Gayatri Vidya Parishad College for Degree and PG Courses(A)

R20

Department of Mechanical Engineering

Accredited by NBA and NAAC

ANNEXURE-I

SEMESTER-1

Sl. No.	Code Number	Category	Course	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	2009101	Basic Science Course	Mathematics -I	3	0	0	3	3
2	2009104	Basic Science Course	Physics	3	0	0	3	3
3	2009106	Engineering Science Course	Engineering Graphics	2	0	4	6	3
4	2009107	Engineering Science Course	Engineering Mechanics	3	0	0	3	3
5	2009108	Engineering Science Course	Electrical and Electronics Engineering	3	0	0	3	3
6	2009110P	Engineering Science Course	Workshop	0	0	3	3	1.5
7	2009104P	Basic Science Course	Physics Lab	0	0	3	3	1.5
8	2009108P	Engineering Science Course	Electrical and Electronics Engineering Lab	0	0	3	3	1.5
9	2095109	Non-Audit	Professional Development	0	0	3	3	0
			Total	**14**	**0**	**16**	**30**	**19.5**

SEMESTER-2

Sl.No.	Code Number	Category	Course	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	2009201	Basic Science Course	Mathematics -II	3	0	0	3	3
2	2009203	Basic Science Course	Chemistry	3	0	0	3	3
3	2009209	Humanities and Social Sciences Course	English	3	0	0	3	3
4	2009205	Engineering Science Course	Computer Programming using C & Numerical Methods	3	0	0	3	3
5	2095201	Professional Core Course	Mechanics of Solids-I	3	0	0	3	3
6	209209P	Humanities and Social Sciences Course	English Language Lab	0	0	3	3	1.5
7	209203P	Basic Science Course	Chemistry Lab	0	0	3	3	1.5
8	209205P	Engineering Science Course	CPNM Lab	0	0	3	3	1.5
			Total	**15**	**0**	**09**	**24**	**19.5**

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Semester III (Second year]

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Basic Science Course	2095301	Mathematics-III	3	0	0	3	3
2	Professional Core Course	2095302	Mechanics of Solids-2	3	0	0	3	3
3	Mandatory course	2095303	Professional Ethics and Universal Human Values	2	0	0	2	0
4	Professional Core Course	2095304	Basic Thermodynamics	3	0	0	3	3
5	Professional Core Course	2095305	Manufacturing Processes	3	0	0	3	3
6	Professional Core Course	2095304P	Fuels and Mechanics lab-1	0	0	3	3	1.5
7	Professional Core Course	2095302P	Mechanics of Solids Lab	0	0	3	3	1.5
8	Skill Oriented course	2095306S	Industrial Safety Management	0	0	3	3	2
9	Professional Core Course	2095307	Mechanical Engineering Drawing (MD+PD)	1	0	2	3	1.5
10	Mandatory course	2095308	NCC/NSS	0	0	2	2	0
			Total	**15**	**0**	**13**	**28**	**18.5**

Semester IV (Second year)

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
2	Professional Core course	2095401	Applied Thermodynamics-I	3	0	0	3	3
3	Professional Core course	2095402	Theory of Machines - 1	3	0	0	3	3
4	Professional Core course	2095403	Metal cutting & Machine tools	3	0	0	3	3
5	Professional Core Course	2095404	Fluid Mechanics and Hydraulic Machines	3	0	0	3	3
6	Engineering Science Course	2095405	Metallurgy and Material science	2	0	0	2	2
7	Humanities and Social Sciences Course	2095406	Environmental Science	3	0	0	3	0
8	Professional Core Course	2095404P	Manufacturing Technology Lab-I	0	0	3	3	1.5
9	Professional Core Course	2095405P	FMM Lab	0	0	3	3	1.5
10	Skill Oriented course	2095408S	Computer Aided Drafting	0	0	3	3	2
			Total	**20**	**0**	**9**	**29**	**19**
11	Professional Core Course	2095409	**Minor course-I**	**3**	**1**	**0**	**4**	**4**
12	Professional Core Course	2095410	**Honors Course-I**	**3**	**1**	**0**	**4**	**4**

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Semester V (Third year]

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Core course	2095501	Theory of Machines – 2	3	0	0	3	3
2	Professional Core Course	2095502	Applied Thermodynamics- II	3	0	0	3	3
3	Engineering Science Course	2095503	Metrology	3	0	0	3	3
4	Professional Elective Course	2095504	Elective-I	3	0	0	3	3
5	Professional Elective Course	2095505	Elective-II	3	0	0	3	3
6	Humanities and Social Sciences Course	2095406	Managerial Economics	3	0	0	3	3
7	Professional Core Course	2095503P	Metrology and Mechatronics Lab	0	0	3	3	1.5
8	Professional Core Course	2095505P	Manufacturing Technology Lab-II	0	0	3	3	1.5
9	Skill Oriented course	2095407S	SOC-3 (Computer Aided Manufacturing)	0	0	3	3	2
10	Mandatory Course	2095408	Community Service	0	0	3	3	1.5
			Total	**18**	**0**	**12**	**30**	**24.5**
9	Professional Core Course	2095409	**Minor Course-II**	**3**	**1**	**0**	**4**	**4**
10	Professional Core Course	2095410	**Honors Course-II**	**3**	**1**	**0**	**4**	**4**

Elective-I:

1995505A Mechatronics
1995505B Work Study
1995505C Rapid Prototyping
1995505D Power Plant Engineering

Elective-II:

1995506A Un Conventional Machining Process
1995506B Total Quality Management
1995506C Industrial Tribology
1995506D Hydraulic Machinery and Systems

Semester VI (Third year]

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Core Course	2095601	CAD-CAM	3	0	0	3	3
2	Professional Core Course	2095602	Heat and Mass Transfer	3	0	0	3	3
3	Professional Core Course	2095603	Production Planning and Control	3	0	0	3	3
4	Professional Core Course	2095604	Design of Machine Elements	3	0	0	3	3
5	Professional Elective Course	2095605	Elective - III	3	0	0	3	3
6	Open Elective Course	2095606O	OEC-1	3	0	0	3	2
7	Skill Oriented Course	2095607S	SOC-4 (Matlab)	0	0	3	3	2
8	Professional Core Course	2095601P	Engines and Mechanisms Lab- II	0	0	3	3	1.5
9	Professional Core Course	2095602P	Heat and Mass Transfer Lab	0	0	3	3	1.5
			Total	**18**	**0**	**9**	**27**	**22**
10	Professional Core Course	2095608	**Minor Course-III**	**3**	**1**	**0**	**4**	**4**
11	Professional Core Course	2095609	**Honors Course-III**	**3**	**1**	**0**	**4**	**4**

Elective-III: 1995605A Project Management 1995605C Tool Design
1995605B Automobile Engineering 1995605D Finite Element Analysis

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Semester VII (Fourth year]

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Core Course	2095701	Industrial management& Entrepreneurship	3	0	0	3	3
2	Professional Core Course	2095702	Machine Design	3	0	0	3	3
3	Professional Core Course	2095703	Operation Research	3	0	0	3	3
4	Professional Elective Course	2095704	Elective IV	3	0	0	3	3
6	Open Elective Course	2095705	OEC-2	3	0	0	3	2
7	Project	2095706	Mini-Project/Summer Internship	0	0	6	6	3
8	Professional Core Course	2095702P	CAD/CAM Lab	0	0	3	3	1.5
9	Professional Core Course	2095701P	Industrial Engineering Lab	0	0	3	3	1.5
10	Skill Oriented course	2095707S	SOC-5 (CNC Machining)	0	0	3	3	2
			Total	**15**	**0**	**15**	**30**	**22**
11	Professional Core Course	2095708	**Minor Course-IV**	**3**	**1**	**0**	**4**	**4**
12	Professional Core Course	2095709	**Honors Course-IV**	**3**	**1**	**0**	**4**	**4**

Elective -IV:

1995703A Product Design and Development
1995703B Supply Chain Management
1995703C Mechanical Material Handling
1995703D Refrigeration and Air- conditioning

Semester VIII (Fourth year]

Sl. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Project	2095801	Project	0	0	12	12	15
			Total	**0**	**0**	**12**	**12**	**15**

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR I SEMESTER	Regulation	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095301	MATHEMATICS-III	3	0	0	30	70	3

COURSE OBJECTIVES

The main objective of Engineering Mathematics is to make the students familiar with mathematical thinking and realization of the background of their problems.

Multiple Integral is a natural extension of a definite integral to a function of more than one real variable.
The students should be able to evaluate Double and Triple Integrals, volumes of solids and area of curved surfaces.
They should know the concepts of analyticity, Complex integration, and complex power series classification of singularities.
The student should know the applications of the calculus of residues in the evaluation of real definite integrals.

COURSE OUTCOMES: At the end of the course, student will be able to

CO 1 Calculate the double and triple integral of a function of two or three variables.

CO 2 Apply the knowledge of multiple integral, to find areas, volumes and moment of inertia.

CO 3 Have deal with some elementary complex functions.

CO 4 Solve the complex integration of a function and find the singularities of a function

CO 5 Acquire the skill of contour integration to evaluate complicated real definite integrals via residue calculus.

Unit-I

Multiple Integral –I

Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates. Triple Integrals - Change of Variables.

Unit-II

Multiple Integral -II

Area enclosed by plane curves - Volumes of solids - Calculation of mass - Center of gravity - Moment of inertia Beta Function - Gamma Function - Relation between Beta and Gamma Functions.

Unit-III

Complex Analysis -I

Introduction - Limit and continuity of f(z)- Derivative of f(z), Cauchy-Reimann Equations, Analytic Functions, Harmonic functions, Orthogonal systems. Introduction to Conformal transformation, Bilinear transformation w (az +b) / (cz d)

Unit-IV

Complex Analysis -II

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula and their applications. Complex terms -Taylor's and Laurent's series (without proofs), Zero's and Singularities of analytic functions.

UNIT V

Complex Analysis -II

Residues and Calculations of residues, Cauchy's Residue Theorem, Evaluation of real definite integrals: Integration around unit circle, semi-circle.

TEXT BOOK

Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, Khanna Publishers, 43rd Edition.

REFERENCE BOOKS

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, Inc.
2. A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal; Lakshmi Publications.
3. Advanced Engineering Mathematics by H.K. Dass. S. Chand Company.
4. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw Hill Company.
5. Advanced Mathematics for Engineers″, by Chandrika Prasad, Pothishala Pvt. Ltd., Allahabad.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR I SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095302	MECHANICS OF SOLIDS-II	3	1	0	30	70	3

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

CO1	The student is capable of evaluating an already existing fixed and continuous beam with uniform Moment of inertia as well as Non uniform Moment of inertia which is under different loading conditions and with different support conditions and can even able to design a fixed and continuous engineering beam for any loading conditions.
CO2	The student is capable of evaluating any engineering column or strut under different end conditions and under different specified variable loading conditions as mentioned under objectives
CO3	The student is capable of evaluating curved beams of different cross sections and can able to evaluate the stresses across the cross-sections of the curved beam.
CO4	The student is capable of calculating the radial stress and circumferential stress for rotating circular disc(both hollow and solid) of uniform thickness.
CO5	The student is capable of calculating the radial and circumferential stress for both thick and compound cylinders under different pressurized conditions.

Note: L – Lecture periods; T- Tutorial periods; P- Practical periods

UNIT-I

FIXED BEAMS AND CONTINUOUS BEAMS: Fixing moments for a fixed beam of uniform and variable sections, Effect of sinking support, slope and deflection.

Analysis of continuous beam, Reactions at the supports, Effect of sinking of supports.

UNIT-II

COLUMNS AND STRUTS: Columns with one end free and the other fixed, both ends fixed, One end fixed and other hinged, Limitation of Euler's formula, Column with initial curvature, Column carrying eccentric load, Laterally loaded columns with Central point load and Uniformly distributed load, Empirical formulae.

UNIT-III

BENDING OF CURVED BARS: Stresses in bars of circular, rectangular and trapezoidal sections.

UNIT-IV

STRESSES DUE TO ROTATION: Wheel rim, disc of uniform thickness, disc of uniform strength.

UNIT-V

THICK CYLINDERS: Subjected to internal and external pressure and compound cylinders.

Text Books:

1. Analysis of Structures, Vol. 1, 1993 edition, by Vazirani and Ratwani.
2. Chapter VI from Advanced Topics in Strength of Materials, by Prof. L.B.Shah and Dr.R.T.Shah.

References:

1. Strength of Materials, by Timoshenko.

GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND P.G.COURSES (A)

ENGINEERING AND TECHNOLOGY PROGRAM

II/IV B. Tech. DEGREE EXAMINATION

II/IV B.Tech. :: CSE/ECE/CE/ME

MANDATORY COURSE

Professional Ethics and Universal Human Values

(Effective from 2020-2021 Admitted Batches)

(Common for all Branches)

Course Objectives:

The objective of the course is:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- This course will illuminate the students in the concepts of laws and its applicability to engineers
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and professional lives
- To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional lives
- The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

CO-1: Self-explore by using different techniques to live in harmony at various levels

CO-2:Analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life

CO-3: Students are expected to become more aware of themselves and their surroundings (family, society, nature)

CO-4: They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO-5: They would also become sensitive to their commitment towards what they have understood human values, human relationship and human society

UNIT-I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education.

- Need, Basic Guidelines, Content and Process for Value Education.
- Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation - as the process for self-exploration.
- Continuous Happiness and Prosperity - A look at basic Human Aspirations.

- Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as: a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility(sukh and suvidha)
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer),
- Understanding the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Program to ensure Sanyam and Swasthya,

UNIT-III:Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship

- Understanding Harmony in the family – the basic unit of human interaction
- Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
- Understanding the meaning of *Vishwas*; Difference between intention and competence
- Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

UNIT-IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence.

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all – pervasive space
- Holistic perception of harmony at all levels of existence

UNIT-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order,
- Competence in professional ethics:

a.Ability to utilize the professional competence for augmenting universal human order

b.Ability to identify the scope and characteristics of people friendly and eco-friendly production systems

c.Ability to identify and develop appropriate technologies and management patterns for above Production systems

- Case studies of typical holistic technologies, management models and production systems,
- Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

3. R. Subramanian, "Professional Ethics", Oxford University Press.

4. S.B. Srivasthva, "Professional Ethics & Human Values", SciTech Publications (India) Pvt. Ltd. New Delhi.

5. D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.

6. Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.

2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiments with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful –Cecile Andrews, J C Kumarappa "Economy of Permanence", Pandit Sunderlal "Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India

4. G K Kapoor, "Business Law" and Sen & Mitra, "Business & Commercial Laws" and Calvin Frank Allen, "Business law for Engineers"

5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). *Introduction to Psychology*. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

6. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). *Professional Ethics & Human Values*. Prentice Hall: New Delhi
7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.
8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.
9. Caroline Whitbec, " Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester	II B.Tech - I SEMESTER	Regulation:			R – 20		
Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095304	BASIC THERMODYNAMICS	3	0	0	30	70	3

Course Objectives:	
COB 1	To give a clear understanding of basic concepts of thermodynamics, thermodynamic system and fundamental concepts relevant to perfect gases and real gases.
CO B2	To describe various non flow and flow engineering system with the application of first law and to understand the second law of thermodynamics
COB 3	To explain the different thermodynamic relationships and carry out the performance of various air- standard cycles.

Course Outcomes: At the end of the course, the student will be able to :	
CO 1	Strengthen knowledge on basic concepts of thermodynamics and to identify the approach to analyze thermodynamic system, interaction with surroundings in terms of energy and recapitulate the fundamental concepts relevant to perfect gases and real gases.
CO 2	Analyze various non-flow and steady flow engineering systems with the application of first law of thermodynamics.
CO 3	Identify the possibilities to improve the performance of heat engine, refrigerator and heat pump in conformity with second law of thermodynamics and to gain insight knowledge on reversibility, irreversibility and Carnot cycle.
CO 4	Analyze the entropy of different thermodynamic systems and to study various thermodynamics potentials and different relationships among them.
CO 5	Carryout thermodynamic analysis and computation of the performance of air-standard cycles such as Otto cycle, Diesel cycle and Dual cycle along with other basic thermodynamic reversible cycles namely Stirling cycle, Erricson cycle, Atkinson cycle and Brayton cycle.
Note: L – Lecture periods; T- Tutorial periods; P- Practical periods	

SYLLABUS

UNIT- I:

Fundamental concepts of Thermodynamics: Introduction to concepts; Thermodynamic systems; Microscopic and Macroscopic approaches- Homogeneous and heterogeneous systems; Concept of continuum; Pure substance; Thermodynamic equilibrium; State; Property; Path; Process; Reversible and irreversible cycles; Work; Heat; Point function; Path function; Heat transfer, Zeroth law of thermodynamics, Concept of equality of temperatures- Perfect gas laws- Specific heat at constant pressure and constant volume and their relation-Real gases- Vanderwall's equation of state.

UNIT- II:

First law of thermodynamics: Joule's experiments - First law of thermodynamics for closed system undergoing a cycle and a change of state - First law of thermodynamics for flow systems- Application of First law of thermodynamics to various non-flow processes and steady flow systems- throttling and free expansion process; Perpetual motion machine of first kind (PMM-I); Limitations of first law of thermodynamics.

UNIT- III:

Second law of thermodynamics: Thermal energy reservoirs - heat source and heat sink; Cyclic heat engine- Refrigerator and heat pump - Kelvin Plank and Clasius statements of second law of thermodynamics and their equivalence; Perpetual motion machine of second kind (PMM-II); - Reversibility and irreversibility- Cause of irreversibility - types of irreversibility; Carnot cycle- Carnot efficiency; Carnot's theorem - Corollary of Carnot's theorem ;

UNIT- IV:

Entropy, Availability and irreversibility: Clausius theorem - Concept of entropy; Temperature - entropy plot; Clausius inequality; Principles of increase of entropy ; Entropy change for an ideal gas undergoing different thermodynamic processes ; Available energy- Availability – Availability in a steady flow process – Availability in a non-flow process –Irreversibility; Helmholtz function and Gibbs function-Maxwell's equations- Tds relations.

UNIT-V:

Air standard cycles: Air standard cycle; Assumptions in air-standard cycles; Important terms used in air standard cycles - bore - stroke-dead centres - clearance volume-swept volume - clearance ratio- compression ratio- air standard efficiency-relative efficiency-mean effective pressure ; Thermodynamic analysis of Otto cycle, Diesel cycle, Dual cycle. Comparison of Otto, Diesel and Dual cycles; Thermodynamic analysis of Brayton cycle, Atkinson cycle, Stirling cycle and Erickson cycle.

Text Book:

1. Engineering Thermodynamics, by P.K. Nag, Tata McGraw-Hill Publications Company, 5th Revised Edition

References:

1. Thermal Engineering by R.K. Rajput, Laxmi Publications, 10th Edition.
2. Thermodynamics & Heat Engines Vol-I by R. Yadav, Central Book House, 7th Revised Edition
3. Thermodynamics An Engineering Approach by Yunus A Cengel,Michael A.Boles, Tata McGraw-Hill Publications Company, 9th Edition
4. Fundamentals of Thermodynamics by Sonntag, Borgnakke,Van Waylen, John Wiley & Sons, 6th Edition.

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Program: ENGINEERING AND TECHNOLOGY PROGRAM

Year and Semester:	II YEAR-I SEMSTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095305	MANUFACTURING PROCESSES	3	0	0	30	70	3

COURSE OBJECTIVES:

1. To provide an understanding and appreciation of the different manufacturing (Casting, Forming) and fabrication (Welding, Soldering and Brazing) methods to the students.
2. To expose the students to various applications of the manufacturing process in real life articles/ products.
3. To expose the students to advanced techniques for a day to day application in manufacturing industry.

COURSE OUTCOMES: After completion of this course, the students will be able to

1. Discuss and analyze the process of casting and terminology associated with sand casting.
2. Classify several special casting processes and identify various casting defects.
3. Illustrate and select the type of forming technique to be used for manufacturing the components.
4. Identify different bulk deformation techniques and sheet metal operations with their applications.
5. Assess the weld methodology to be followed for attaining better weld quality using various welding techniques.

UNIT – I

Casting: Job, Batch and Mass production; Primary and Secondary Manufacturing Processes; Terminology; Pattern Types, Materials and Allowances; Sand composition, types, properties, preparation and Testing of moulding sands; Moulding tools and equipment; Sand moulds preparation (Manual, Moulding machines and CO2 Moulding), types of sand moulds; Core- types and making, Core Prints, chaplets, chills;

UNIT II

Elements of gating system- Sprue; Runner, gates and risers' types; Gating system design, Melting and pouring of the metal, types of furnaces (Cupola, Induction), Types of cast irons, fettling.

Special Casting Processes:

Expendable mould casting processes – Shell mould casting, investment casting.

Permanent mould casting processes- High and Low Pressure die casting, Centrifugal casting, Continuous casting, squeeze casting, Casting Defects.

UNIT- III

Bulk Deformation Processes

Rolling: Cold and hot working; Rolling- Types of Rolling mills, Roll size, Roll Pressure distribution, Rolling Defects;

Forging: Forging processes; Forging techniques; Forging presses; Forging pressure distribution and forging force; Automation of forging;

Extrusion- Forward, Backward, Impact and Hydrostatic Extrusion, Wire, Bar and Tube Drawing; Swaging

UNIT –IV

Sheet Metal Forming:

Shear forming – Blanking, Piercing, Trimming, Shaving, Notching, Nibbling, Lancing.
Tensile forming - Stretch forming; Compressive forming – Coining, Sizing, ironing;
Combined Tensile and Compressive forming - Drawing, Metal spinning, Bending, Forming, Embossing; Sheet metal die types- Progressive, Compound and combination dies: Punch types – Plain, pedestal punches and punch mounted in punch plates.

UNIT – V

Welding: Welding metallurgy; Principles and processes of arc welding (SMAW, GTAW, GMAW, FCAW, PAW, SAW); Welding equipment – classification of welding power source and characteristics; Weld positioners and fixtures; Oxyacetylene welding; Flame cutting; Brazing and soldering; Principle of resistance welding; Types of resistance welds; Seam welding; Projection welding; Resistance butt welding; Solid state welding; Weld defects, inspection and testing.Projection welding; Resistance butt welding; Solid state welding; Weld defects, inspection and testing.

Text Books:

1. Manufacturing Technology-Foundry, Forming and Welding by P.N. Rao, 5th Edition, Vol-1, Tata McGraw Hill Publishing Company.
2. Manufacturing Science by Amitabha Ghosh and Ashok Kumar Mallik, 2nd Edition, East-West Press Pvt Ltd.
3. Welding Processes and Technology by R. S. Parmar, 3rd Edition, Khanna Publishers.

REFERENCE BOOKS:

1. Manufacturing Engineering & Technology by Kalpak Jian, 7th Edition Addition Wesley, Pearson.
2. Materials and Processes in Manufacturing by De Margo, Black and Kohser, 11th edition, Wiley, Prentice Hall of India.
3. Principles of Metal Casting by Richard W. Heine, Carl R. Loper, Philip C. Rosenthal, 2nd Edition,Tata Mc-Graw Hill India.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR I SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095307	MECHANICAL ENGINEERING DRAWING	2	5	0	50	50	1.5

COURSE OBJECTIVES:

1. To provide an understanding and draw the assembly drawing of various engine components and machine tool components to the students.
2. To expose the students to draw and place feature control symbols and datum references on a drawing various fastenings (Screw, Riveted, welded etc.), Bearings, couplings, key etc.
3. Students will be able to understand and demonstrate the basics of Geometric Dimensioning and Tolerancing (GD&T) Preparation of process sheets, stock strip layouts in sheet metal work. and machine elements and their assembly drawings.
4. Students will be able to understand and prepare the process sheets, stock strip layouts.

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

CO1	Understand and draw the orthographic views and sectional views of machine tool parts.
CO2	Understand and draw various thread profiles, Screwed fasteners, joints, couplings and bearings.
CO3	Draw Assembly drawings of various engine components and other machine parts.
CO4	Draw the production drawings indicating limits, geometrical tolerances, surface roughness and prepare process and also sheets stock strip layouts.

Note: L – Lecture periods; T- Tutorial periods; P- Practical periods

UNIT-I

Introduction to machine drawing, Orthogonal Projection: B.I.S. code, symbols for methods of projection. Sectional views of machine parts: Half sectional View and Full Sectional View,

UNIT-II

Screw Threads and Fastenings: Screw Threads: Forms of screw threads, Metric Thread, With worth Thread, B.S. F., Sellers Thread, B.A., Square Threads. Screw Fasteners: Types of nuts and bolts, Washers, Screws, Foundation bolts using standard Empirical formulae

UNIT-III

Keys and Joints: Keys Joints: Taper Keys and
Parallel keys, Riveted joints: Forms of rivet-heads,
Lap Joint and Butt Joint.
Cotter-joints: Socket and spigot joint, Sleeve joint, Strap Joint, Pin-joints,
Pipe Joints: Cast-iron flanged joint, Socket and spigot joint, Hydraulic joint, Union Joints.

UNIT-IV

Couplings and Bearings: Couplings: Box and split muff couplings, Flanged couplings, Flexible couplings, Universal and Oldham couplings.
shat bearings: Solid Bearings, Bushed bearings, Plumber block, Foot-step bearing.

UNIT-V

Assembly Drawing:
a) Engine parts: Stuffing box, Cross head, Eccentric, Petrol Engine connecting rod
b) Other machine parts: Screws jack, Tailstock

UNIT-VI

Production drawing: Conventional Prepresentation, Machine shop drawing, Pattern-shop drawing, Sheet metal drawing, Limits, Fits, Geometric Tolerances, Surface roughness, Preparation of process sheets, stock strip layouts in sheet metal work.

Text Book:

1. N D Bhatt, "Machine Drawing", 44th Edition, Charotar publishers,2009.
2. K.L.Narayana, P.Kannaiah & K. Venkata Reddy, "MachineDrawing", 3rd Edition, New age international publishers, 2007.

Reference Books:

1. Textbook of Machine Drawing by K.C. John, PHI Learning
2. Machine Drawing by K.L Narayana, P. Kannaiah and K. Venkata Reddy, New age international Publishers
3. A Text Book of Machine Drawing by Dr. R.K. Dhawan, S.Chand PublicationsProduction Engineering by P.C. Sharma, S. Chand and Company.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR I SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095306S	INDUSTRIAL SAFETY MANAGEMENT	1	0	2	50	50	2

UNIT- I

Henrichs Axioms Of Industrial Safety, Concepts Of Safety, Organization For Safety, Organization, Definition, Need & Principles Organizing For Health, and ,Environmental, Activities, Organization Structure, Function & Responsibilities

UNIT- II

Directing For Safety, Direction, Definition, Process, Principles and Techniques Leadership, Role, Function And, Attributes of a Leader.

UNIT- III:

Safety Management System, Objectives of Health, Safety and Environment Policy, Responsibility for Implementation of HSE Policy

UNIT- IV

Role of Occupier and Factory Manager, Factory Safety Committee, Structure and Functions and Working Tenure Details Etc

UNIT- V

ACCIDENT PREVENTION Definition: Incident, Accident, Injury , Dangerous occurrence ,Unsafe Act, Unsafe, Conditions, Hazards, Error, Oversight, Mistake ,Near Miss ,Electricity & Hazards ,Of Electricity ,Explosives And ,Transportation Safety.

Text Books

1. Fundamentals of Industrial safety & health by K.U. Mistry.
2. Factories Act 1948

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR I SEMESTER	Regulation:	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095302P	MECHANICS OF SOLIDS LAB	0	0	3	50	50	1.5

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

CO 1: To understand the different types of loading and measure the loads.
CO 2: To understand the material properties of different materials and the ways of finding them.
CO3: To understand the bulking property and fineness of sand grains and the methods of finding them.

List of Experiments

1. Load deflection test on simply supported beam
2. Load deflection test on cantilever beam
3. To study the stress strain characteristics (tension and compression) of metals by using UTM.
4. Determination of compression strength of wood
5. Determination of hardness using different hardness testing machines (Brinell and Rockwell)
6. Impact test by using Izod and Charpy methods.
7. Deflection test on beams using UTM.
8. To find stiffness modulus of rigidity by conducting compression tests on springs.
9. To find stiffness modulus of rigidity by conducting tension tests on springs
10. Torsion tests on circular shafts.
11. Bulking of sand.
12. Sieve Analysis and determination of fineness number.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR I SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095304P	FULES AND MECHANICS LAB	0	0	3	50	50	1.5

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

CO1: Compare the flash, fire points and carbon residue of different fuels.

CO 2: Find the absolute and kinematic viscosity of different fuels.

CO 3: Verify law of polygon of forces and principle of moments using bell crank lever apparatus and also evaluate the coefficient of friction between two surfaces.

LIST OF EXPERIMENTS

1. Determination of the kinematic and absolute viscosity of the given sample oil using Redwood viscometer I.
2. Determination of the kinematic and absolute viscosity of the given sample oil using Redwood viscometer II.
3. Determination of flash point using Abels flash point apparatus.
4. a) Determination of flash and fire points using Cleveland open cup tester.
   b) Conradsons carbon residue test.
5. Calibration of the given pressure gauge.
6. Determination of moment of inertia of the given flywheel.
7. Determination of modulus of rigidity of the given wire with torsion pendulum.
8. Verification of polygon law of forces.
9. Verification of principle of moments using the bell crank lever apparatus.
10. Determination of co efficient of friction between two surfaces.
11. Determination of calorific value of given sample of fuel by Bomb calorimeter. (Demonstration only)

Program: ENGINEERING AND TECHNOLOGY PROGRAM

Year and Semester:	II B.TECH- II SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095401	APPLIED THERMODYNAMICS-I	3	1	0	30	70	3

COURSE OBJECTIVES:

This course will be able to identify issues related to thermodynamics in real world problems, use basic concepts and fundamental laws to construct thermodynamic models, apply mathematical principles to solve these models, draw conclusions based on these solutions and formulate sound recommendations based on these conclusions.

COURSE OUTCOMES: At the end of the course, student will be able to:

1. Explain the basic concepts of a pure substance, phase change of a pure substance and different terms related to steam formation.
2. Evaluate the impact of modifications such as reheat, regeneration and intercooling on the efficiency and net power produced by a vapour power cycle and draw conclusions regarding the implementation of these modifications.

3.a. Understand the working of different types of steam nozzles and its applications, conditions for maximum discharge of steam through it

b. Understand the working of different types of condensers, performance parameters and its applications in steam power plants.

4. Classify different types of steam turbines and working of impulse& reaction turbine and its performance parameters and methods of compounding to reduce rotor speed of an impulse and reaction turbine.

5. Understand the basic concepts and fundamentals of refrigeration, refrigeration systems, evaluate and draw conclusions regarding the performance of bell colemen cycle, vapor-compression refrigeration cycles, absorption refrigeration cycles and Principles of psychrometry and Air conditioning

UNIT-I

Properties of Pure Substance : Properties of Pure Substance: Definition of pure substance, phase change of a pure substance, property diagrams for phase change process- T-v, p-v, p-T, T-s, h-s (Mollier diagram), formation of steam, terms relating to steam formation, external work done during evaporation, internal latent heat, internal energy of steam, entropy of steam, thermodynamic process of steam-isobaric and isentropic processes only, determination of dryness fraction-throttling calorimeter, separating and throttling calorimeter.

UNIT-II

Vapor Power Cycles: Simple steam power cycle, Rankine cycle, steam rate, heat rate and thermal efficiency, actual vapor power cycle , comparison of Rankine – Carnot cycles, mean temperature of heat addition, methods for improving efficiency of Rankine cycle - reheat cycle, regenerative cycle, reheat-regenerative cycle, binary vapor power cycle , characteristics of ideal working fluid.

UNIT-III

Steam Nozzles: Types of nozzles - Flow through nozzles- Condition for maximum discharge Nozzle efficiency- Super saturated flow in nozzles- Relationship between area velocity and pressure in nozzle flow- Under expansion & over expansion.

Steam Condensers: Introduction, vacuum, Classification of condensers-Jet and surface condensers, Sources and effects of air leakage in condensers, Vacuum efficiency and Condenser efficiency, Determination of mass of cooling water.

UNIT-IV

Steam Turbines: Introduction, classification of steam turbines, compounding of turbines.
Impulse Turbines: Velocity diagrams and performance parameters, condition for maximum blade efficiency for single stage impulse turbine, velocity diagram for velocity compounded impulse turbine.
Reaction Turbines: Velocity diagram, degree of reaction, Parson's reaction turbine, condition for maximum blade efficiency of Parson's turbine.

UNIT-V

Refrigeration: Fundamentals of refrigeration, refrigeration systems, Coefficient of performance, Bell Colemen cycle, Vapor compression cycle- effect of suction and condensing temperature on cycle performance. Refrigerants, Properties of common refrigerants, Vapor absorption system. Principles of psychrometry and Air conditioning - Psychrometric terms, psychrometric process, air conditioning systems.

Text Books:

1. Thermal Engineering, by R. K. Rajput.
2. Applied Thermodynamics-II by R. Yadav.
3. Fundamentals of Engineering Thermodynamics by E. Radhakrishna, PHI.

References:

1. Fluid Flow Machines, by M.S. GovindaRao, Tata McGraw Hill publishing company Ltd.
2. Refrigeration and Air-conditioning, by C.P.Arora and Domokundwar.
3. Thermal Science and Engineering by D.S. Kumar, S.K. Kataria and Sons
4. Thermodynamics and Heat Engines volume 2-R.Yadav-Central book depot
5. Refrigeration and Air-conditioning, by AhamadulAmeen, PHI.

Program: ENGINEERING AND TECHNOLOGY PROGRAM

Year and Semester:	II B.Tech – II Sem	Regulation:	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095402	Theory of Machines - I	3	0	0	30	70	3

COURSE OBJECTIVES:

COB 1	To know about the basics of Machine and mechanism and to learn about velocity and acceleration analysis
COB 2	To learn about lower pairs and understand the Steering gear mechanism, Friction
COB 3	To understand the governors and Dynamic force analysis

COURSE OUTCOMES:

Student will be able to

CO 1	To understand the knowledge of machine and mechanism and able to perform the geometric analysis for various mechanisms.
CO 2	To analyze velocity and acceleration of various mechanisms.
CO 3	To demonstrate straight line motion mechanism, Automobile Steering gear mechanism and Hooke's joint. To understand the principles of friction.
CO 4	To illustrate the principles of governors and sensitiveness of a governor
CO 5	To Outline the static and dynamic strength parameters for a material and design a dynamically equivalent system.

SYLLABUS

UNIT 1: Mechanisms and Machines

Introduction; Mechanism and machine – Rigid and resistant bodies – Link, Kinematic pair; Degrees of freedom – Classification of kinematic pairs – Kinematic chain, Linkage, mechanism and structure – Mobility of mechanisms – The four-bar chain – The slider-crank chain – Double slider-crank chain – Inversions of mechanisms.

UNIT 2: Velocity and Acceleration Analysis

Introduction, Motion of a link – Four-link mechanism – Angular velocity of links – Instantaneous center (I-center) – Kennedy's theorem – Locating of I-centers – Velocity and acceleration of Slider-crank mechanism – Coriolis component of acceleration, Velocity and acceleration of Crank and slotted lever mechanism

UNIT 3: Lower Pairs & Friction

Introduction – Pantograph – Straight line mechanisms – Engine indicators – Automobile steering gears – Types of steering gears

Introduction – Types of friction – Laws of friction – Coefficient of friction – Inclined plane – Pivots and collars – Friction clutches.

UNIT 4: Governors

Introduction – Types of governors – Watt governor (simple conical governor) – Portor governor – Proell governor – Hartnell governor – Hartung governor – Wilson-Hartnell governor (radial-spring governor) – Pickering governor – Spring-controlled gravity governor – Inertia governor – Sensitiveness of a governor – Hunting – Isochronism – Stability – Effort of a governor – Power of a governor – Controlling force.

UNIT 5: Dynamic Force Analysis

Introduction – D'Alembert's principle – Equivalent offset inertia force – Dynamic analysis of four-link mechanism – Dynamic analysis of slider-crank mechanism – Engine force analysis – Dynamically equivalent system – Inertia of the connecting rod –

Text Book:

1. Theory of Machines by R.S.Khurmi & J.K.Gupta.
2. Theory of Machines by S.S. Rattan.

Reference books:

1. Theory of Machines by Thomas Bevan.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR II SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095403	Metal Cutting and Machine Tools	3	1	0	30	70	3

COURSE OBJECTIVES:

1. To give a clear understanding of the mechanism of machining to the students
2. To describe the mechanisms of the various metal cutting machines, types of machines, various operations that can be performed on them, machining time and force calculations etc to the students.
3. To expertise in advance numerical control machines to maxims the work output and efficiency of the numerical machines.

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

CO1	The student can be able to know the mechanism of metal cutting and in a position to work on the metal cutting machines directly without a little assistance.
CO2	They can calculate the machining times and forces developed on all metal cutting machines.
CO3	They will know the different cutting machines and their classifications and how to specify the metal cutting machines and limitations
CO4	They will be in a position to know the different types of finishing operations and cutting fluids for different metals on all types of machines.
CO5	They know the importance, use, applications, advantages and limitations of various computer numerical control machines

Note: L – Lecture periods; T- Tutorial periods; P- Practical periods

Unit I

Mechanics of Metal Cutting; Chip formation & Types; Tool geometry and tool signature ASA&ISO systems; Orthogonal and Oblique Cutting, Merchant Circle analysis, Tool wear and tool life; Cutting forces and power; Tool materials; Cutting fluid:-simple problems

Unit II

Lathe Machines: Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and capstan lathes – collet chucks – other work holders – tool holding devices

Unit III

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

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

Unit IV

Reciprocating Machines: Shaping, Slotting and Planing Machines: Principles, Types, Operations, Mechanism, specifications, operations performed, machining time calculations.

Finishing Processes: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, specification and selection of a grinding wheel. Lapping, Honing.

Unit V

Computer-Numerical Control Machines: CNC Machines, working principle, classification, constructional features of CNC machines, CNC controller, types of motion controls in CNC machines, applications of CNC machines.

Part Programming: Designation of co-ordinate axes for CNC machines, Functions of machine control units, Tape format, Manual part programming and computer assisted part programming (using APT language). Exercises involving simple contours and positioning.

Text Book:

1. Process and Materials of Manufacture (4th Edition) by Roy A.
Lindberg, Prentice-Hall of India Private Limited.
2. Manufacturing technology II, P.N Rao. TMH Ltd 1998(Revised edition).
3. CAD/CAM- Computer Aided Design & Manufacturing, by M.D.Groover & E.W.Zimmer.

Reference Books:

1. Metal Cutting Principles by M.C. Shaw, MIT Press, Cambridge.
2. Metal Cutting-Theory and Practice by Amitabha Bhattacharya, Central Book Publishers.
3. Production Engineering by P.C. Sharma, S. Chand and Company.
4. Production Technology by H.M.T. (Hindustan Machine Tools).
5. Production Engineering, K.C Jain & A.K Chitaley, PHI Publishers.
6. Technology of machine tools, S.F.Krar, A.R. Gill, Peter SMID, TMH (I).

Program: ENGINEERING AND TECHNOLOGY

Year and Semester	II B.Tech - II SEMESTER	Regulation:			R – 20		
Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
2095405	FLUID MECHANICS AND HYDRAULIC MACHINES	L	T	P	Int	Ext	3
		3	0	0	30	70	

Course Objectives:	
COB 1	To give a clear understanding of basic concepts of fluid statics, kinematics and dynamics
CO B2	To describe the flow phenomena using boundary layer theory and able to understand the compressible fluid flow
COB 3	To understand the hydraulic machines and its design and significance

Course Outcomes: At the end of the course, the student will be able to :	
CO 1	Strengthen knowledge on basic concepts of fluid statics, kinematics and fluid dynamics
CO 2	Analyze the flow of incompressible laminar and turbulent flows and flow through pipes
CO 3	Describe fluid flow using boundary layer theory and able to understand the different types of compressible fluid flow
CO 4	Understand the principle and working hydraulic turbines and their study their design aspects and characteristics
CO 5	Understand the principle and working hydraulic pumps and their study their characteristics
Note: L – Lecture periods; T- Tutorial periods; P- Practical periods	

SYLLABUS

UNIT- I:

Fluid Statics and Kinematics : Fundamentals of fluid properties; pressure measurement – Manometry - U-tube manometer and differential U-tube manometers ; Hydrostatic forces on surfaces; Bouyancy and flotation - Meta centre (Theory only); Kinematics of fluid flow - Types of fluid flow; Description of fluid flow pattern - path lines, stream lines , streak lines, stream tube; Continuity equation in one dimension ; Continuity equation in Cartesian coordinates ; Velocity potential function and Stream function.

Fluid Dynamics: Dynamics of fluid flow – Euler's equation of motion - Bernoulli's equation - Application of Benoulli's equation - Venturimeter and Orifice meter. Impulse-momentum equation - Moment of momentum equation - Applications - Impact of jets on stationary and moving plates.

UNIT- II:

Laminar flow, Turbulent flow: Introduction-Laminar flow - Reynolds experiment; Navier- Stokes equations of motion (Explanation only, No derivation); Relationship between Shear Stress and Pressure Gradient; Flow of viscous fluid in circular pipes-Hagen Poiseuille Law; Flow of viscous fluid between two parallel plates - one plate moving and other at rest ; both plates at rest ; Turbulent flow - Introduction- Loss of head due to friction in pipe flow- Darcy equation- characteristics of turbulent Flow.

Flow through Pipes: Introduction- Major Energy Losses- Darcy-weisbach formula; Minor Energy Losses- Losses due to sudden enlargement, sudden contraction, loss of head at the entrance to pipe, exit of a pipe, loss of head due to bend in pipe and various pipe fittings ; pipes in series; equivalent pipe; pipes in parallel; Power Transmission through pipes

UNIT- III:

Boundary Layer theory: Introduction - Boundary layer definitions and characteristics - Momentum equation for boundary layer by Von Karman (Explanation only, no derivation), laminar boundary layer; turbulent boundary layer; Boundary layer separation and its control; **Compressible fluid flow:** Introduction – Basic thermodynamic relations and processes; Basic equations of compressible fluid flow - Continuity equation - Momentum equation- Bernoulli's equation; Propagation of disturbances in fluid and velocity of sound - Derivation of sonic velocity (velocity of sound); Sonic velocity for isothermal and adiabatic processes; Mach number and significance.

UNIT- IV:

Hydraulic turbines: Introduction to hydraulic turbines, Heads and efficiencies of a turbine; Classification of hydraulic turbines; Impulse turbine - Principle of impulse turbines; Pelton wheel - construction and working ; velocity triangles - work done and efficiencies of Pelton wheel ; Design aspects of Pelton wheel. Reaction turbines - Principle of reaction turbines; component parts, construction and operation of a Francis turbine and Kaplan turbine; velocity triangles - work done and efficiencies of Francis turbine and Kaplan turbine; Working proportions of Francis and Kaplan turbines; Unit quantities; Specific speed of turbines - Characteristics curves of turbines.

UNIT-V:

Hydraulic pumps: Hydraulic pumps - classification; Centrifugal Pumps- Main parts, principle and working, heads and efficiencies, work done; Minimum speed for starting; Classification, Multi-stage centrifugal pumps, Specific speed of a centrifugal pump, Priming of a centrifugal pump, Characteristic curves; Effects of Cavitation in hydraulic pumps. Reciprocating Pumps: Classification, main parts-working - slip, velocity and acceleration variation in suction and delivery pipes due to acceleration of piston; Indicator diagram - Effect of acceleration in suction and delivery pipes on indicator diagram.

Text Books:

1. A Text book of Fluid Mechanics and Hydraulic machines , by R.K. Rajput, S.Chand & Co
2. A Text book of Fluid Mechanics and Hydraulic machines , by R.K. Bansal, Laxmi Publications

References:

1. Hydraulics and Fluid Mechanics Including Hydraulic machines and by P.N Modi and S.M Seth, Standard Book house publishers,22nd edition
2. Hydraulic Machines by K.Subramanya - McGraw Hill Education

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR II SEMESTER	Regulation:	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
2095405	MATERIAL SCINECE AND METALLURGY	L	T	P	Int	Ext	2
		3	1	0	30	70	

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

1. Identify crystal structures and characterize them
2. Catagorise types of binary phase diagrams and iron-iron carbide phase diagram and other binary phase diagrams can be notated and characterized.
3. Understand different heat treatment regimes in steels and their transformations, various surface heat treating and precipitation hardening techniques can be identified and analysed.
4. Identify Iron alloys and non ferrous alloys depending on the various alloying elements
5. Choose methods of manufacture of P/M parts and their applications

UNIT I

Structure of crystalline solids: Atomic structure & bonding in solids- Crystal structures- calculations of radius, Crysrallography: Classification of Crystal lattices- Miller Indices Coordination Number and Atomic Packing Factor for different cubic structures - Imperfection in solids, point defects, linear defects, planar defects and volume defects- Concept of Slip & twinning.

UNIT II

Phase diagrams: Basic terms- phase rule- Lever rule & free energy of phase mixtures cooling curves- Phase diagram & phase transformation - construction of phase diagrams - Invariant reactions, eutectic, peritectic, eutectoid, peritectoid, monotectic reactions, Iron carbon phase diagram & microstructures of plain carbon steel & cast iron

UNIT III

Heat treatment: Heat treatment of steel- Annealing, and its types, normalizing, hardening, tempering, martemering, austempering - TTT diagrams, drawing of TTT diagram, TTT diagram for hypo-& hypereutectoid steels, effect of alloying elements, CCT diagram- Martensitic transformation, nature of martensitic transformation- Surface hardening processes like case hardening, carburizing, cyaniding, nitriding, induction hardening, hardenabilty, Jominy end- quench test, Age hardening of Al & Cu alloys, Precipitation Hardening

UNIT IV

Engineering Alloys: Properties, composition, microstructure and uses of low carbon, mild medium & high carbon steels. stainless steels, high speed steels, Hadfield steels, tool steels - Cast irons, gray CI, white CI, malleable CI, SC iron-The light alloys- Al & Mg & Titanium alloys- Copper & its alloys: brasses & bronzes- super alloys.

UNIT V

Powder Metallurgy: Powder Metallurgy process, Preparation of powders, Characteristics of Metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy.

Text Books:

1. "Materials Science & Engineering- An Introduction", William D.Callister Jr., David G Rethwisch, Wiley India Pvt. Ltd., 9th Edition, 2014, New Delhi.
2. Introduction to Physical Metallurgy by Sidney H Avner, 2nd Edition, Tata McGraw-Hill, 1997

References

1. Physical Metallurgy, Principles & Practices", V Raghavan, PHI 3rd Edition 2016, New Delhi.
2. Materials Science and Engineering: A First Course By V. Raghavan, PHI 5th Edition 2011, New Delhi.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR II SEMESTER	REGULATION : R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095406	ENVIRONMENTAL SCIENCES	3	0	0	30	70	3

COURSE OBJECTIVES: The objectives of the Environmental Science course are to

1. Familiarize the fundamental aspects of environment and the environmental management'
2. Make realize the importance of natural resources management for the sustenance of the life and the society.
3. Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
4. Provide the concept of Sustainable Development, energy and environment.
5. Impart knowledge on the new generation waste like e-waste and plastic waste

COURSE OUTCOMES:

CO 1: In this unit the students learn about the scope and importance of Environmental studies. The students understand about different kinds of ecosystems.

CO 2: The students learn about biodiversity and its conservation. They also learn about types of biodiversity, values of biodiversity and threats to biodiversity.

CO 3: The students understand about the types of natural resources and problems associated with them.

CO 4: In this unit the students gain knowledge about different types of environmental pollution-causes, effects and control measures.

CO 5: In this unit the students gain knowledge about characteristics of human population growth and its impact on environment. The students develop deep understanding about the environmental legislation.

UNIT-I: Introduction to Environmental studies and Ecosystems

Definition, Scope and importance of environmental studies.

Concept of an Eco system ,Biotic and Abiotic components of ecosystem, structure and function of an ecosystem. Food Chains, Food web and Ecological Pyramids.

Forest ecosystem, Grassland ecosystem, Desert ecosystem, Pond ecosystem and Marine ecosystem.

UNIT – II: Bio-Diversity and its Conservation

Introduction – Definition and types of biodiversity – value of biodiversity - India as mega diversity nation – Hot spots of biodiversity – Threats to biodiversity – Conservation methods of biodiversity – In-situ & Ex – situ methods of conservation - Concept of sustainable development.

UNIT – III: Environment and Natural Resources Management

Soil erosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources : Use and over-exploitation, Mining and dams – their effects on forest and

tribal people, Water resources : Use and over-utilization of surface and ground water, Floods, droughts, Water logging and salinity, Dams – benefits and costs, Conflicts over water, Energy Resources : Energy needs, Renewable and non-renewable energy sources.

UNIT - IV: Environmental Pollution – climate change and environmental problems

Definition, causes, effects and control measures of (a) air pollution (b) water pollution (c) soil pollution (d) noise pollution. Global Warming – Acid Rain – Ozone depletion – Photochemical smog.

Drinking water, Sanitation and public health, Effect of Human activities of the quality of environment- Urbanization, transportation, Industrialization. Water scarcity and ground water depletion, Controversies on major dams –resettlement and rehabilitation of people problems and concerns. concept of plastic waste and e-waste

UNIT - V : Human Population and Environmental legislations

Population Explosion – characteristics of population explosion. Impact of population growth on Environment – Role of Information technology in Environment and Human Health . Environmental Ethics .

Environmental acts: Water (Prevention and control of pollution) act, air (Prevention and control of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act.

TEXT BOOKS:

1. Anubha Kaushik and C.P.Kaushik.Environmental Science by New age International Publishers.
2. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
3. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
4. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
5. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

REFERENCE BOOKS:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.

MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR II SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095408S	COMPUTER AIDED DRAFTING	1	0	2	50	50	2

Course Objective:

The course introduces to the student to the CATIA V5 environment with emphasis on the use of the Sketcher Workbench. It also presents an overview of the Part Design, Generative Shape Design, and Assembly Design

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

1. Use the conventional representations of materials and machine components Model various riveted, welded and key joints
2. Generate solid models and sectional views of machine components
3. Develop solid models of machine parts them
4. Generate the sectional views of machine parts

List of Experiments:

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs, dimensioning types, lines and rules of dimensioning
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned
3. Popular forms of Screw threads, bolts, and nuts
4. Protected Flange Coupling
5. Cotter joint and knuckle joint
6. Riveted joints for plates
7. Spigot and socket pipe joint
8. Journal bearing and foot step bearing

Software Packages: Auto CAD and CATIA

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR II SEMESTER (MINOR)	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095409	Materials Technology (MINORS)	3	1	0	30	70	4

COURSE OBJECTIVES:

1. To provide the students with basic knowledge of materials science, so that they would be able to understand and distinguish between variety of materials based on their structure and properties
2. To develop an understanding of the basis of physical metallurgy and correlate structure of materials with their properties for engineering applications.
3. To provide an understanding of the basic principles of various testing and characterization tools and use those tools to analyze metallurgical components.

COURSE OUTCOMES: At the end of the course, the student able to

1. Identify the classification of metal and their crystal structures
2. Categorize types of binary phase diagrams and iron-iron carbide phase diagram and other binary phase diagrams can be notated and characterized and Understand different heat treatment regimes in steels and their transformations, various surface heat treating and precipitation hardening techniques can be identified and analyzed.
3. Identify Iron alloys, cast iron alloys and light alloys depending on the various alloying elements
4. Understand the concepts of synthesizing and manufacturing of composites.
5. Select the appropriate tool to characterize and test the material by knowing its merits and demerits.

UNIT – I

Classification of Materials: Metallic materials, Polymeric Materials, Ceramics and Composites: Definition, general properties, applications with examples.

Structure of crystalline solids: Atomic structure & bonding in solids- Crystal structures- calculations of radius, Crystallography: Classification of Crystal lattices -Miller Indices Coordination Number and Atomic Packing Factor for different cubic structures Imperfection in solids, point defects, linear defects, planar defects and volume defects- Concept of Slip & twinning.

UNIT – II

Phase diagrams: Basic terms- phase rule- Lever rule, construction of phase diagrams, binary phase diagrams:-Fe-C phase diagram- Invariant reactions, eutectic, peritectic, eutectoid, peritectoid, monotectic reactions.

Heat treatment: Heat treatment of steel- Annealing, and its types, normalizing, hardening, tempering, basics of other heat treatment processes.

UNIT- III

Ferrous and non -ferrous materials: Properties composition and use of grey cast iron, malleable iron, SG iron. Copper alloys- brasses and bronzes, aluminum alloys Al-Cu, Al-Si, Al-Zn alloys.

UNIT –IV

Composites: Basic concepts of composites, Processing of composites, advantages over metallic materials, various types of composites and their applications

Powder Metallurgy: Powder Metallurgy process, Preparation of powders, Characteristics of Metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy.

UNIT – V

Characterisation and Testing of Materials: Physical & characterization techniques related to density, optical microscope, electron microscopes (SEM and TEM), Structural Characterization (XRD), Mechanical Testing techniques related to tensile, compressive, hardness.

TEXT BOOKS:

1. Introduction to Physical Metallurgy by Sidney H Avner, 2nd Edition, Tata McGraw-Hill, 1997

2. Mechanical Metallurgy by GEORGE E DIETER

REFERENCE BOOKS:

1. Physical Metallurgy, Principles & Practices, V Raghavan, PHI 3rd Edition 2016, New Delhi.
2. Materials Science and Engineering: A First Course, V. Raghavan, PHI 5th Edition 2011,
New Delhi.
3. “Materials Science & Engineering- An Introduction”, William D. Callister Jr., David G Rethwisch, Wiley India Pvt. Ltd., 9th Edition, 2014, New Delhi.

Program: ENGINEERING AND TECHNOLOGY PROGRAM

Year and Semester:	II YEAR- II SEMESTER (HONORS)	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095410	Alternative fuels for Automotive Engineering	3	1	0	30	70	4

COURSE OBJECTIVES:

1. To present a problem oriented in depth knowledge of Alternate fuel and energy system.
2. To address the underlying concepts and methods behind alternate fuel and energy system.
3. To understand the performance characteristics of alternative fuels

COURSE OUTCOMES: At the end of the course, the student able to understand

1. Students can identify different areas of alternate fuels and energy system.
2. Student will be able to understand the manufacturing, performance characteristics of alternate fuels and Environmental assessment of alternative fuels.
3. Student will be able to Identify different alternate automotive fuels
4. Student will be able to advantages and disadvantages associated with each fuel.
5. Students will have the Field experience of a commercial alternative fuel facility

UNIT – I

Introduction:
Fuels, classification of fuels, Availability and properties of alternate fuels. Merits and demerits of various alternate fuels, introduction to alternative energy sources. Like EV, hybrid, fuel cell and solar cars. Engines, Working of I.C. EnginE-2stroke and 4 stroke.

UNIT – II

Need for Alternative Fuels:
Effects of constituents of Exhaust gas emission on environmental condition of earth (N2 , CO2, CO, NOx, SO2, O2) Pollution created by Exhaust gas emission in atmosphere. Greenhouse effect, Factors affecting greenhouse effect. Study of Global Carbon Budget, Carbon foot print and Carbon credit calculations. Emission norms as per Bharat Standard up to BS – IV and procedures for confirmation on Production

UNIT- III

Bio Diesels:
Base materials used for production of Bio Diesel (Karanji oil, Neemoil, Sunflower oil, Soyabeen oil, Musturd oil, Palm oil, Jatropha seeds). Process of separation of Bio Diesel. Properties Diesel blended with vegetable oil, and difference in performance of Engine.

UNIT –IV

Biogas:
Introduction to Biogas system, Process during gas formation, Factors affecting biogas formation. Usage of Biogas in SI engine & CI engine.
LPG & CNG: Properties of LPG & CNG as engine fuels, fuel metering systems, combustion Characteristics, effect on performance, emission, cost and safety.

UNIT – V

Electric & Hybrid Vehicles:
Layout of an electric vehicles, advantages & limitations. Systems components, electronic controlled systems, high energy and power density batteries. Types of hybrid vehicles.
Solar Power:
Solar cells for energy collection. Storage batteries, layout of solar powered automobiles. Advantages and limitations

TEXT BOOKS:

1. Alternate Fuels by Dr. S. Thipse, Jaico Publications

2. Automotive Emission Control" by Crouse, AND Anglin – McGraw Hill

REFERENCE BOOKS:

1. Alternative Fuels Guidebook" by Bechtold R..

2. Internal Combustion Engines" by Ganeshan – Tata McGraw Hill.

3. Internal Combustion Engines" by Heywood John.

Program: ENGINEERING AND TECHNOLOGY

Year and Semester:	II YEAR II SEMESTER	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095404P	MANUFACTURING TECHNOLOGY LAB-1	0	0	3	50	50	1.5

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

CO1	to design moulds of simple objects like flange, gear V- grooved pulley etc. and various parts of moulds such as cope, drag, riser, etc.
CO2	Join metal plates to create butt joint, Lap Joint, T fillet etc. and select appropriate parameters for improvement of weld quality
CO3	Machine the metals using turning, shaping and milling Tools

Note: L – Lecture periods; T- Tutorial periods; P- Practical periods

LIST OF EXPERIMENTS

1. STEP TURNING ON A LATHE
2. TAPER TURNING ON A LATHE
3. THREADING AND KNURLING OPERATIONS ON A LATHE
4. HEXAGONAL BLOCK ON A SHAPER
5. SPUR GEAR ON A MILLING
6. PREPARATION OF MOULD CAVITY BY USING A SINGLE PIECE PATTERN
7. PREPARATION OF MOULD CAVITY BY USING A SPLIT PIECE PATTERN
8. SQUARE BUTT JOINT
9. LAP JOINT
10. TEE FILLET JOINT

Program: ENGINEERING AND TECHNOLOGY PROGRAM

Year and Semester:	II year –II Semester	Regulation :	R-20

Course code	Title of the Course	Contact Hours/week			Allotment of Marks		Credits
		L	T	P	Int	Ext	
2095405P	Fluid Mechanics and Machinery Lab	-	-	3	50	50	1.5

COURSE OUTCOMES: At the end of the course, the student able to

1. Evaluate the pressure measurement by understanding the hydrostatic law, Pascal's law.
2. Apply the Bernoulli's principle to flow meters to measure the co-efficient of discharge.
3. Understand the working principle of Turbines and Pumps .

LIST OF EXPERIMENTS

1 a. Calibration of Venturimeter

b. Calibration of Orifice meter.

2. Determination of Co efficient of discharge for Nozzle meter.

3 a. Determine Co efficient of discharge for small orifice.

b. Determine Co efficient of discharge for mouth piece.

4 Find the Co efficient of discharge for Rectangular Notch.

5 Find the Co efficient of discharge for Triangular Notch.

6 Experimentation to determine the performance of Pelton wheel.

7 Experimentation of Centrifugal pump to find the performance and draw the performance characteristic curves.

8 Performance on Reciprocating pump to draw the characteristic curves.

9 Performance of Francis turbine a study experiment.