11/computational-fluid-d)'namics.html (IIT Madras)
[6] http://www.cfd-onIine.com/

17ME4704/B - OPERATIONS RESEARCH

Course Category: Programme elective
Course Type : Theory
Prerequisites: 17MA1301D Mathematics for Mechanical Engineers

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:
Upon successful Completion of the course, the student will be able to:
CO1: Develop an LPP model and apply different methods for solving.
CO2: Determine optimal allocation of resources.
CO3: Apply Queuing theory model and project scheduling techniques to real life problems.
CO4: Apply the concept of game theory and develop optimal schedule.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	H			H									M
CO2	M	H			H									M
CO3	M	H			H									M
CO4	M	H			H									M

(L-Low, M-Medium, H-High)

UNIT – I:
Introduction: Definition and Scope of Operations Research, Limitations of Operations Research, Model building in Operations Research.
Linear programming: Mathematical formulation of the problem, Graphical method, Simplex method, artificial basis technique, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution.

UNIT – II:
Transportation problem: Basic feasible solution by north-west corner method, Vogel‘s approximation method, assignment by inspection method. Finding optimal solution, degeneracy, unbalanced transportation matrix.
Assignment problem: One-to-one assignment problem, optimal solution, unbalanced assignment matrix

UNIT – III:
Queuing theory: Queuing systems and their characteristics. M/M/1 : FCFS/ μ / μ
Project planning through networks: Arrow (Network) Diagram representation. Rules for constructing an arrow diagram, PERT and CPM, Critical path calculations, earliest start and latest completion times, Determination of critical path, determination of floats, Probability considerations in project, cost considerations in project scheduling, crashing (least cost project scheduling).

UNIT – IV:

Game theory: Optimal solution of two-person zero-sum games, the max-min and min-max principle. Games without saddle points, mixed strategies.Arithmetic and algebraic methods, reduction by dominance and average, method of sub games, graphical method.

Sequencing: Introduction, Job shop Scheduling, Flow shop Scheduling, Solution of Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, Scheduling Criteria's.

Text Books:

[1]S. D Sharma, _Kedarnath, Ramnath& Co., Operations Research, Macmillian publishers Meerut.16th Edition, 2009.

[2] V. K Kapoor*Operations Research,*S.ChandPublications , 7th edition, 2001.

Reference books:

[1] R Pannerselvam, Operations Research, Pentice Hall of India Pvt Ltd-New Delhi 2nd Edition.2006

E-resources and other digital material:

[1] http://en.wikipedia.org
[2] http://coral.ie.lehigh.edu
[3] http://books.google.co.in
[4] http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm
[5] http://www.wolfram.com/solutions/OperationsResearch/

17ME4704/C - MECHANICAL VIBRATIONS

Course Category: Programme Elective **Credits**: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /0/ 0
Prerequisites: **Continuous Evaluation**: 30
17ME1104A Engineering Mechanics **Semester end Evaluation**:70
17ME3402 Machine Dynamics **Total Marks:**100

Course Outcomes:
Upon successful Completion of the course, the student will be able to:
CO1: Analyze the concepts of damping.
CO2: Solve single degree of freedom forced vibration problems.
CO3: Solve two-degrees of freedom systems for natural frequencies.
CO4: Solve multi-degree of freedom systems for natural frequencies.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	L											M
CO2	M	H	L											M
CO3	M	H	L											M
CO4	M	H	L											M

(L-Low, M-Medium, H-High)

UNIT – I:
Free vibrations of un-damped and damped single DOF systems: Overview of un-damped single DOF systems, Different types of damping, Free vibrations with viscous damping, Over-damped system, Critically-damped system, Under-damped system, Logarithmic decrement.
Forced vibrations of single DOF systems: Introduction, Forced vibrations with constant harmonic excitation, steady state vibrations.

UNIT – II:
Applications of Forced vibrations of single DOF systems: Forced vibrations with rotating and reciprocating unbalance, Forced vibrations due to excitation of the support, Energy dissipated by damping, Vibration isolation and transmissibility.
Critical speeds of shafts: Critical speed of a light shaft having a single disc without damping, critical speed of a light shaft having a single disc with damping.

UNIT – III:
Un-damped two-degrees of freedom systems: Natural frequencies of rectilinear and torsional systems, Semi-definite system, generalized coordinates and co-ordinate coupling.
Vibration absorbers: un-damped dynamic vibration absorber, centrifugal pendulum absorber.

UNIT – IV:

Multi-Degree of freedom systems: Free vibrations- equations of motion, Influence coefficients, Natural frequencies and mode shapes (Eigen values and Eigenvectors).

Text Books:

[1] Mechanical Vibrations by G. K. Grover, New Chand & Bros, 8th edition, 2009.
[2] Mechanical Vibrations by Dr.R.K.Singal, S.K.kataria& Son, First edition, 2010-2011.

Reference books:

[1] Mechanical Vibrations by Dilip Kumar Adhwarjee, Laxmi Publications, 1st Edition, 2007
[2] Mechanical Vibrations by V.P.singh, DhanpatRai& Co. (P) Ltd, Delhi, 4th edition, 2015
[3] Mechanical Vibrations by Singiresu S Rao, Prentice Hall, Fifth Edition, 2011

E-resources and other digital material:

[1] http://nptel.ac.in/courses/112103112/1
[2] http://freevideolectures.com/Course/2684/Mechanical-Vibrations.

17ME4705/A - REFRIGERATION & AIR CONDITIONING

Course Category: Programme Elective **Credits**: 3
Course Type : Theory **Lecture/Tutorial/ Practice**: 3 /0/ 0
Prerequisites: 17ME3303 Basic Thermodynamics, **Continuous Evaluation**: 30
17ME3501 Applied Thermodynamics, **Semester end Evaluation**:70
17ME3602 Heat Transfer **Total Marks:**100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Analyze air refrigeration system and systems used in aircrafts.
CO2: Analyze simple VCR cycle and factors affecting the performance of the cycle and understand the operation of various devices of VCR system
CO3: Choose the most appropriate refrigerant for a given cooling application and understand the impact of refrigerants on the environment
CO4: Demonstrate the vapor absorption and other non-conventional refrigeration systems and their application as alternatives to VCR systems.
CO5: Summarize thermodynamics of air –vapor mixtures and analyze A/C process & systems and heat pump circuits to design real world heating & cooling needs.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	H										M	
CO2	M	H	H										M	
CO3						H	H					M	M	
CO4	M		M				M						M	
CO5	H	H	H			M	M						M	

(L-Low, M-Medium, H-High)

UNIT – I:

Introduction to refrigeration: Applications, methods of refrigeration, unit of refrigeration, C.O.P, **Refrigerants**- classification, nomenclature, desirable properties, commonly used refrigerants and alternative refrigerants.

Air refrigeration: Bell Coleman cycle, Open and Dense air systems, Actual refrigeration cycle, advantages of air refrigeration, refrigeration needs of aircrafts, types of aircraft refrigeration systems, problems.

UNIT – II:

Vapor compression refrigeration: simple vapor compression refrigeration cycle, T-S, P-h diagrams, Effect of super heating, subcooling, evaporative and condenser pressures, pressure losses, problems.

VCR System components: Compressors- types, comparison, Condensers - classification, working, Evaporators – Flooded and dry expansion types, Expansion devices –AEV, TEV and capillary tube.

UNIT – III:

Vapor absorption system: COP of absorption system, max COP, working of NH_3 - water system, H_2O -Li Br system, three fluid absorption systems, comparison between VCR and VAR systems.

Steam jet refrigeration system: Principle of working, application, merits and demerits.

Non-conventional refrigeration methods: Principle and operation of thermoelectric refrigeration, Vortex tube and adiabatic demagnetization.

UNIT – IV:

Air conditioning: Psychrometry- Psychrometric properties and processes, Psychrometric chart, Summer, winter and year round A/C systems, human comfort and effective temperature.

Cooling Loads: Sensible and latent heat loads, RSHF, GSHF, ESHF & ADP, air conditioning load calculations, Types of heating, heat pump, different heat pump circuits, application.

Text books:

[1] A course in refrigeration and air conditioning - S. C. Arora, Domkundwar, 2014.
[2] Refrigeration and air conditioning - C. P. Arora. Tata McGraw-Hill, 7th Print, 2006

Reference books:

[1] Principles of Refrigeration - Dossat., 4th Reprint 1997,Pearson Education Ltd.
[2] Refrigeration and air conditioning - Stoecker and Jones 1983, McGraw Hill

Data Books:

[1] Refrigeration and Air conditioning Data book by Domkundwar&Domkundwar ,DhanapatRai& Co.
[2] Refrigerant &Psychrometric Tables &charts., SS Banwait and SC Laroiya, Birla publication pvt ltd.

E-resources and other digital material:

[1] http://www.refrigerationbasics.com/index.htm
[2] http://www.howstuffworks.com/ac.htm
[3] http://www.ashrae.org
[4] http://www.taftan.com/thermodynamics/AIRCOND.HTM
[5] http://www.wisegeek.com/how-does-air-conditioning-work.htm

17ME4705/B - THEORY OF METAL CUTTING

Course Category: Program Elective **Credits:** 3
Course Type: Theory **Lecture/Tutorial/ Practice:** 3 /0/ 0
Prerequisites: 17PH1202C- Physics for Engineers **Continuous Evaluation:** 30
17ME3503–Machine Tools and Metal Cutting **Semester End Evaluation:** 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Explain the ASA, ORS and NRS systems of tool geometry and derive their interrelationships.

CO2: Develop the relations for chip reduction coefficient, shear angle, shear strain, forces, power and specific energy with orthogonal cutting.

CO3: Analyze thermal aspects and tool wear relationships in orthogonal cutting.

CO4: Choose cutting tool material for improving tool life and understand the mechanics of multipoint machining

Contribution of Course outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M		M											L
CO2	M		M											L
CO3	M		M											L
CO4	M		M											L

(L – Low, M - Medium, H – High)

UNIT – I:

Introduction: Classification of Mfg. Processes, History of Machining, Scope and Significance of Machining.

Geometry of Cutting Tools: Geometry of single-point cutting tool: Tool-in hand system, ASA system, Significance of various angles of single point cutting tools, Orthogonal Rake System (ORS), Conversions between ASA and ORS systems – Graphical and Analytical Methods, Normal Rake System (NRS) & relation with ORS.

UNIT – II:

Mechanics of Machining Processes: Orthogonal and Oblique cutting, Mechanics of Chip formation: Types of chips, chip-breakers, Chip reduction coefficient, shear angle, shear strain, Built- Up-Edge and its effect in metal cutting.

Merchant‘s analysis of metal cutting process: Various forces, power and specific energy in cutting, Problems on Tool Geometry and Mechanics of Machining.

Theories of Metal Cutting: Ernst & Merchant, theory, Modified Merchant‘s theory, Lee & Shaffer Theory, Chip-tool Natural Contact Length – Hahn‘s Analysis Stress distribution at Chip-Tool Interface – Zorev‘s Analysis, Machining with controlled contact cutting, Chip breakers.

UNIT – III:

Thermal aspects in Machining: Sources of heat generation, Effects of temperature, Determination of cutting temperature using analytical methods, Determination of cutting temperature using experimental methods, Methods of Controlling Cutting Temperature.

Tool wear, Tool life, Machinabilty and Machining Economics: Wear Mechanisms, Types of tool wear, Tool Life and Machinability, A brief treatment for single pass turning operations, Problems on Economics of Machining.

UNIT – IV:

Cutting Tool Materials: Desirable Properties of tool materials, Characteristics of Cutting Tool Materials, Indexable inserts, Coated tools.

Mechanics of Multipoint Machining processes: Drill Geometry & Mechanics of Drilling Process, Geometry of Milling Cutters and Mechanics of Milling process, Mechanics of Grinding (plunge grinding and surface grinding), Grinding wheel wear.

Oblique Cutting: Mechanics of Oblique Cutting.

Text Books:

[1] M. C. Shaw, Metal cutting-Principles and Practices, Cambridge University press. 2005
[2] Rao PN, Manufacturing Technology–Metal Cutting and Machine Tools, 3/e, TMH, New Delhi, 2013.
[3] Bhattacharya A, Metal Cutting: Theory and Practice, New Central Book Agency, Kolkata, 2007

Reference books:

[1] Winston A. Knight and Geoffrey Boothroyd, Fundamentals of Machining and Machine Tools, 3/e, Taylor & Francis Group, 2005.
[2] Trent, E. M. and P. K. Wright, Metal Cutting, 4th edition, Butterworth-Heinemann, 2000

E-resources and other digital material:

[5] https://openoregon.pressbooks.pub/manufacturingprocesses45/
[6] www.americanmachinist.com/
[7] http://www.machinetools.net.tw/

17ME4705/C - MECHANICAL MEASUREMENTS

Course Category: Program Elective **Credits:** 3
Course Type: Theory **Lecture/Tutorial/ Practice:** 3 /0/ 0
Prerequisites: 17PH1202C- Physics for Engineers **Continuous Evaluation:**30
Semester End Evaluation: 70
Total Marks: 100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Illustrate the terms of the measurements and understand the principle of operation of thread and surface finish measurement.
CO2: Apply the principles of measurement for transducers & strain measurement
CO3: Measure the measurement of Force, Torque & Pressure
CO4: Apply the knowledge of Humidity, Density, Liquid level and Biomedical measurement.

Contribution of Course outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M			M										L
CO2	M			M										L
CO3	M			M										L
CO4	M			M										L

(L – Low, M - Medium, H – High)

UNIT – I:

MEASURING INSTRUMENTS:

Measurement: Definition, methods of measurement, Significance of measurement, Terms applicable to measuring instruments: Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, Drift, Span, Range, Resolution, calibration, Errors in Measurements: Systematic and Random error.

Measuring instruments: Factors in selecting the measuring instruments.

Thread measurements: Bench micrometer, Thread gauge micrometer, Angle measurements, Bevel protractor Surface finish: Measurement of surface finish by Talysurf surface roughness tester,Co-ordinate measuring machine.

UNT – II:

TRANSDUCERS AND STRAIN GAUGES:

Transducers: Concept, Characteristics, Classifications of Transducer, Actuating mechanisms.

Displacement Measurement: Transducers for displacement, displacement measurement, potentiometer, LVDT, Capacitance Types, Digital Transducers (optical encoder), Nozzle Flapper Transducer

Strain Measurements: Theory of Strain gauge, Classification, Berry type mechanical strain gauge, optical strain gauges, mounting of strain gauges, Strain gauge rosettes-two and three elements, Gauge factor, Temperature Compensation.

UNIT – III:

MEASUREMENT OF FORCE, TORQUE, AND PRESSURE

Force measuring devices: Spring Balance, Proving ring, Strain guage type Load cell.

Torque measuring devices: Prony brake, Hydraulic dynamometer.

Pressure measuring devices- - Diaphragm type pressure gauge, Bourdon tube pressure gauge, bellows and piezoelectric pressure sensors. Vacuum measurement: Vacuum gauges Mcloed gauge, Construction, working and applications.

UNIT – IV:

APPLIED MECHANICAL MEASUREMENTS:

Speed measurement: Classification of tachometers, Working principle, construction, working of Revolution counters and Eddy current tachometers.

Flow measurement- Working principle, construction, working of Bernoulli flow meters, Ultrasonic Flow meter, Magnetic flow meter, Rotometers.

Temperature measurement: Principle, construction, working of Resistance thermometers and Optical Pyrometer, Thermocouples.

MISCELLANEOUS MEASUREMENTS

Humidity measurement: Construction, working of hair hygrometer

Density measurement: Measurement of density using hydrometer.

Liquid level measurement: Measurement of liquid level by using sight glass, Float gauge, Biomedical measurement: Construction, working of Sphygmo monometer

Text Books:

[1] Mechanical Measurements & Control Engineering by D. S. Kumar, 6th Edition, 2002, Metropolitan Book company Ltd.

[2] Mechanical Engineering Measurement - Thomas Beckwith, N. Lewis Buck, Roy Marangoni - Narosa Publishing House, Bombay

References:

[1] Mechanical Engineering Measurements - A. K. Sawhney – DhanpatRai& Sons, New Delhi.

[2] Metrology & Measurement by Anand K Bewoor,VinayKulakarni ,Tata McGraw hill New Delhi 2009

E-resources and other digital material:

[1] http://www.nptelvideos.in/2012/12/principles-of-mechanical-measurements.html

[2] http://www.nptelvideos.in/2012/12/mechanical-measurements-and-metrology.html

[3] https://www.youtube.com/watch?v=lc4dsNvm2Ks

17ME3751- DESIGN & METROLOGY LABORATORY

Course Category: ProgrammeCore **Credits**: 1
Course Type : Laboratory **Lecture/Tutorial/ Practice**: 0 /0/ 2
Prerequisites: 17ME3402 Machine Dynamics **Continuous Evaluation**: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

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

CO1: Evaluate the time period of oscillations of simple, compound pendulum, Single and double rotor shaft systems.

CO2: Determine the whirling speed of shafts under different boundary conditions and Understand the gyroscopic effect of moving bodies

CO3: Measure the internal taper angle, external taper angle, tool signature, elements of a given thread by using metrology instruments

CO4: Demonstrate the working and applications of surf tester, comparator, FFT analyzer and gauges

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	M	M	M	M									M
CO3	M	H	M	H	H									M
CO5	M	M		H	M									M
CO8	M			H	M									M

(L-Low, M-Medium, H-High)

Design Laboratory:

1. Vibration measurements: Simple pendulum.
2. Vibration measurements: compound pendulum.
3. Vibration measurements: Single and double rotor shaft system
4. Determine the whirling speed of shafts.
5. Understand the gyroscopic effect of moving bodies using Motorized Gyroscope.
6. User defined design based experiment.

Metrology laboratory:

Experimentation:

1. Measuring external taper angle of a given work piece using sine bar.
2. Measuring external taper angle of a given work piece using roller and slip gauges.
3. Measuring internal taper angle of a given work piece using Vernier depth gauge.
4. Measuring screw thread effective diameter by using three wire methods.
5. Measuring different elements of a thread using profile projector.
6. Measuring angular dimensions of a tool using tool -maker‘s microscope.

Model Demonstrations:

1. Measurements of surface finish using surf tester
2. Vibration measurements by using FFT Analyzer.
3. Use of pneumatic comparator
4. Demonstration of various gauges

Note: Any 6 experiments must be completed from Design Laboratory

E-resources and other digital material:

[1] www.iitg.ernet.in/scifac/qip/public.../r.../chapter_5_gyroscope.pdf
[2] www.nptel.ac.in/courses/112101096/download/lecture-25.pdf
[3] https://en.wikipedia.org/wiki/Critical_speed
[4] https://www.youtube.com/watch?v=HpIEeBtJupY

17ME3752 SIMULATION AND ANALYSIS LABORATORY

Course Category: Programme Core
Course Type : Laboratory
Prerequisites : -----

Credits: 1
Lecture/Tutorial/ Practice: 0 /0/ 2
Continuous Evaluation:30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Simulate simple static structural problems for stress analysis.

CO2: Model axi-symmetric components for stress analysis.

CO3: Analyze thermal problems for thermal stress analysis

CO4: Analyze structure response and its frequency and mode shapes.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	L	M		H								H		
CO2	L	M		H								H		
CO3	L	M		H								H	M	M
CO4	L	M		H								H		

(L-Low, M-Medium, H-High)

Course Content:

Finite Element Analysis Package (ANSYS)

1. Introduction of ANSYS tools, its utilities and fundamentals of FEM
2. Structural analysis of stepped bar, tapered bar and trusses.
3. Stress and deflection analysis in beams (Cantilever, Simply supported, Fixed ends).
4. Stress analysis of flat plates and simple shells.
5. Stress analysis of axi-symmetric components.
6. Thermal stress analysis of cylindrical shells.
7. Coupled analysis of thick cylinders
8. Vibration analysis of spring-mass systems.
9. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
10. Harmonic analysis of simple systems.

17ME5753 - MINI PROJECT

Course Category: Project
Course Type: Practical
Prerequisites:

Credits: 2
Lecture - Tutorial - Practice: 0 - 0- 4
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

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

CO1: Identify the problem, define objectives and scope of the project work
CO2: Carryout Team work
CO3: Prepare and present a comprehensive report of the project work
CO4: Apply the principles of Thermal Engineering to solve problems.
CO5: Solve Engineering problems using the concept of design and manufacturing.

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1									H					
CO2				H										
CO3							H	M						
CO4	M	M			H			M			M		H	
CO5	M	M			H			M			M			H

17ME6754 A – INTERNSHIP

Course Category: Internship
Course Type:
Prerequisites: -

Credits: 2
Lecture/Tutorial/ Practice: 2 /0/ 0
Continuous Evaluation: -
Semester end Evaluation: 100
Total Marks: 100

CO1: Demonstrate the practical knowledge acquired from the work place

CO2: Develop self-learning skills

CO3: Exhibit problem solving skills by analyzing the underlying issues

CO4: Communicate and collaborate effectively and appropriately with different Professionals in the work environment through written and oral means

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

17ME6754B - INDUSTRY OFFERED COURSE

Course Category: Industry offered Course
Course Type: Theory
Prerequisites: -

Credits: 2
Lecture/Tutorial/ Practice: 2 /0/ 0
Continuous Evaluation: -
Semester end Evaluation: 100
Total Marks: 100

- The students can opt for the courses under this category offered by the Industry experts whose minimum academic qualification is Bachelor or Engineering or equivalent.

- The semester end examination for courses under this category is evaluated for 100 marks and it shall be conducted & evaluated by the industry expert who has delivered the lecture or by faculty nominated by the head of the department in consultation with the industry expert. The question paper pattern shall be decided by the industry expert at the beginning of the course and same is to be approved by the Principal.

- The following courses are offered

17ME6754B/1 - NON DESTRUCTIVE TESTING

Course Category: Industry offered Course
Course Type: Theory
Prerequisites: -

Credits:2
Lecture/Tutorial/ Practice: 2 /0/ 0
Continuous Evaluation: -
Semester end Evaluation: 100
Total Marks: 100

Course Outcomes:
Upon successful Completion of the course, the student will be able to:
CO1: Apply Non Destructive Testing Methods.
CO2: Able to apply the surface NDE methods.
CO3: Understand the Eddy Current Testing.
CO4: Apply the knowledge of Ultrasonic testing and Radiography.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M	L											M
CO2	M	H	L											M
CO3	M	H	L											M
CO4	M	H	L											M

(L-Low, M-Medium, H-High)

UNIT – I:

OVERVIEW OF NDT

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterization. Relative merits and limitations, various physical characteristics of materials and their applications in NDT. Visual inspection – Unaided and aided.

UNIT – II:

SURFACE NDE METHODS

Liquid Penetrant Testing – Introduction, Principle, types and properties of liquid penetrants, developers, Testing Procedure, Interpretation of results, advantages and limitations, Applications.

Magnetic Particle Testing- Theory of magnetism, Magnetization methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Applications, advantages and limitations

UNIT – III:

EDDY CURRENT TESTING (ET)

Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

UNIT – IV:

ULTRASONIC TESTING (UT) ANDRADIOGRAPHY (RT)

Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Radiography- Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens.

Text Books:

[1] J.Prasad, C G K Nair, ―Non-Destructive Testing and Evaluation of Materials‖, Tata McGraw Hill Education Private Limited.
[2] Baldev Raj, T.Jayakumar, M.Thavasimuthu ―Practical Non-Destructive Testing‖, Narosa Publishing House, 2009.
[3] Ravi Prakash, ―Non-Destructive Testing Techniques‖, 1st revised edition, New Age International Publishers, 2010

Reference books:

[1] ASM Metals Handbook,‖Non-Destructive Evaluation and Quality Control‖, American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.
[2] Paul E Mix, ―Introduction to Non-destructive testing: a training guide‖, Wiley, 2nd Edition New Jersey, 2005
[3] Charles, J. Hellier,― Handbook of Nondestructive evaluation‖, McGraw Hill, New York 2001.
[4] ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Handbooks.

E-resources and other digital material:

[1] www.ndt-ed.org
[2] www.krautkramer.com.au
[3] https://archive.org/details/nondestructivete000538mbp
[4] http://www.issp.ac.ru/ebooks/books/open/Nondestructive_Testing_Methods_and_New_Applications.pdf

17ME6754B/2 - SMART MATERIALS

Course Category: Industry offered course **Credits**: 2
Course Type : Theory **Lecture/Tutorial/ Practice**: 2/0/ 0
Prerequisites: **Continuous Evaluation**: 00
17PH1202C- Physics for Engineers **Semester end Evaluation:** 100
17ME3403 Engineering Metallurgy **Total Marks:**100

Course Outcomes:
Upon successful Completion of the course, the student will be able to:
CO1: Understand the basic terminology and classification of Composite Materials
CO2: Realize the potential advantages, applications and manufacturing methods of Composite Materials
CO3: Understand the curing and joining methods of Composite Materials
CO4: Realize the advantages, applications and classification of Smart Materials

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M								M				L	L
CO2	M								M				L	L
CO3	M		L						M		L		L	L
CO4	M		L						M		L		L	L

(L-Low, M-Medium, H-High)

UNIT – I:
INTRODUCTION TO COMPOSITE MATERIALS: Introduction to Composite Materials: Introduction, Classification and Characteristics of Composite Materials, Mechanical Behaviour.

UNIT – II:
ADVANTAGES AND APPLICATIONS OF COMPOSITE MATERIALS: Current and potential advantages of Fiber-Reinforced Composite Materials, Applications of Composite materials.

UNIT-III:
SMART MARTIALS: Introduction, classification of smart materials, advantages, disadvantages and applications of smart materials.

UNIT-IV:
SHAPE MEMORY ALLOYS: Introduction-shape memory effect-classification of shape memory alloys and applications of shape memory alloys.

Text Books:

[1] Engineering Materials Technology, W. Bolton, Newnes, 3 edition, 1998.
[2] Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press.

References:

[1] R. M. Jones, Mechanics of Composite Materials, McGraw Hill Company, New York, 1975.
[2] L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold.
[3] B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley- Interscience, New York, 1980
[4] M.V. Gandhi, B.D. Thompson, Smart Materials and Structures,Springer Netherlands, First Edition, 1992.

E-resources and other digital material:

[1] https://www.youtube.com/watch?v=VMH6qbED7pg
[2] https://www.youtube.com/watch?v=yXHlIowQntk

17ME6754/C – GLOBAL PROFESSIONAL CERTIFICATION

Course Category: Industry offered Course
Course Type:
Prerequisites: -

Credits: 2
Lecture/Tutorial/ Practice: 2 /0/ 0
Continuous Evaluation: -
Semester end Evaluation: 100
Total Marks: 100

- The students can complete the global professional certification under this category.

- Students who obtained Global Professional Certification from the globally recognized bodies. There will not be continuous evaluation for the courses under this category. The students shall earn minimum 50% of maximum marks for qualifying under this category of courses.

17ME4801/A - ENERGY CONVERSION SYSTEMS

Course Category: Programme Elective
Course Type : Theory
Prerequisites:
17ME3303 Basic Thermodynamics
17ME3501 Applied Thermodynamics

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

Course Outcomes:

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

CO1: Explain the working principle of conventional energy conversion system
CO2: Analyse the thermal &Nuclear energy systems
CO3: Identify different non-conventional energy resources and their utilization
CO4: Apply direct energy conversion systems for power generation

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1		L											M	
CO2		H											M	
CO3		H											M	
CO4		H											M	

(L-Low, M-Medium, H-High)

UNIT – I:

Hydro electric power plant: Hydrology, rainfall, runoff and their measurement, hydrograph, flow duration curve, mass curve and calculation of storage capacity, site selection of hydro plant, different types of hydro plants.

Diesel and gas turbine power plants: classification, main components of plant, plant layout, application and comparison with other plants.

UNIT – II:

Thermal power plant: general lay out, fuels coal analysis, coal handling, burning of coal-stoker and pulverized systems, ash handling systems, ESP, need for draught in thermal plants, high-pressure boilers,condensers,cooling ponds and towers(wet and dry types), dearation.

Nuclear power plants: Principles of release of nuclear energy; Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors.Elements of the nuclear reactor; moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types-Pressurized water reactor, boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shielding, Radio active waste disposal.

UNIT – III:

Solar energy: solar collectors, solar energy storage, solar ponds , solar energy utilization and applications.

Wind energy: Basic principle, different types of wind mills, wind energy conversion systems, other applications.

Geo-thermal power: Sources, energy conversion systems, potential in India.

Bio-mass energy: Sources, conversion systems

Otec: ocean thermal energy conversion systems, introduction to tidal power.

UNIT – IV:

Direct energy conversion systems:fuel cells- different methods of conversion systems,

MHD-principle and explanation,

Solar cell-different types of cells.

Text books:

[1] Principles of Energy Conversion - A.W.Culp, TMH,1979

[2] Power Plant Engineering - G.R.NAGPAL - khanna publications,15th Edition,1996.

[3] Power Plant Engineering- P.K.Nag – Tata McGraw hill , 3rd Edition.

[4] Non ConventionalEnergyResources - G.D.Rai -khanna publications 4th Edition

Reference books:

[1] Power Plant Technology - M.M. EL Wakil TMH, 1984

E-resources and other digital material:

[1] en.wikipedia.org/wiki/Thermal_power_station

[2] www.world-nuclear.org/info/inf32.html

[3] en.wikipedia.org/wiki/Hydroelectricity

[4] en.wikipedia.org/wiki/Gas_turbine

[5] www.renewable-energy-sources.com/

[6] www.grist.org/article/the-economics-of-power-plant-construction/

17ME4801/B - PRODUCTION PLANNING AND CONTROL

Course Category: Programme Elective
Course Type : Theory
Prerequisites:

Credits: 3
Lecture/Tutorial/ Practice: 3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation:70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Understand the concepts of production and service systems.

CO2: Apply principles and techniques in the design of inventory system

CO3: Identify different strategies employed in Routing and scheduling.

CO4: Measure the effectiveness in improved planning and control methods for production systems.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1											H			H
CO2			M								H			H
CO3											H			H
CO4											H			H

(L-Low, M-Medium, H-High)

UNIT – I:

Introduction: Definition – objectives and functions of production planning and control – elements of production control – types of production – organization of production planning and control department – internal organization of department.

Forecasting – importance of forecasting – types of forecasting, their uses – general principles of forecasting – forecasting techniques – qualitative methods and quantitive methods.

UNIT – II:

Inventory management – functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems.MRP I, MRP II, ERP, LOB (Line of Balance), JIT and KANBAN system.

UNIT- III:

Routing – definition – routing procedure –route sheets – bill of material – factors affecting routing procedure, schedule –definition – difference with loading.

Scheduling policies – techniques, standard scheduling methods. Line balancing, aggregate planning, chase planning.

UNIT - VI:

Dispatching – activities of dispatcher – dispatching procedure

Follow up – definition controlling aspects, expediting – reason for existence of functions – types of follow up, applications of computer in production planning and control.

Text Books:

[1] Elements of Production Planning and Control / Samuel Eilon.
[2] Manufacturing, Planning and Control, PartikJonssonStig-Arne Mattsson, Tata McGraw 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.

17ME4801/C - ADVANCED MATERIALS

Course Category: Programme Elective
Course Type : Theory
Prerequisites:
17PH1202C- Physics for Engineers

Credits: 3
Lecture/Tutorial/ Practice:3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO 1 Understand the basic constituents and types of Composite Materials

CO 2 Realize the manufacturing methods and macro-mechanical analysis of a lamina

CO 3 Understand the importance of Smart Martials and Electroactive polymers.

CO 4 Realize the advantages, applications and classification of Functionally Graded Materials and Shape Memory Alloys.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M								M				L	L
CO2	M								M				L	L
CO3	M		L						M		L		L	L
CO4	M		L						M		L		L	L

(L-Low, M-Medium, H-High)

UNIT – I:

COMPOSITE MATERIALS: Introduction, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon–carbon composites, fiber- reinforced composites and nature-made composites, and applications.

REINFORCEMENTS: Fibres- natural fibres and man-made fibres, Particles reinforcement.
MATRIX PHASE: Polymer, metal, carbon and bio-resins.

UNIT – II:

MANUFACTURING METHODS: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

MACROMECHANICAL ANALYSIS OF A LAMINA: Introduction, generalized hooke‘s law, reduction of hooke‘s law in three dimensions to two dimensions, relationship of compliance and stiffness matrix to engineering elastic constants of an orthotropic lamina, laminate-laminate code.

UNIT - III:

Smart Martials: Introduction, Smart Structures, Smart Structures Components, Piezo Electric Materials- introduction, principle and applications.
Electroactive polymers: Introduction, Types- Dielectric, Ionic. Advantages and applications of Electroactive Polymers.

UNIT - IV:
FUNCTIONALLY GRADED MATERIALS: Types of functionally graded materials- classification - different systems-preparation-properties and applications of functionally graded materials.

SHAPE MEMORY ALLOYS:Introduction-shape memory effect, composition-properties and applications of shape memory alloys.

Text Books:

[1] Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press.
[2] M.V. Gandhi, B.D. Thompson, Smart Materials and Structures, Springer Netherlands, First Edition, 1992.
[3] Functionally grade materials by Modupe Mahamood and Esthe Titilayo Akinlabi, Springer, Cham, 2007

References:

[1] Engineering Materials Technology, W. Bolton, Newnes, 3 edition, 1998.
[2] R. M. Jones, Mechanics of Composite Materials, McGraw Hill Company, New York, 1975.
[3] L. R. Calcote, Analysis of Laminated Composite Structures, Van NostrandRainfold.
[4] B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley- Interscience, New York, 1980

E-resources and other digital material:

[3] https://www.youtube.com/watch?v=VMH6qbED7pg
[2] https://www.youtube.com/watch?v=yXHlIowQntk

17ME2802/A- AUTOMOBILE ENGINEERING

Course Category: Open Elective **Credits**: 3
Course Type : Theory(Self Learning) **Lecture/Tutorial/ Practice**:3 /0/ 0
Prerequisites: **Continuous Evaluation**: 30
17ME4603/A I.C. Engines& Gas Turbines **Semester end Evaluation:** 70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO1: Identify the different engine components& maintenance procedures.
CO2: Illustrate different automobile cooling, lubrication and electrical systems.
CO3: Inspect the working of automobile transmission system components.
CO4: Identify different ways of automobile vehicle suspension and control systems.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M					M							L	
CO2	M					M								
CO3	M					M								
CO4	M					M								

(L – Low,M – Medium,H- High)

UNIT – I:

Introduction: Classification of vehicles, applications, transmission arrangements.
Engine Components: Engine construction, combustion chambers for petrol and diesel engines, Pistons, DTSI, valve arrangements and operating Mechanisms, firing order, crankshaft, flywheel.
Engine Servicing and Maintenance: Engine trouble-shooting, engine testing procedures and instruments used, engine tests, reconditioning of engine components – valve seat boring, re-boring, crankshaft grinding

UNIT – II:

Cooling systems for I.C. Engines: Need for cooling system, air cooling and water cooling - thermo-syphon and forced circulation, radiator, thermostat, antifreeze solutions.
Lubricating systems for I.C. Engines: Petroil, splash, pressure & dry sump lubrication systems, oil filters, crankcase ventilation.
Electrical system for I.C. Engines: Ignition systems – battery-, magneto- & electronic Ignition, spark plugs, alternator, cutout, current and voltage regulators, Starting motors - Bendix drive mechanism, lighting, instruments and accessories.

UNIT – III:

Transmission system: Introduction to chassis & transmission, Clutches – single-plate, multi-plate, diaphragm and centrifugal clutches, clutch actuating mechanisms.
Gear boxes and others: Gear Box types - four speed and five speed sliding mesh, constant mesh & synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential.

UNIT – IV:

Suspension systems: Need for suspension systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment
Vehicle control: Steering mechanisms and power steering, types of brakes and brake actuation mechanisms (air and hydraulic), Disc brakes, anti-lock braking system, Air bags, types oftyres.

Text books:

[1] Automobile Engineering – Vol. I & II - Kirpal Singh, Standard Publishers.
[2] Automobile Engineering - R.B. Gupta, SatyaPrakashan.

Reference books:

[1] Automobile Engineering - G.B.S. Narang, Khanna Publishers.
[2] Automotive Mechanics - Joseph Heitner, Van NastrandRehinhold.
[3] Automotive Mechanics – William H. Crouse, D.L. Anglin, Tata McGraw hill.

E-resources and other digital material

[1] www.gec.ac.in/~bsm/automobile/automobile.html
[2] http://auto.howstuffworks.com/engine2.htm
[3] www.carbibles.com/steering_bible.html
[4] www.educypedia.be/education/carjava.htm

17ME2802/B - SOLAR ENGERY UTILIZATION

Course Category: Open Elective
Course Type : Theory (Self Learning)
Prerequisites:
17ME3303Basic Thermodynamics
17ME3501 Applied Thermodynamics

Credits: 3
Lecture/Tutorial/ Practice:3 /0/ 0
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks:100

Course Outcomes:

Upon successful Completion of the course, the student will be able to:

CO 1: Analyze the solar radiation data and its measurement

CO 2: Describe the principles of solar energy collection and devices

CO 3: Distinguish types of Thermal energy storage systems and their applications

CO 4: Explain power generation using PV principles and design of PV systems

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M													
CO2	M		M											
CO3	M							M		M			L	
CO4	M		M					M		M			M	

(L – Low,M – Medium,H- High)

UNIT – I:

Introduction: Applications of Solar Energy, Solar energy utilization in India Solar Radiation: Solar constant, Solar time, Solar angle.

Radiation measurement and devices, Solar radiation data, estimation of average solar radiation on tilted and horizontal surfaces

UNIT – II:

Flat Plate Collector: Description, performance analysis of FPC, Collector efficiency, overall loss coefficient, heat removalfactor. Effect of absorber coatings, dust, shading on the performance of collector, selection of materials for FPC.

Focusing Collectors: Types of concentrating collectors, Orientation and tracking systems, materials for concentrating collectors.

UNIT – III:

Solar Energy Storage: Types, Sensible and Latent heat storage, Electrical, chemical and hydro storage of solar energy. Solar Pond- principle, description, extraction of thermal energy, types and application of solar ponds.

Other Applications: Solar water heating, natural and forced circulation heaters, series and parallel array, solar cooling systems, Solar thermal power generation, solar furnace.

UNIT – IV:

Solar Photo Voltaic: Solar cell principle, PV cell, efficiency, cell materials, Solar PV Systems for power generation- stand alone, grid type and hybrid, Solar cell modules, design of PV system, Applications of SPS, advantages and disadvantages of solar PV system.

Text Books:

[1] Solar energy utilization - G.D. Rai, Khanna Publishers, 4th ed.,2009.
[2] Solar energy - Sukhatme S.P., TMH., 3rded.,2008
[3] Solar engineering of thermal processes - Duffie J.A. and Beckman W.A.,4th ed., 2001.

Reference Books:

[1] Non-conventional Energy resources - S.K. Dubey, S.K. Bhargava,Dhanpatrai publications, 1stEdition,2009
[2] Principles of solar engineering - D.Y. Goswami, F. Kreith andJ.F.
[3] Kerider, Taylor& Francis publishers,USA, 2nd edition,2008
[4] Fundamentals of solar energy conversion - Edward E.Anderson, 1st Ed

E-resources and other digital material

[1] science.howstuffworks.com/...vs.../what-are-some-practical-uses-for-solar energy.htm
[2] solarpowernotes.com/solar-energy-applications.html
[3] www.seci.gov.in/
[4] www.makeinindia.com/sector/renewable-energy
[5] www.renewableenergyworld.com/solar-energy/tech.html
[6] https://www.nrel.gov/workingwithus/re-solar.html

17ME5851 - MAJOR PROJECT

Course Category: Project
Credits: 9
Course Type: Practical
Lecture - Tutorial - Practice: 0 - 5 - 8
Prerequisites:
Continuous Evaluation: 30
Semester end Evaluation: 70
Total Marks: 100

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

CO1: Identify the problem, define objectives and scope of the project work.

CO2: Carryout Team work.

CO3: Prepare and present a comprehensive report of the project work.

CO4: Apply the principles of Thermal Engineering to solve problems.

CO5: Solve Engineering problems using the concept of design and manufacturing.

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1									H					
CO2				H										
CO3							H	M						
CO4	M	M			H			M			M		H	
CO5	M	M			H			M			M			H