Kavayitri Bahinabai Chaudhari NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering

(Automobile Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
3rd Cycle

SYLLABUS STRUCTURE

Semester – III & IV

W.E.F. 2019 – 20

Subject Group Code and Subject Groups

Sr. No.	GROUP	Category	Breakup of Credits (Total 160)
1	A	Humanities and Social Sciences including Management Courses (HSMC)	10
2	B	Basic Science Courses (BSC)	26
3	C	Engineering Science Courses including workshop, drawing, basics of electrical/mechanical/computer etc. (ESC)	26
4	D	Professional Core Courses (PCC)	53
5	E	Professional Elective Courses relevant to chosen specialization/branch (PEC)	18
6	F	Open subjects – Electives from other technical and /or emerging subjects (OEC)	12
7	G	Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad (PROJ)	15
8	H	Mandatory Courses (MC) [Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
		Total	160

Kavayatri Bahinabai Chaudhari NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Bachelor of Engineering (Automobile Engineering) Faculty

of Science and Technology

Syllabus Structure & Contents of Second Year of Engineering

Semester-III

w.e.f. 2019 – 2020

Syllabus Structure for Second Year Engineering (Semester – III) (Automobile Engineering) (w.e.f. 2019 – 20)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Biology	B	3	1	--	4	40	60	-	-	100	**4**
Engineering Mechanics	C	3	--	--	3	40	60	-	-	100	**3**
Automobile System	C	3	--	-	3	40	60	--	--	100	**3**
Thermodynamics	D	3	--	-	3	40	60	--	--	100	**3**
Industrial Psychology	A	3	--	--	3	40	60	-	-	100	**3**
Automobile System Lab	C	--	--	2	2	--	--	25	25(OR)	50	**1**
Thermodynamics Lab	D	--	--	2	2	--	--	25	25(OR)	50	**1**
Computer Graphics Lab	D	1	--	2	3	-	-	25	25(PR)	50	**2**
		16	**1**	**6**	**23**	**200**	**300**	**75**	**75**	**650**	**20**

ISE: Internal Sessional Examination **ESE: End Semester Examination** **ICA: Internal Continuous Assessment**

Syllabus Structure for Second Year Engineering (Semester – IV) (Automobile Engineering) (w.e.f. 2018 – 19)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Mathematics – III	B	3	1	--	4	40	60	--	--	100	**4**
Automobile Chassis and Body Engineering	C	3	--	--	4	40	60	--	--	100	**3**
Applied Thermodynamics	D	3	1	--	3	40	60	--	--	100	**4**
Fluid Mechanics and Fluid Machines	D	3	--	--	3	40	60	--	--	100	**3**
Industrial Economics	A	3	--	--	3	40	60	--	--	100	**3**
Applied Thermodynamics Lab	D	--	--	2	2	--	--	25	25(OR)	50	**1**
Fluid Mechanics and Fluid Machines Lab	D	--	--	2	2	--	--	25	25(OR)	50	**1**
Drawing of Automotive Components Lab	D	1	--	2	3	-	-	25	25(OR)	50	**2**
Environmental Studies	H	--	--	--	--	--	60	40	--	--	**0**
Internship – I*		--	--	--	--	--	--	--	--	--	--
		16	**2**	**6**	**24**	**200**	**300**	**75**	**75**	**650**	**21**

ISE: Internal Sessional Examination ESE: End Semester Examination ICA: Internal Continuous Assessment

* Internship – I is a mandatory and non-credit course. It shall be during summer vacation after Semester – IV. The satisfactory completion of Internship – I should be submitted to university at the end of semester – VIII

Biology

COURSE OUTLINE

Course Title:	*Biology*	Short Title:	*Biology*	Course Code:	

Course description:

This course is introduced for learning the basic fundamentals of Life sciences (zoology & Botany) to undergraduate students. The prospectus includes a prior knowledge of Biotechnology. The goals of the course are to understand the basic principles of Biology and its applications in the field of Engineering.

	Hours/week	No. of Weeks	Total hours	Semester credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite course(s):

Course objectives:

1. Students will understand the structures and characteristics or functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
2. Students will learn the basic principles of inheritance at the molecular, cellular and Organism levels.
3. Students will test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations.

Course outcomes:

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

1. Use current techniques and analysis methods in molecular biology and genetics.
2. Understand the current concepts in Cell Biology, Stem Cell Biology and Development.
3. Know the structure/function of the basic components of prokaryotic and eukaryotic cells including macromolecules and organelles.
4. Demonstrate proficiency with at least one instrument commonly used in biological research (microscope, etc).

COURSE CONTENT

Name of the Subject: Biology		Semester:	*III*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Diversity of Organism and Cell Biology	No. of Lectures: 08 Hours	Marks: 12

Introduction: Living systems, Bio-mimicry, Metabolism, Taxonomy, Concept of species, Structural organization of life, Concepts of modern cell, history of cell, Cell theory, Structure of

cell:- Cell shape, size and cell number, Types of cells:- Prokaryotic cells and Eukaryotic cells, Chemistry of cells.
Cell Division: Cell cycle, mitosis, meiosis, mitotic cell division, cell cycle check points, meiotic cell division, embryonic cell division, cell death.

Unit–II: Plant and Animal Kingdom	No. of Lectures: 08 Hours	Marks: 12

Plant Kingdom:
Introduction to plants, Salient features of major plant groups: Bryophyta, Pteridophyta, Gymnospermae, Angiospermae.
Plant Growth & Development: Introduction, Seed Dormancy, Seed Germination, Phases of growth, Plant growth hormones.
Animal Kingdom:
Animal Classification, Salient features of non-chordates upto phylum level: Phylum porifera, phylum Cnidaria, Phylum Ctenophora, Phylum Platyhelminthes.

Unit–III: Plant Cell and Animal cell culture and Applications	No. of Lectures: 08 Hours	Marks: 12

Plant Cell Culture:
Brief introduction to cell culture with respect to the properties of plant cells, Media requirements, Typical media used, Classification of tissue culture, callus culture, cell suspension culture, Application of callus culture and cell suspension culture, Plant cell cultivation Bioreactors
Animal Cell Culture:
Brief introduction to animal cell culture, Culture medium: Natural and Artificial media, introduction to balanced salt solutions and simple growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Animal Bioreactors.

Unit–IV: Microbial Culture and Applications	No. of Lectures: 08 Hours	Marks: 12

Introduction, Microbial Culture Techniques, growth curve, Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, Applications of Microbial Culture Technology.

Unit–V: Biotechnology and its Applications	No. of Lectures: 08 Hours	Marks: 12

Definitions, scope of Biotechnology, Recombinant DNA Technology: Making Recombinant DNA, Tools in Genetic Engineering, Polymerase Chain reaction (PCR).
Applications of Biotechnology:
Bioinformatics, Biomechanics, Biotechnology of waste treatment, Biosensors, Forensic science, Food Biotechnology, Fermentation Technology.

Text Books:

1. B.D. Singh “Genetics” Kalyani Publications, Third Edition.
2. C.B. Pawar “Cell Biology” Himalaya Publications, Third Edition.

3. C.B. Pawar "Cell and Molecular Biology" Himalaya Publications.
4. Text book of Zoology by V.K. Agrawal, S. Chand Publication.
5. Text book of Botany by Dr. B.P. Pandey S. Chand Publication.
6. Text book of Biotechnology by R.C. Dubey, S. Chand Publications.

Reference Books:

1. P. K Gupta, Introduction to Biotechnology, Rastogi Publications.
2. B. D. Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
3. S. S. Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
4. Andreas D. Boxevanis, Bioinformatics, Wiley International
5. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
6. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology:Principles and Applications, Mcgraw Hill international.
7. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India
8. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice, Revised Edition, Elsevier
9. Freshney, Culture of Animal Cells, 5th Edition, Wiley-Liss, 2005
10. M.J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5th Ed., TMH Book Company.

Engineering Mechanics

COURSE OUTLINE

Course Title:	*Engineering Mechanics*	Short Title:	*EM*	Course Code:	

Course description:

The objective of this Course is to provide an introductory treatment of *Engineering Mechanics* to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.

	Hours/week	No. of Weeks	Total hours	Semester credits
Lecture	03	14	42	03
Tutorial	00	00	00	

Prerequisite course(s):

Applied Physics I, Applied Physics II, Applied Mathematics I & Applied Mathematics II.

Course objectives:

A working knowledge of statics with emphasis on force equilibrium and free body diagrams. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behaviour of materials under various load conditions.

Course outcomes:

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

a. Use scalar and vector analytical techniques for analysing forces in statically determinate structures
b. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
c. Apply basic knowledge of maths and physics to solve real-world problems
d. Understand measurement error, and propagation of error in processed data
e. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
f. Understand basic dynamics concepts – force, momentum, work and energy;
g. Understand and be able to apply Newton's laws of motion;
h. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution;
i. Extend all of concepts of linear kinetics to systems in general plane mot ion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)
j. Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and
k. Attain an introduction to basic machine part s such as pulleys and mass-spring systems

COURSE CONTENT

Name of the Subject: Engineering Mechanics	Semester:	*III*
Teaching Scheme:	Examination scheme	

Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

INTRODUCTION:
Force systems, Basic concepts, Particle equilibrium in 2D & 3D; Rigid body equilibrium; System of Forces; Coplanar Concurrent Forces, Components in Space – Resultant – Moment of Forces & its Applications; Couples & Resultant of Force systems, Equilibrium of System of Forces, Free Body Diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

BASIC STRUCTURAL ANALYSIS:
Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;
VIRTUAL WORK:
Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency.

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

CENTROID & CENTRE OF GRAVITY
Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications;
Area moment of inertia - Definition, Moment of inertia of plane sect ions from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

KINETICS OF RIGID BODIES:
Basic terms, general principles in dynamics; Types of mot ion, Instantaneous centre of rotation in plane motion and simple problems;
D'Alembert's Principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

FRICTION:
Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;
KINEMATICS:
Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates); Work - kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

Text Books:

1. S. S. Bhavikatti (2009), Engineering Mechanics, New Age International Publishers.
2. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

3. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications.

Reference Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall.
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill.
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press.
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education.
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education.
7. Reddy Vijaykumar K. and K. Suresh Kumar (2010), Singer's Engineer ing Mechanics.
8. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications.

Automobile System					
COURSE OUTLINE					
Course Title:	*Automobile System*	**Short Title:**	*A S*	**Course Code:**	

Course description:

This subject includes various systems and their operations on ignition system, battery working starting systems, tyres and wheels.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	4

Prerequisite course (s):

Automobile Engineering, Automobile Air Conditioner, Automobile Design

Course objectives:

To study various layouts and their systems

Course outcomes:

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

Distinguish the various operating systems with their working mechanism like vehicle layouts, ignition system, Air conditioner, automotive batteries.

COURSE CONTENT

Automobile System		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I: Vehicle layouts and specification	**No. of Lectures: 08 Hours**	**Marks: 12**

Vehicle specification, vehicle layouts, types of vehicles and their applications, Two and four wheelers, cars, Light commercial vehicles, Trucks, buses, earth moving machinery, highway vehicles, agricultural tractors, Construction of automobile and various systems of automobiles Chassis and frames, sub frame, integral construction, frame alignment. Body bumpers, doors, hood, articulated vehicles, trailers and safety consideration.

Unit–II: Battery	**No. of Lectures: 08 Hours**	**Marks: 12**

Introduction, Principles of battery operation, battery construction. Recharging of battery, Battery rating, battery capacity and battery efficiency. Checking specific gravity of battery, battery test, Battery charging, battery failure and battery troubles shooting.

Unit–III: Ignition systems	**No. of Lectures: 08 Hours**	**Marks: 12**

Conventional Ignition systems: Function, types of Ignition systems, components, Battery

Ignition systems, Magneto Ignition systems, Testing of Ignition circuits, Ignition systems trouble shooting.
Electronic Ignition systems
Introduction, principles of Electronic Ignition systems, pulse generator, distributor less ignition system.
Starting systems:
Starting motors, starting devices, Bendix drive, overrunning clutch drive, starting motor switch and control switch, starting system trouble shooting.

Unit–IV: Wheels & Tyres	**No. of Lectures: 08 Hours**	**Marks: 12**

Construction and types of wheels, wheel dimensions.
Types of tyres, tyre property , tyre material, consideration in trade design, wheels and tyre trouble shooting, retrading of tyres, Tubes, Natural rubbers and butyl flops. Rims, types, and maintenance.
Front axle and steering:
Introduction, front axle, factors of wheel alignment, steering geometry. Steering mechanisms, cornering force, under steer and over steer, steering linkages, steering gears, steering ratio. Special steering columns, power steering, advanced steering systems.

Unit–V: Air conditioning systems	**No. of Lectures: 08 Hours**	**Marks: 12**

Definition of basic terms of psychometric terms such as DBT, WBT, RH, etc. Human comfort conditions. Temperature control system, Insulation methods in auto air conditioner, Study of typical auto air conditioner, location of window air conditioner. Study of typical air conditioner systems, various parts of systems, compressor performance and its effect on overall engine performance.

Text Books:

1. Dr. Kripal Singh, ”Automobile Engineering” vol-I&II
2. R.B. Gupta, ”Automobile Engineering” ;Satya prakashan, New Delhi
3. Newton, steed and Garret, “Motor vehicle”, Butter worth, London

Reference Books:

1. Narang G.B.S, “Automobile Engineering”, Khanna publication, New Delhi
2. A.W. Judge, ”Modern Transmission” Chapmen and Hall std 1989
3. Nakara C.P., ”Basic Automobile Engineering”, Dhanpat Rai Publishing co.

Thermodynamics					
COURSE OUTLINE					
Course Title:	*Thermodynamics*	Short Title:	*THERMO*	Course Code:	

Course description:

It provides insights to the basic principles of classical thermodynamics. The system and surrounding interactions involving work and heat transfer associated with the change in property is included. Zeroth law, First Law, Second Law and Significance of Entropy are the key areas of the study in this course. It will help students to apply in everyday life and in industrial applications.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course (s):

1. Physics
2. Chemistry

Course objectives:

1. To learn about work and heat interactions, and balance of energy between system and its surroundings.
2. To learn about application of I law to various energy conversion devices.
3. To evaluate the changes in properties of substances in various processes.
4. To understand the difference between high grade and low grade energies and II law limitations on energy conversion.

Course outcomes:

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

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
2. Students can evaluate changes in thermodynamic properties of substances
3. The students will be able to evaluate the performance of energy conversion devices
4. The students will be able to differentiate between high grade and low grade energies

COURSE CONTENT

Name of the Subject: Thermodynamics		Semester:	*III*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Fundamentals of Thermodynamics	No. of Lectures: 08 Hours	Marks: 12

Introduction to Thermodynamics, Macroscopic & Microscopic aspects, System & Control Volume, properties, processes and cycles, thermodynamic equilibrium, Quasi static process, Temperature, Zeroth law of thermodynamics, thermal equilibrium, Measurement of temperature, temperature scales, liquid in glass thermometer, electrical resistance thermometer, thermocouples, Work- Thermodynamic definition of Work, p-dv work or displacement work, path function , point function, electrical work, Shaft work, Flow work, magnetic, gravitational , spring work, Heat transfer, path function, specific heat, latent heat, comparison of heat transfer and work transfer phenomenon, examples of heat and work interactions.

Unit–II: First Law of Thermodynamics	No. of Lectures: 08 Hours	Marks: 12
First law for non flow processes or closed system, Joule‟s experiment, Energy –a property of the system, different forms of the stored energy, internal energy, concept of total energy, specific heats, Enthalpy, First law for flow process or open system, steady flow process, general steady flow energy equations, Application of SFEE to Nozzle and diffuser, throttling device, Turbine and compressor, heat exchanger, pumps, variable flow process, system technique and control volume technique, discharging and charging a tank.		

Unit–III: Second Law of Thermodynamics	No. of Lectures: 08 Hours	Marks: 12
Introduction, Limitations of First Law, Energy reservoirs, Heat Engine, Refrigerator, Heat Pump, Kelvin-Plank statement, Clausius‟s Statement, equivalence of Kelvin –Plank and Clausius‟s statement, Reversibility and Irreversibility, Causes of irreversibility, Conditions for irreversibility, Carnot cycle, Carnot Theorem, Absolute Temperature scale Entropy: Introduction, Entropy Principle, Clausius‟s theorem, Entropy is a property, Temperature Entropy plot, Clausius‟s inequality, Entropy change in an irreversible process, Entropy and Disorder		

Unit–IV: Ideal & Real Gases	No. of Lectures: 08 Hours	Marks: 12
Introduction, The equation of State, p-v-T surface, Internal energy, Enthalpy, Specific heats, Real gases Pure Substances: Definition, Phase change phenomenon, p-T chart, p-v-T surface, phase change terminology and definitions, Formation of steam, critical point, triple point, dryness fraction, Dry , Wet and Superheated steam, Vapour process, Use of steam table, Mollier Charts,		

Unit–V: Availability and Irreversibility	No. of Lectures: 08 Hours	Marks: 12
Quality of Energy, Available and unavailable energy, Availability, surrounding work, reversible work and Irreversibility, Availability in a closed system, Availability in SSSF process in an open system, Second law efficiencies of Processes of Turbine, Compressor and Heat Exchanger. Thermodynamic cycles: Basic Rankine Cycle, Basic Brayton Cycle, Basic Vapor Compression Cycle and comparison with Carnot cycle.		

Text Books:

1. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd.
2. R K Rajput, 2016, A Textbook of Engineering Thermodynamics, Laxmi Publication, 5th edition.
3. Domkunwar,2016,A Course in Thermal Engineering, Dhanpat Rai & Co., 6th edition
4. Y.V.C. Rao, (2004), An Introduction to Thermodynamics, Universities Press.
5. C. P. Arora, (2005) Thermodynamics, Tata McGraw-Hill Publishing Company Ltd.
6. David R. Gaskell, (2003), Introduction to Thermodynamics of Materials, Taylor and Francis Publisher..
7. M. Achuthan, (2004), Engineering Thermodynamics, Prentice Hall India Limited.
8. Eastop, (2004), Applied Thermodynamics for Engineering Technologies, Addison Wesley Logman Limited.

Reference Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edit ion, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India.
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Yunus A. Cengel, (2005), Thermodynamics: An Engineering Approach, Tata McGraw-Hill Publishing Company Ltd.

Industrial Psychology					
COURSE OUTLINE					
Course Title:	*Industrial Psychology*	Short Title:	*IP*	Course Code:	
Course description:					
This course will provide an Introduction to Industrial and Organizational Psychology, a scientific discipline that studies human behavior in the workplace. Organizational psychologists help institutions hire, manage, develop, support employees and align employee efforts with business needs.					
Lecture	Hours/week	No. of weeks	Total hours	Semester credits	
	3	14	42	3	
Prerequisite course (s):					
English, Science,					
Course objectives:					
1. The emergence of Industrial and Organizational Psychology 2. The work done in Industrial and Organizational Psychology 3. The significance of training, performance appraisal, leadership models 4. The importance of Engineering Psychology 5. To acquaint the students with work motivation, Attitudes, Job Satisfaction, Leadership, Communication.					
Course outcomes:					
After successful completion of this course the student will be able to:					
1. To Identify major theoretical concepts in psychology, 2. To Exhibit effective communication skills 3. To Understand importance of motivation 4. To Demonstrate knowledge of the topics listed in the course outline 5. To Think critically about concepts and issues in industrial psychology 6. To Understand and apply the different concepts in industrial psychology					
Introduction to Industrial Psychology					
COURSE CONTENT					
Industrial Psychology		Semester:	III		
Teaching Scheme:		Examination scheme			
Lectures:	3 hours/week	End semester exam (ESE):		60 marks	
		Duration of ESE:		03 hours	
		Internal Sessional Exams (ISE):		40 marks	
Unit–I: Introduction to Industrial Psychology	No. of Lectures: 08 Hours	Marks: 12			

Nature and Meaning of Industrial Psychology, Psychology as a science. Personality: Definition, types of personality, Measurement of Personality. Type 'A' Personality, Anger scale, wellbeing scales. Behaviour Modification: Perception, Motivation, and Learning, Relaxation Techniques, Assertive Training, and Desensitization Procedures Role of Industrial Psychology, Organizational Attitude, Groups & work teams, managing Work-force diversity, improving quality and productivity, improving people skills, Empowering peoples, Group formation & development, stimulating innovation and change Group Behaviour, productive & Counterproductive behaviour.		
Unit–II: Application of Psychology	No. of Lectures: 08 Hours	Marks: 12
Industry: Selection, Training, motivation and Productivity, Team building, Stress-management. Marketing: Consumer Behavior and Advertising; Self Development: Application of Psychology in building memory and creativity, occupational health psychology, Motivation & Decision making :Motivation & work behaviour, Theories of Employee Motivation, Theory X and Y, McClelland‟s, Need Theory, Herzberg‟s Two Factor Theory, Cultural, Differences in Motivation, leadership and power in organization, Decision making process, individual influences, group decision process.		
Unit–III: Communication in Organization	No. of Lectures: 08 Hours	Marks: 12
Communication process: barriers in communications, Communication technology: management information systems, telecommunication, Interpersonal communication, factors involved in interpersonal communication, communication networks, improving communications. Leadership: Leadership vs Management, Leadership Theories, Emerging issues in Leadership		
Unit–IV: Personnel Selection and Training	No. of Lectures: 08 Hours	Marks: 12
Job Profile, job analysis and Recruitment techniques, Interviews, psychological testing and Needs assessment for training, Psychological Principles in training and training for knowledge and skill, Evaluation of Training Programme.		
Unit–V: Job Evaluation and satisfaction	No. of Lectures: 08 Hours	Marks: 12
Uses of performance evaluation: Downsizing, promotion, seniority, Appraisal rating systems: Graphic rating scales and rating errors, Non-rating evaluation methods: Checklists and comparison methods. Job satisfaction as a job attitude, Components of job satisfaction: Satisfaction with work, with pay and with Supervision, Measuring job satisfaction: Job Descriptive Index, Minnesota Satisfaction, feelings about work,		
Text Books:		
1. Michael G. Aamodt A textbook on Applied Industrial/ Organizational Psychology. 2. Richard Cyert and James March, A Behavioural Theory of The Firm, Blackwell Publishers. 3. Paul Spector, Industrial and organizational Psychology, Wiley		

Reference Books:

1. Aamodt, M.G. (2007), Industrial and organizational psychology: An applied approach. US:Thomson & Wadsworth.
2. Berry, L.M. (1998), reprint 2010. Psychology at work: An introduction to Industrial and Organizational Psychology. N.Y.: McGraw-Hill International Editions.
3. Luthans, F. (1995). Organizational behavior (7th ed). New York: McGraw- Hill, inc. Corporate Social Responsibility – Madhumita Chattergi – Oxford University Press.
4. Khanna O.P. : Industrial Engineering obbins, Stephen, Organizational Behavior, Prentice Hall, India.
5. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi: Tata McGraw Hill.

Automobile System Lab

LAB COURSE OUTLINE

Course Title:	*Automobile System Lab*	**Short Title:**	*AS Lab*	**Course Code:**	

Course description:

This subject includes various systems and their operations on ignition system, battery working starting systems, tyres and wheels.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	02	14	28	1

End Semester Exam (ESE) Pattern: ***Oral (OR)***

Prerequisite course(s):

Automobile Engineering, Automobile Air Conditioner, Automobile Design

Course objectives:

To study various layouts and their systems

Course outcomes:

Upon successful completion of lab Course, student will be able to:

Distinguish the various operating systems with their working mechanism like vehicle layouts, ignition system, Air conditioner, automotive batteries.

LAB COURSE CONTENT

Automobile System		**Semester:**	*III*
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***

(Any Six experiments were carried out)

1. To study different vehicle layouts & their comparison
2. To study various batteries testing & battery charging methods.
3. To study battery ignition & magneto ignition system
4. To study Electronics ignition & distributor less ignition system
5. To study Bendix drives and overrunning clutch type starting motors
6. To study of power steering mechanism
7. Trial on wheel alignment and wheel balancing machine
8. To study automobile air conditioning system.

Text Books:

1. Dr. Kripal Singh, ”Automobile Engineering” vol-I&II
2. R.B. Gupta, ”Automobile Engineering” ;Satya prakashan, New Delhi
3. Newton, steed and Garret, “Motor vehicle”, Butter worth, London

Reference Books:

1. Narang G.B.S, “Automobile Engineering”, Khanna publication, New Delhi
2. A.W. Judge, ”Modern Transmission” Chapmen and Hall std 1989
3. Nakara C.P., ”Basic Automobile Engineering”, Dhanpat Rai Publishing co.

Guide lines for ICA:

The duration for completion of experiment is of 1 week

Guidelines for ESE:

Oral will be based on above experiments.

Thermodynamics Lab					
LAB COURSE OUTLINE					
Course Title:	*Thermodynamics Lab*	Short Title:	*Thermo Lab*	Course Code:	
Course description:					
This course provides the students with comprehensive study of domestic Refrigerator, Air conditioner, Four stroke engine, Two stroke engine, various Nozzles, Centrifugal pump, Air compressor and Heat exchangers.					
Laboratory	Hours/week	No. of weeks	Total hours	Semester credits	
	02	*14*	*28*	*01*	
End Semester Exam (ESE) Pattern:		*Oral (OR)*			
Prerequisite course(s):					
Physics					
Course objectives:					
1. To understand the construction and working of thermal appliances. 2. To analysis the performance. 3. To study uses and applications of these thermal devices.					
Course outcomes:					
Upon successful completion of lab Course, student will be able to:					
1. Describe the construction and working of thermal appliances. 2. Explain thermal systems. 3. Apply the thermal principles.					
LAB COURSE CONTENT					
Thermodynamics Lab			Semester:	*III*	
Teaching Scheme:			Examination scheme		
Practical:	2 hours/week		End semester exam (ESE):		*25 marks*
			Internal Continuous Assessment (ICA):		*25 marks*
1. Demonstration and study of domestic Refrigerator. 2. Demonstration and study of Air conditioner. 3. Demonstration and study of Four stroke engine. 4. Demonstration and study of Two stroke engine. 5. Demonstration and study of various Nozzles. 6. Demonstration and study of Centrifugal pump. 7. Demonstration and study of Air compressor. 8. Demonstration and study of Heat Exchanger.					
Text Books:					

1. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd.
2. R K Rajput, 2016, A Textbook of Engineering Thermodynamics, Laxmi Publication, 5th edition.
3. Domkunwar, (2016), A Course in Thermal Engineering, Dhanpat Rai & Co., 6th edition
4. Y.V.C.Rao, (2004), An Introduction to Thermodynamics, Universities Press.
5. C. P. Arora, (2005), Thermodynamics, Tata McGraw-Hill Publishing Company Ltd.
6. David R. Gaskell, (2003), Introduction to Thermodynamics of Materials, Taylor and Francis Publisher.
7. M. Achuthan, (2004), Engineering Thermodynamics, Prentice Hall India Limited.
8. Eastop, (2004), Applied Thermodynamics for Engineering Technologies, Addison-Wesley Logman Limited.

Reference Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edit ion, *Fundamentals of Thermodynamics*, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
4. Yunus A. Cengel, (2005), Thermodynamics: An Engineering Approach, Tata McGraw-Hill Publishing Company Ltd.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Computer Graphics lab					
COURSE OUTLINE					
Course Title:	*Computer Graphics lab*	Short Title:	*CG*	Course Code:	
Course description:					
This course includes design and drafting related to mechanical elements. Lab‟s related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.					

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	01	14	14	2
Laboratory	02	14	28	

Prerequisite course (s):
Engineering Graphics, Essential Computer Knowledge Required.

Course objectives:

1. Learn to sketch and take field dimensions.
2. Learn to take data and transform into the graphics drawing
3. Learn basic AutoCAD skills.
4. Learn basic engineering drawing formats
5. To model the object using Wireframe, surface and solid modeling techniques

Course outcomes:

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

1. Demonstrate and understand the basic concepts of geometric modeling and computer graphics.
2. Drafting of mechanical elements.
3. Programs for mechanical elements in Auto-LISP.
4. Solve numerical on transformation.

COURSE CONTENT			
Name of the Subject: Computer Graphics		Semester:	*III*
Teaching Scheme:		Examination scheme	
Lectures:	1 hours/week	End semester exam (ESE):	25 marks
		Internal Class Assessment (ICA):	25 marks
Unit–I: Overview of Computer Graphics covering		No. of Lectures: 02 Hours	

Introduction to CAD. Advantages and Applications of CAD. Difference between conventional drafting methods and CAD. Introduction to Auto-CAD and Details of various menu bars and tool bars, Drawing Area etc. Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Cross hairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects

Unit–II: Customization & CAD Drawing	No. of Lectures: 02 Hours
Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles. Annotations, layering & other functions covering: Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers	

Unit–III: Transformations in Graphics	No. of Lectures: 04 Hours
Two Dimensional transformation, Homogeneous transformation, Concatenate co ordinate transformation, Translation, Rotation, Scaling, Mirror, Reflection, Inverse coordinate transformation, clipping, 3D transformation, View Port, Windowing and clipping	

Unit–IV: Computer-Aided Design (CAD)	No. of Lectures: 02 Hours
Requirement of Geometric Modeling, Salient features of Geometric Model, Geometric Model Construction Method: Wire Frame Modeling, Surface Modeling, Solid Modeling, and Introduction to Bezier curve.	

Unit–V: Auto-LISP Programming	No. of Lectures: 04 Hours
Introduction to Auto - LISP programming, Advantages and Applications of Auto-LISP . Auto-LISP commands, Auto-LISP Programs for simple geometric shapes-line, circle, rectangle, etc Auto-LISP Programs for elements geometric shapes such as circle in rectangle, triangle in rectangle, etc.	

LAB COURSE CONTENT			
Computer Graphics Lab		Semester:	*III*
Teaching Scheme:		Examination scheme	
Practical:	2 hours/week	End semester exam (ESE):	*25 marks*
		Internal Continuous Assessment (ICA):	*25 marks*
List of Practical‟s and Assignments			

1. Two Dimensional Sketch of any mechanical component using AutoCAD software.
2. Isometric Drawing of any Mechanical Component using AutoCAD software.
3. AutoLisp Programming for any two components such as rectangular Plate, rectangular plate with hole, triangular plate etc.

Assignment:

1. Assignments on introduction to AutoCAD
2. Assignments on introduction to Auto LISP programming

Text Books:

1. AutoCAD reference manual
2. A text book on Computer Graphics Including CAD, AutoCAD & 'C' by. A. M. Kuthe , S. Chand Publications.
3. A text book on CAD/CAM and Automation by R. B. Patil, Tech. max Publication.
4. Auto-LISP Developer's Guide.
5. A text book on CAD CAM and Automations by Farazdak Haidri.
6. H.G. Phakatkar, Engineering Graphics, Nirali publication.

Reference Books:

1. Ibrahim Zeid and R. Sivasubramanian - CAD/CAM – Theory and Practice Tata McGraw Hill Publishing Co. 2009
2. Rao P.N., Introduction to CAD/CAM Tata McGraw Hill Publishing Co.
3. P. Radhkrishnan, S. Subramanyam, V. Raju ,"CAD/CAM/CIM" , New Age Publication.
4. Mikell P. Grover, Emory W. Zimmers ,"Computer Aided Design and manufacturing", P.H.I.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Bachelor of Engineering

(Automobile Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
(3rd Cycle)

Syllabus Structure & Contents
Of
Second Year of Engineering
Semester-IV
w.e.f. 2018 – 19

Mathematics-III					
COURSE OUTLINE					
Course Title:	Mathematics - III	Short Title:	M-III	Course Code:	

Course description:
This course provides the elementary level knowledge of first order and second order partial Differential Equations, Statistics and Probability Distributions. Course includes solution of 2nd order partial differential equations, solution of one dimensional wave equation and heat diffusion and vibration problems.

	Hours/week	No. of weeks	Total hours	Semester credits
Lecture 03	3	14	42	3
Tutorial 01	1	14	14	1

Prerequisite course(s):
mathematics- I and mathematics- II

Course objectives:

(1) To introduce the solution methodologies for second order Partial Differential Equations
with applications in engineering
(2) To provide an overview of probability and statistics to engineers

Course outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving PDEs. They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

COURSE CONTENT

Mathematics - III		Semester:	IV
Teaching Scheme:		Examination scheme	
Lectures:03	3 hours/week	End semester exam (ESE):	60 marks
Tutorial:01	1 hours/week	Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

Laplace Transform: Properties of Laplace Transform. Inverse Laplace transform & Properties. Convolution theorem. Evaluation of integrals by Laplace transform.

Unit–II:	No. of Lectures: 08 Hours	Marks: 12

Partial Differential Equations :
Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear

partial differential equations of second order by complimentary function and particular integral method.		
Unit–III	No. of Lectures: 09 Hours	Marks: 12
1) Application of Laplace Transform Solving ordinary differential equations by Laplace Transform. 2) Application Of PDE: Initial and boundary conditions. wave equation; one dimensional heat flow equation, Two dimensional heat flow equation.		
Unit–IV	No. of Lectures: 08 Hours	Marks: 12
Statistics: Measures of Central tendency, Moments, skewness and Kurtosis.,Probability distributions: Binomial, Poisson and Normal. Correlation and regression. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas		
Unit–V:	No. of Lectures: 09 Hours	Marks: 12
Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi-square test for goodness of fit.		
Text Books:		
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,ninth edition 2016. 2. H.K.DASS "Advance Engineering Mathematics" S. Chand publications. 3. S. C. Gupta "Fundamentals of Statistics",Himalaya Publishing House 4. Debashis Datta "Textbook of Engineering Mathematics''New Age International Publication. Revised second edition		
Reference Books:		
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint). 3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.		

Automobile Chassis and Body Engineering

COURSE OUTLINE

Course Title:	*Automobile Chassis and Body Engineering*	**Short Title:**	*ACBE*	**Course Code:**	

Course description:

This subject includes various chassis layouts and bodies and their design requirements related to motor vehicle act like materials, aerodynamics, requirements of Passenger vehicle, Luggage space, Repairs of chassis and painting.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	4

Prerequisite course (s):

Automobile System, Automobile Engineering, Automobile Chassis/Layouts, Automobile design

Course objectives:

To study various repairing and testing works, body mechanisms and painting processes.

Course outcomes:

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

1. Describe various styles and nomenclatures of vehicles.
2. Able to acknowledge the chassis exterior and interior layouts.
3. Able to design seat, body, space requirements.

COURSE CONTENT

Automobile Chassis and Body Engineering	**Semester:**	*IV*

Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I: Vehicle Bodies and Materials	**No. of Lectures: 08 Hours**	**Marks: 12**

Classification, nomenclature of car body, different types of car body, Basic Requirements & Structures Of Different Vehicle Bodies Regulations & Standards, Constructional Trends & Styling Forms. Timber Reinforced Plastic Molding, Sandwich Construction, Light Alloys, Expanded Metals, Fasteners, Adhesives, Glass, Steel Sheets, Insulating Materials, Use Of Aluminum Structure For Bus Body Building.

Unit–II: Private Car Body Work	**No. of Lectures: 08 Hours**	**Marks: 12**

Sheet Metal Construction, Body Work Aerodynamics (Drag & Lift, Pitching, Yawing & Rolling) Forces & Moments, Sideways Forces, Hull Sealing, Commercial Vehicle Body Design - Bus & Truck Body Weight Analysis, Pay Load, Methods Employed In Loading & Discharge, Body

Builders Drawing, Body Mounting, Wood Working Joints, Roof Construction Floor Construction.		
Unit–III: Body Mechanism	**No. of Lectures: 08 Hours**	**Marks: 12**
Design Of Windows, Door Construction, Design Of Luggage Carrier, Design Of Spare Wheel Carrier, Design Of Passenger Seats, Driver Seats, Comfort Factors, Circle Of Riding Comfort, Effect Of Discomfort, Safety Consideration, Body Work Drafting :- Full Size Layout On Draft, Proportional, Developments, Timber Framing For Composite Body Work , Body Draughtsman Curves.		
Unit–IV: Auto Body Repairs & Testing	**No. of Lectures: 08 Hours**	**Marks: 12**
Broad Review Of Manufacturing Processes & Equipments, Manufacture Of Prototype, Static & Dynamic Testing, Sources Of Body Noises, Testing & Elimination, Leakage Testing, Testing For Safety & Road Testing, Sheet Metal Working Tools, Timber Body Repairs, Light Alloy & Steel, Body Repair, Repairs To Reinforced Plastics Body Work, Corrosion Repairs.		
Unit–V: Painting & Anti-Corrosion Finishes	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction, Cleaning, Pretreatment, Priming, Finish Coating, Stoving, Internal Corrosion & sealing, Materials Of Construction, Painting Processes, Protection Of A Finished Cars, Water Leaks, Water Drainage, System, Windscreens, Apron Panel & Heating/Ventilation, Rear Drip, Tail Gate.		
Text Books:		
1. G.Y Wong "Theory of Ground Vehicle"; John Willey & Sons. 2. Raza N Jazzar, "Vehicle Dynamics"; Springler.		
Reference Books:		
1. Hans-Joachim Streitberger "Automobile Paints & Coatings, Wiley _ VCH Verlay GmbH & Co. KGaA 2. Hans-B Pacejka, Tyre & Vehicle Dynamics. 3. Jason c.Brown, A.John Robertson, "Motor Vehicle Structure "; Butterworth Heinemann.		

Applied Thermodynamics

COURSE OUTLINE

Course Title:	*Applied Thermodynamics*	Short Title:	AT	Course Code:	

Course description:

This course is designed to introduce students with basic concepts of thermodynamic systems and their application in real life including Steam Power Plant, Air Compressors and its different component. The course will help students to understand the dynamics of energy through the air, gas or other media and build students‟ ability to solve thermodynamic problems and understand other basic properties of gases, liquids, vapours with energy and energy transfer mechanisms, enthalpies/analysis of systems. The course also includes vapour and gas cycles theories of energy generating systems, such as boilers and the use of steam tables and mollier chart to study energy properties of the steam at different conditions. Students will also familiarize with the SI and English Units commonly used in the field of thermodynamics.

Lecture	Hours/week	Tutorial/ week	No. of weeks	Total hours	Semester credits
	03	01	14	56	04

Prerequisite course (s):-

- Applied Physics
- Fundamentals of Thermodynamics

Course Objectives:

1. To learn about of I law for reacting systems and heating value of fuels.
2. To learn about gas and vapour cycles and their first law and second law efficiencies.
3. To understand about the properties of steam and its applications in steam operated devices.
4. To learn about gas dynamics of air flow and steam through nozzles.
5. To learn the about reciprocating compressors with and without inter-cooling.
6. To analyse the performance of steam turbines.

Course Outcomes:

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

1. After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles.
2. They will be able to analyse energy conversion in various thermal devices such as engines, nozzles, diffusers, steam turbines and reciprocating compressors.
3. They will be able to comprehend the phenomena of Boiler performance system.
4. They will be able to understand phenomena occurring in high speed compressible flows.

COURSE CONTENT

Applied Thermodynamics		Semester:	*IV*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
Tutorials:	1 hours/week	Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Chemical Thermodynamics	No. of Lectures: 08 Hours	Marks: 12
Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis – Orsat apparatus and Gas Chromatography, Actual Air-Fuel Ratio, Excess air supplied, First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy, Joule–Thomson effect.		

Unit–II: Steam Generators (Boiler) and its Analysis	No. of Lectures: 09 Hours	Marks: 12
Steam Power Plant layout, Classification and selection of boilers, IBR act. Boiler performance - Equivalent evaporation, boiler efficiency. Numerical on boiler performance. Energy balance for a boiler. Numerical on Energy balance for a boiler. Boiler Draught - Natural & Artificial draught. Derivation of Height & Diameter of Chimney and Numerical. Draught losses, Condition for maximum discharge through chimney- Numerical.		

Unit–III: Power Cycles	No. of Lectures: 07 Hours	Marks: 12
Vapour power cycles- Rankine cycle with superheat, reheat and regeneration, use of mollier chart, Super-critical and ultra-super-critical Rankine cycle, Gas power cycles - analysis of air standard Otto, Diesel and Dual Cycles, Air standard Brayton cycle – Analysis and effect of reheat, regeneration and inter-cooling, Analysis of steam turbines, velocity and pressure compounding of steam turbines.		

Unit–IV: Compressible Fluid Flows	No. of Lectures: 08 Hours	Marks: 12
Basics of compressible flow, Stagnation properties, Mach number, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows, normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, supersaturation- compressible flow in diffusers, efficiency of nozzle and diffuser.		

Unit–V : Air Compressors	No. of Lectures: 08 Hours	Marks: 12
Applications of Compressed Air, Classification of Compressors, reciprocating compressors: with clearance, without clearance, staging of reciprocating compressors, optimal stage pressure ratio, effect of inter-cooling, minimum work for multistage reciprocating compressors, free air delivered (FAD), Volumetric efficiency and Isothermal efficiency.		

Text Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd
5. R. P. Yadav, Applied Thermodynamics & Heat Engines –Vol II, 5th edition, 2012
6. M M Rathod, "Thermal Engineering", Tata McGraw Hill.

Reference Books:

1. R K Rajput, "Thermal Engineering", Laxmi Publication New Delhi.
2. Domkundwar and Kothandaraman,"Thermal Engineering", Dhanpat Rai & Co.
3. Onkar Singh, "Applied thermodynamics", New Age International Publisher.
4. Y A Cengel and M A Boles, "Thermodynamics: an Engineering Approach", Tata McGraw Hill.
5. P L Ballaney, "Thermal Engineering", Khanna Publishers, New Delhi.
6. Venkanna, Swati,"Applied Thermodynamics",PHI.
7. D.S. Kumar, "Thermal Science & Engineering", S.K. Kataria & Sons
8. P K Nag,"Power Plant Engineering", Tata McGraw Hill.
9. T. D. Eastop and A. McConkey, "Applied Thermodynamics for Engineering Technologists", Pearson Education India

Fluid Mechanics And Fluid Machines					
COURSE OUTLINE					
Course Title:	*Fluid Mechanics And Fluid Machines*	Short Title:	*FM*	Course Code:	
Course Description:					
The primary aim of this course is to provide students with a first introduction to continuum mechanics, in general and theoretical fluid mechanics in particular. Course is deal with understanding and hence predicting the properties of liquid and gases under external forces. Course provides introduction to principle concepts and method of fluid mechanics. Topics covered in the course include pressure, hydrostatics and buoyancy. Mass conservation and momentum conservation for moving fluids; viscous fluid flow, flow through pipes, dimensional analysis. Students will work to formulate and developed the problem solving skills essential to good engineering practice of fluid mechanics in practical applications.					

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3

Prerequisite course (s):

Engineering Mechanics, Applied Physics, Mathematics

Course objectives:

1. To learn about the application of mass and momentum conservation laws for fluid flows
2. To understand the importance of dimensional analysis
3. To obtain the velocity and pressure variations in various types of simple flows
4. To analyze the flow in water pumps and turbines.
5. To understand fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
6. To implement basic laws and equations used for analysis of static and dynamic fluid.

Course outcomes:

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

1. Upon completion of this course, students will be able to mathematically analyze simple flow situations
2. They will be able to evaluate the performance of pumps and turbines.
3. Understand Euler‟s equation of motion hence to reduce Bernoulli‟s equation and its application in fluid mechanics.
4. Examine energy losses in pipes transitions and Evaluate pressure drop in pipe flow using Hagen-Poiseuille‟s equation.

COURSE CONTENT

Fluid Mechanics And Fluid Machines		Semester:	*IV*
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks

	Duration of ESE:	03 hours
	Internal Sessional Exams (ISE):	40 marks

Unit–I: Fundamental of Fluid Mechanics	No. of Lectures: 09 Hours	Marks: 12
Properties of fluid: -Definition of fluid, Newton‟s law of viscosity, Units and dimensions- Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum equation, Incompressible flow Fluid Statics:- Pascal‟s law, pressure at a point, Hydrostatic law derivation , Total pressure and centre of pressure for vertical , horizontal, inclined curve surface it‟s derivation, concepts of buoyancy, metacentre and floatation.		
Unit–II: Fluid Kinematics & Dynamics	No. of Lectures: 09 Hours	Marks: 12
Kinematics: - Eulerian and lagrangian approach to solution, Definition of streamlines, Path line, steak line, Different types of flow; steady and unsteady flow, uniform and non-uniform flow, Laminar, Turbulent, compressible, incompressible, rotational, irrotational flows. Fluid Dynamics: - continuity equation for flow, Euler‟s equation, Bernoulli‟s equation along stream line for incompressible flow. Practical application of Bernoulli‟s equation: Pitot tube, venture meter, Orifice meter.		
Unit–III: Laminar flow and Dimensional Analysis.	No. of Lectures: 08 Hours	Marks: 12
Laminar flow: - Definition of Laminar flow relation between pressure and shear stress, laminar flow through circular pipe, fixed plate. Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer – measures of boundary layer thickness Need for dimensional analysis – methods of dimension analysis – Similitude – types of similitude Dimensionless parameters – application of dimensionless parameters – Model analysis.		
Unit–IV: Fundamental of Fluid Machines & Flow Through Pipes	No. of Lectures: 08 Hours	Marks: 12
Euler‟s equation – theory of Rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitation in pumps- Reciprocating pump – working principle. Flow through Pipes. TEL, HGL, Energy losses through pipes. Darcy- weisbach Equation. Minor losses in pipes. friction factor, Moody‟s diagram		
Unit–V:Hydraulic Turbines	No. of Lectures: 08 Hours	Marks: 12
Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working		

principles – draft tube- Specific speed, unit quantities, performance curves for turbines – governing of turbines.

Text Books:

1. Textbook of fluid mechanics and hydraulics machine, Dr. R.K. Bansal, Laxmi publication New Delhi.
2. Textbook of fluid mechanics and hydraulics machine, R.K. Rajput, S Chand and Co. Delhi.
3. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
4. R. Subramanian, Strength of Materials, Oxford University Press, 2007.
5. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGraw Hill Publishing Co. Ltd., New Delhi 2005

Reference Books:

1. Introduction to fluid mechanics, S. K. Som and G. Biswas, Tata McGraw Hill Publisher Pvt. Ltd.
2. Hydraulics and Fluid Mechanics, P.N. Modi and S.M. Seth, Standard book house Delhi.
3. Fluid Mechanics Victor Lyle Streeter, E. Benjamin Wylie, Tata McGraw-Hill Publisher Pvt. Ltd.
4. Fluid Mechanics by Frank. M. White, Tata McGraw-Hill Publisher Pvt. Ltd

Industrial Economics

COURSE OUTLINE

Course Title:	Industrial Economics	Short Title:	*IE*	Course Code:	

Course Description:

Principles of Microeconomics :- To provide an overview of microeconomic issues - the behavior of individual household , firm & market in respect of demand , supply & price for goods and services ; demand , supply & price determination .
Principles of Macroeconomics: - To provide an overview of macroeconomic issues – national income & economic growth, inflation, international trade, rate of exchange, balance of payment, monetary & fiscal policy.
Business & Managerial Economics :- To provide an overview of actual demand forecasting & price determination in practice

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3

Prerequisite course (s):

Principles of Managements

Course objectives:

The student after studying this subject will learn about :-

1. The basic objectives & concepts of micro economics
2. The concept of economy & economic laws.
3. The concept of demand, supply & price, their inter-relation & their elasticity.
4. The concept of demand forecasting.
5. The basic objectives & concepts of macro economics.
6. The concepts of national income , economic growth & inflation
7. The concept of international trade policy, rate of exchange, trade, deficit, monetary & fiscal policy.

Course outcomes:

After completing this course the student will be able to :-

1. Confidently apply for the post of Purchase or Sales Engineer
2. Look for suitable projects & scope for entrepreneurship

COURSE CONTENT

Industrial Economics		Semester: IV	
Teaching Scheme:		Examination scheme	
Lectures:	3 hours/week	End semester exam (ESE):	60 marks
		Duration of ESE:	03 hours
		Internal Sessional Exams (ISE):	40 marks

Unit–I: Introduction to economics	No. of Lectures: 08 Hours	Marks: 12

Definition , importance , issues , micro & macroeconomics, Concept of Economy – 2 & 4

sector model , capitalist , socialist & mixed economy
Economic laws – their nature , limitation , importance & application
Law of diminishing return / marginal utility.

Unit–II: Demand and Supply	No. of Lectures: 08 Hours	Marks: 12

Meaning , individual & market demand , factors effecting demand , Law of demand , demand curve , Price elasticity of demand & its measurement , demand forecasting
Supply – meaning , individual & market supply , factors effecting supply , Law of supply , supply curve , Price elasticity of supply & its measurement.

Unit–III: Production	No. of Lectures: 08 Hours	Marks: 12

Short run , long run , very long run ; issues , short run production curve , marginal & average production , Laws of production ; cost concepts , economies of scale
Concept of market , market equilibrium & equilibrium price , Price determination in different types of market , Price determination in practice.

Unit–IV: Macro-economics	No. of Lectures: 10 Hours	Marks: 12

Macro-economics - definition , importance & scope
National Income – definition & methods of measurement
Economic Growth – definition , factors affecting growth
Inflation – definition , measurement method , effects ; demand-pull , cost-push & other factors.

Unit–V: International Trade	No. of Lectures: 08 Hours	Marks: 12

Law of Reciprocal demand , free trade , trade protection policy, Concepts of Rate of Foreign Exchange , Balance of Payment, Monetary & Fiscal Policy – objectives , instruments , limitations.

Text Books:

1. Principles of Economics by Frank and Bernanke – Tata McGraw hill publication
2. Principles of Economics by D.N. Dwivedi – Vikas Publishing House
3. Managerial Economics by D.M. Mithani - Himalaya Publishing House
4. Managerial Economics by Dr. H.L. Ahuja - S. Chand
5. Business Economics by Gillespe – Oxford University Press
6. Microeconomics by D.N. Dwivedi - Pearson
7. Macro Economics -A South Asian Perspective by W. McEachern , A. Indira, Cengage Learning

Applied Thermodynamics Lab					
COURSE OUTLINE					
Course Title:	*Applied Thermodynamics Lab*	Short Title:	AT Lab	Course Code:	

Course description:

In this laboratory, course emphasis is on the understanding of basic principles, working of Orsat apparatus, Bomb calorimeter, Reciprocating air compressors, different components of Steam Power Plant. The learner can use this knowledge and apply in various industries as required.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

Prerequisite course (s):-

- Basic principles and theories
- Fundamentals of Thermodynamics

Course Objectives:

This course is intended to provide engineering students with an application of important concepts, principles of Engineering Thermodynamics and emphasis on those areas considered most relevant in an engineering context with practical applications in engineering and technology.

1. To impart knowledge of basic concepts in applied Thermodynamics and implementation to various engineering fields.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.

Course Outcomes:

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

1. Comprehend the Performance parameters of 4-Stroke petrol/diesel engine
2. Analyze the Calorific value of fuel sample by using Bomb calorimeter.
3. Investigate the Flue Gas analysis using gas analyzer.
4. Conduct a trial on air compressor.
5. Understand the difference parameters of boiler performance and properties of steam

LAB COURSE CONTENT

Applied Thermodynamics Lab	Semester:	*IV*
Teaching Scheme:	Examination scheme	
Practical: 2 hours/week	End semester exam (ESE):	*25 marks*
	Internal Continuous Assessment (ICA):	*25 marks*

(Any 5 Practical)

1. Determination of Calorific value of a solid / liquid fuel using Bomb Calorimeter.
2. Determination of Exhaust gas analysis using Gas Analyzer
3. Determination of Isothermal and Volumetric efficiency of single/multi-stage reciprocating air compressor.

4. Determination of the p-V diagram and the performance of a 4-stroke diesel engine.
5. Determination of the performance of 4-stroke petrol engine test rig.
6. To find out dryness fraction of steam using combined separating and throttling calorimeter.
7. Visit to the any Thermal Power plant station.

Text Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd
5. R. P. Yadav, Applied Thermodynamics & Heat Engines –Vol II, 5th edition, 2012
6. M M Rathod, "Thermal Engineering", Tata McGraw Hill.

Reference Books:

1. R K Rajput, "Thermal Engineering", Laxmi Publication New Delhi.
2. Domkundwar and Kothandaraman, "Thermal Engineering", Dhanpat Rai & Co.
3. Onkar Singh, "Applied thermodynamics", New Age International Publisher.
4. Y A Cengel and M A Boles, "Thermodynamics: an Engineering Approach", Tata McGraw Hill.
5. P L Ballaney, "Thermal Engineering", Khanna Publishers, New Delhi.
6. Venkanna, Swati, "Applied Thermodynamics", PHI.
7. D.S. Kumar, "Thermal Science & Engineering", S.K. Kataria & Sons
8. P K Nag,"Power Plant Engineering", Tata McGraw Hill.
9. T. D. Eastop and A. McConkey, "Applied Thermodynamics for Engineering Technologists", Pearson Education India

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Fluid Mechanics Lab					
COURSE OUTLINE					
Course Title:	Fluid Mechanics Lab	Short Title:	FM Lab	Course Code:	

Course description:

The primary aim of this course is to provide students with basic fundamentals of fluid mechanics through experimentations. Course provides introduction to principle concepts and method of fluid mechanics. Topics covered in the course include pressure, hydrostatics and buoyancy. Mass conservation and momentum conservation for moving fluids; viscous fluid flow, flow through pipes, dimensional analysis.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	02	14	28	01

Prerequisite course (s):-

Engineering Mechanics, Applied Physics, Mathematics

Course Objectives:

1. To learn about the application of mass and momentum conservation laws for fluid flows
2. To obtain the velocity and pressure variations in various types of simple flows
3. To analyze the flow in water pumps and turbines.
4. To understand fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
5. To implement basic laws and equations used for analysis of static and dynamic fluid.

Course Outcomes:

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

1. Upon completion of this course, students will be able to mathematically analyze simple flow situations.
2. They will be able to evaluate the performance of pumps and turbines.
3. Understand Euler‟s equation of motion hence to reduce Bernoulli‟s equation and its application in fluid mechanics.
4. Examine energy losses in pipes transitions and Evaluate pressure drop in pipe flow using Hagen-Poiseuille‟s equation.

LAB COURSE CONTENT

Fluid Mechanics Lab	Semester:	*IV*
Teaching Scheme:	Examination scheme	
Practical: 2 hours/week	End semester exam (ESE):	*25 marks*
	Internal Continuous Assessment (ICA):	*25 marks*

Note: Lab file should contain at list EIGHT experiments from below mentioned list.

1. To find the viscosity of a given oil by using Red wood viscometer.
2. To verify the Bernoulli‟s theorem
3. Measurement of Coefficient of Discharge of given Orifice and Venturi meters.
4. Experiment on determination of major and minor losses for flow through pipes
5. Determination of the performance characteristics of a centrifugal pump.
6. Determination of the performance characteristics of Pelton Wheel
7. Determination of the performance characteristics of a Francis Turbine
8. Determination of the performance characteristics of a Kaplan Turbine
9. Determination of the density & viscosity of an oil and friction factor of oil flow in a pipe
10. To study the flow patterns by using Reynolds‟s apparatus
11. Study of velocity distribution in boundary layer and its thickness.

Text Books:

1. Textbook of fluid mechanics and hydraulics machine, Dr. R.K. Bansal, Laxmi publication New Delhi.
2. Textbook of fluid mechanics and hydraulics machine, R.K. Rajput, S Chand and Co. Delhi.
3. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
4. R. Subramanian, Strength of Materials, Oxford University Press, 2007.
5. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGrawHill Publishing Co. Ltd., New Delhi 2005

Reference Books:

1. Introduction to fluid mechanics, S. K. Som and G. Biswas, Tata McGraw Hill Publisher Pvt. Ltd.
2. Hydraulics and Fluid Mechanics, P.N. Modi and S.M. Seth, Standard book house Delhi.
3. Fluid Mechanics Victor Lyle Streeter, E. Benjamin Wylie, Tata McGraw-Hill Publisher Pvt. Ltd.
4. Fluid Mechanics by Frank. M. White, Tata McGraw-Hill Publisher Pvt. Ltd

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Drawing of Automotive Components

COURSE OUTLINE

Course Title:	*Drawing of Automotive Components Lab*	**Short Title:**	*DOAC*	**Course Code:**	

Course description:

This subject includes free hand sketching of various machine components and drawing sheets related to assembly and details of automotive components such as couplings, bearings, clutches, gear boxes etc. The course also introduces students to study sequences of preparing the assembly drawing of automotive components and bill of materials.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	01	12	12	2

Prerequisite course (s):

Automobile Design, Automobile Dynamics

Course objectives:

To study the various automotive components, layouts and their functions.

Course outcomes:

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

Students were able to acknowledge the automotive component sizes its structures and their design with their functional ability

Analyze the component functions and their construction.

COURSE CONTENT

Drawing of Automotive Components		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Lectures:	**1 hours/week**	**End semester exam (ESE):**	**25 marks**
		Duration of ESE:	**00hours**
		Internal Sessional Exams (ISE):	**00 marks**

Unit 1

Significance and importance of BIS Conventions, Conventional representation of engineering Materials, all type of gear and assemblies, helical and leaf springs, Internal and external threads, square head, spline shaft, diamond knurling, BIS conventions for sectioning, type of sections, BIS methods of linear and angular dimensioning. Symbolic representation of welds.
(First angle method of projection recommended by BIS is to be used)

Unit 2 -

Sketches of nut, bolts, square and hexagonal flanged nuts, lock nuts, dome nut, capstan nut, wing nut, castle nut, split pin, square headed bolt, cup headed bolt, Threaded bolt, Rag foundation bolt, stud, washer, Various types of rivets and riveted joints, Various types of keys, Muff coupling, Protected and unprotected flanged coupling, universal coupling, solid and bush bearing, Plumber block (pedestal bearing), foot step bearing, Flat and V-belt pulleys, Fast and loose pulleys, speed

cone pulleys, Wooden Joints, First angle method of projection is to be used.

Unit 3 -
Study of Limits, Fits and Tolerances

Unit. 4:
Study of Automotive components by taking actual measurement on parts by various measuring tools.

Unit 5:
Study of auxiliary views.

Text Books:

1. Machine Drawing, N. D. Bhatt, Chorotar Publishing House, Anand, India.
2. Mechanical Engineering Design, J. E. Shingle & C. R. Mischke,Tata McGraw Hill Publications, New Delhi.
3. Machine Drawing, N. Sidheswar & Kannaiah, Tata McGraw Hill Publications, New Delhi.
4. Machine Drawing, N. D. Junnarkar, Pearson Education.

Drawing of Automotive Components Lab

LAB COURSE OUTLINE

Course Title:	*Drawing of Automotive Components*	**Short Title:**	*DOAC*	**Course Code:**	

Course description:

This subject includes free hand sketching of various machine components and drawing sheets related to assembly and details of automotive components such as couplings, bearings, clutches, gear boxes etc. The course also introduces students to study sequences of preparing the assembly drawing of automotive components and bill of materials.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	12	24	2

End Semester Exam (ESE) Pattern: ***Oral (OR)***

Prerequisite course(s):

Automobile Design, Automobile Dynamics

Course objectives:

To study the various automotive components, layouts and their functions

Course outcomes:

Upon successful completion of lab Course, student will be able to:			
Students were able to acknowledge the automotive component sizes its structures and their design with their functional ability Analyze the component functions and their construction.			
LAB COURSE CONTENT			
Drawing of Automotive Components Lab		**Semester:**	*IV*
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	***25 marks***
		Internal Continuous Assessment (ICA):	***25 marks***
Sheet no. 1: Based on BIS conventions Sheet no. 2: Based on sketching (Free hand drawing) of various machine components. Sheet no. 3: Drawing details and assembly (12 Parts) Sheet no. 4: Drawing assembly from given drawing of details and entering limits, fits, tolerances, surface finish symbols, geometrical requirements etc. Sheet no. 5: Sheet based on auxiliary view.			
Text Books:			
1. Machine Drawing, N. D. Bhatt, Chorotar Publishing House, Anand, India. 2. Mechanical Engineering Design, J. E. Shingle & C. R. Mischke,Tata McGraw Hill Publications, New Delhi.			
Reference Books:			
1. Machine Drawing, N. Sidheswar & Kannaiah, Tata McGraw Hill Publications, New Delhi. 2. Machine Drawing, N. D. Junnarkar, Pearson Education.			
Guide lines for ICA:			
The duration for preparing a sheet is of 2 weeks			
Guidelines for ESE:			
Oral will be based on scaled free hand drawing and theory questions.			

Environmental Studies					
COURSE OUTLINE					
Course Title:	Environmental Studies	Short Title:	EVS	Course Code:	
Course description:					
The course aims to percolate the importance of environmental science and environmental studies.					
COURSE CONTENT					
Environmental Studies		Semester:	IV		
		Examination scheme			
		End Semester Exam (ESE):		60 marks	
		Duration of ESE:		03 hours	
		Internal Continuous Assessment (ICA):		40 marks	
Unit–I:	No. of Lectures: 02 Hours				
Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness.					
Unit–II:	No. of Lectures: 08 Hours				
Natural Resources : Renewable and non-renewable resources Natural resources and associated problems. a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest 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, case studies. d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. 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–III:	No. of Lectures: 06 Hours				
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)

Unit–IV:	No. of Lectures: 08 Hours	

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographic 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-sports 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–V:	No. of Lectures: 08 Hours	

Environmental Pollution
Definition

- Cause, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Unit–VI:	No. of Lectures: 07 Hours	

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. Case Studies

- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear
- accidents and holocaust. Case Studies.
- 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.

Unit–VII:	No. of Lectures: 06 Hours	

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Program
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit–VIII:		

Field work

- 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. (Field work Equal to 5lecture hours)

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Reference Books:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental

Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev.,Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay NaturalHistory Society, Bombay (R)
10. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press 1140p.
11. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws.Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
16. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ.Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, BlackwellScience (TB)

Internship - I

Internship is a mandatory and non-credit course. It is mandatory for all admitted students to undergo Internship during the degree course. The course Internship – I shall be of THREE weeks duration during summer vacation after Semester - IV. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.

Students shall choose to undergo Internship / Innovation / Entrepreneurship related activities for Internship. Students shall choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations / Micro / Small / Medium enterprises / academic institutions / research institutions. In case student want to pursue their family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the Department Head / TPO.

During the last year of FOUR year Bachelor of Engineering course the student should take project work, as specified in the curriculum, based on the knowledge acquired by the student during the degree course and during Internship. The project work provides an opportunity to build a system based on area where the student likes to acquire specialized skills. The work may also be on specified task or project assigned to the student during Internship.

The internship activities and list of sub-activities for Internship – I are as under.

- Inter/ Intra Institutional Activities:
    - Training with higher Institutions such as IITs, NITs, University Departments, Recognized Research Labs etc.
    - Soft skill training organized by Training and Placement Cell of the respective institutions
    - Online certification courses by SWAYAM, NPTEL, QEEE etc.
    - Learning at Departmental Lab/Tinkering Lab/ Institutional workshop
    - Working for consultancy/ research project within the institutes
    - Training on Software (As per the need of respective branch)
    - Field Survey / Case Study
- Internship:
    - Internship with Industry/Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ academic institutions / research institutions
    - Online Internship

Faculty Mentor/Supervisors have to play active roles during the internship and minimum 20 students are to be supervised by each faculty mentor or as per the departmental strength. Mentor shall be responsible for selection of Internship activities by the student under his/her supervision

and shall avoid repetition of activities by the student. The college / Institute shall facilitate internship for the students.

Every student is required to prepare a file for Internship – I containing documentary proofs (daily training diary, comprehensive report and completion certificate) of the activities done by him/her. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily training diary should include Date, Time of Arrival, Time of Departure, Main points of the day. The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working.

After completion of Internship, the student should prepare a comprehensive report to indicate what he / she has observed and learnt in the training period. The report should include Internship Objectives (in measurable terms), Internship Activities, and Internship Outcome.

The completion certificate should be signed by the supervisor / in charge of the section where the student has been working with performance remark as Satisfactory / Good / Excellent.

The evaluation of Internship – I shall be in Semester – V. The evaluation shall be done by expert committee constituted by the concerned department including Department Head/ TPO/ faculty mentor or guide. It should be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Originality.
- Adequacy and purposeful write-up.
- Practical applications, relationships with basic theory and concepts taught in the course.
- Skill / knowledge acquired

Hence the satisfactory completion of Internship – I shall be submitted to the university at the end of Semester - VIII of FOUR year Bachelor of Engineering course. Only after successfully completion of Internship- I (during summer vacation after Semester – IV) and Internship- II (during summer vacation after Semester – VI), Internship should be printed in the final year mark sheet as COMPLETED.