SRM UNIVERSITY
(Under section 3 of UGC Act 1956)

B.Tech. (Full Time) - Automobile Engineering
Curriculum & Syllabus
2013 – 2014

Volume – I
(all courses except open electives)

FACULTY OF ENGINEERING AND TECHNOLOGY
SRM UNIVERSITY
SRM NAGAR, KATTANKULATHUR – 603 203

STUDENT OUTCOMES

The curriculum and syllabus for B.Tech. programs (2013) conform to outcome based teaching learning process. In general, **ELEVEN STUDENT OUTCOMES** (a-k) have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear instructional objectives which are mapped to the student outcomes.

The student outcomes are:

(a) An ability to apply knowledge of mathematics, science, and engineering

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) An ability to function on multidisciplinary teams

(e) An ability to identify, formulate, and solve engineering problems

(f) An understanding of professional and ethical responsibility

(g) An ability to communicate effectively

(h) The broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context

(i) A recognition of the need for, and an ability to engage in life-long learning

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

B.TECH. AUTOMOBILE ENGINEERING
Applicable for students admitted from the academic year 2013-14 onwards)
CURRICULUM – 2013

SEMESTER I						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1001	G	SOFT SKILLS-I	1	0	1	1
MA1001	B	CALCULUS AND SOLID GEOMETRY	3	2	0	4
PY1001	B	PHYSICS	3	0	0	3
PY1002	B	PHYSICS LABORATORY	0	0	2	1
CY1003	B	PRINCIPLES OF ENVIRONMENTAL SCIENCE	2	0	0	2
Courses from Table I						
Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester. Keeping this in mind student shall register for the courses in I and II semesters.						

SEMESTER II						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1002	G	SOFT SKILLS-II	1	0	1	1
MA1002	B	ADVANCED CALCULUS AND COMPLEX ANALYSIS	3	2	0	4
PY1003	B	MATERIALS SCIENCE	2	0	2	3
CY1001	B	CHEMISTRY	3	0	0	3
CY1002	B	CHEMISTRY LABORATORY	0	0	2	1
ME1002	P	ENGINEERING MECHANICS	3	2	0	4
AE1001	P	ARTIFACT DISSECTION	0	0	2	1
Courses from Table I						
Student shall register for minimum 20 credits in I semester and minimum 20 credits in II semester. However student shall have registered for all the courses enlisted under Semester I and II as well the courses in Table I by the time the registration process is complete in II semester. Keeping this in mind student shall register for the courses in I and II semesters.						

Legend:

L - Number of lecture hours per week
T - Number of tutorial hours per week
P - Number of practical hours per week
C - Number of credits for the course

Category of courses:

G - General
B - Basic Sciences
E - Engineering Sciences and Technical Arts
P - Professional Subjects

TABLE I
COURSES WHICH CAN BE REGISTERED FOR EITHER IN I OR II SEMESTER

SEMESTER I / II						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1001	G	ENGLISH	1	2	0	2
LE1002	G	VALUE EDUCATION	1	0	0	1
CS1001	G	PROGRAMMING USING MATLAB	0	1	2	2
BT1001	B	BIOLOGY FOR ENGINEERS	2	0	0	2
CE1001	E	BASIC CIVIL ENGINEERING	2	0	0	2
ME1001	E	BASIC MECHANICAL ENGINEERING	2	0	0	2
EE1001	E	BASIC ELECTRICAL ENGINEERING	2	0	0	2
EC1001	E	BASIC ELECTRONICS ENGINEERING	2	0	0	2
ME1004	E	WORKSHOP PRACTICE	0	0	3	2
ME1005	E	ENGINEERING GRAPHICS	0	1	4	3
NC1001/ NS1001/ SP1001/ YG1001	G	*NCC/NSS/NSO/YOGA	0	0	1	1

*NCC-National Cadet Corps
NSS-National Service Scheme
NSO-National Sports Organization (India)

SEMESTER III						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1003/ LE1004/ LE1005/ LE1006/ LE1007	G	GERMAN LANGUAGE PHASE I / FRENCH LANGUAGE PHASE I/ JAPANESE LANGUAGE PHASE I / KOREAN LANGUAGE PHASE I / CHINESE LANGUAGE PHASE I	2	0	0	2
PD1003	G	APTITUDE I	1	0	1	1
MA1013	B	FOURIER SERIES, PARTIAL DIFFERNTIAL EQUATIONS AND ITS APPLICATIONS	4	0	0	4
ME1008	P	MANUFACTURING TECHNOLOGY	3	0	0	3

ME1009	P	FLUID MECHANICS	2	2	0	3
AE1002	P	THERMODYNAMICS & ENGINEERING	3	2	0	4
AE1003	P	INSTRUMENTATION FOR AUTOMOBILE ENGINEERS	2	0	0	2
ME1015	P	FLUID DYNAMICS LABORATORY	0	0	2	1
ME1018	P	MANUFACTURING AND ASSEMBLY DRAWING	0	1	3	2
AE1004	P	MANUFACTURING LABORATORY FOR AUTOMOBILE ENGINEERS	0	1	3	2
TOTAL			**17**	**6**	**9**	**24**
Total contact hours			**32**			

SEMESTER IV						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
LE1008/ LE1009/ LE1010/ LE1011/ LE1012	G	GERMAN LANGUAGE PHASE II / FRENCH LANGUAGE PHASE II/ JAPANESE LANGUAGE PHASE II / KOREAN LANGUAGE PHASE II / CHINESE LANGUAGE PHASE II	2	0	0	2
PD1004	G	APTITUDE II	1	0	1	1
MA1004	B	NUMERICAL METHODS	4	0	0	4
ME1010	P	MECHANICS OF SOLIDS	3	2	0	4
ME1022	P	MATERIALS TECHNOLOGY	3	0	0	3
ME1012	P	MACHINES AND MECHANISMS	3	2	0	4
AE 1005	P	AUTOMOTIVE ENGINES	3	0	0	3
ME1016	P	STRENGTH OF MATERIALS LABORATORY	0	0	2	1
ME1029	P	MATERIALS TECHNOLOGY LABORATORY	0	0	2	1
	P	Dep. Elective I	3	0	0	3
TOTAL			**22**	**4**	**5**	**26**
Total contact hours			**31**			

SEMESTER V						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1005	G	APTITUDE III	1	0	1	1
MA1005	B	PROBABILITY AND STATISTICS	4	0	0	4
AE1006	P	DESIGN OF AUTOMOTIVE COMPONENTS	3	2	0	4
AE1007	P	AUTOMOTIVE CHASSIS	2	2	0	3
AE1008	P	AUTOMOTIVE ENGINE SYSTEMS	3	0	0	3
AE1009	P	ENGINE AND FUEL TESTING LABORATORY	0	0	2	1
AE1010	P	AUTOMOTIVE COMPONENTS LABORATORY	0	0	2	1
AE1047	P	INDUSTRIAL TRAINING I (Training to be undergone after IV semester)	0	0	1	1
	P	Dep. Elective -II	3	0	0	3
	P	Open Elective I	3	0	0	3
TOTAL			**19**	**4**	**6**	**24**
Total Contact hours			**29**			

SEMESTER VI						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
PD1006	G	APTITUDE IV	1	0	1	1
AE1011	P	AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEMS	3	0	0	3
ME1035	P	METROLOGY AND QUALITY CONTROL	3	0	0	3
AE1012	P	AUTOMOTIVE TRANSMISSION	2	2	0	3
ME1039	P	METROLOGY AND QUALITY CONTROL LABORATORY	0	0	2	1
AE1013	P	AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY	0	0	2	1
AE1049	P	MINOR PROJECT	0	0	2	1
	P	Dep. Elective III	3	0	0	3
		Open Elective II	3	0	0	3
		Open Elective III	3	0	0	3
TOTAL			**18**	**2**	**7**	**22**
Total contact hours			**27**			

SEMESTER VII						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
AE1014	P	ALTERNATIVE FUELS AND POLLUTION CONTROL	2	2	0	3
AE1015	P	VEHICLE DYNAMICS	3	2	0	4
AE1016	P	VEHICLE BODY ENGINEERING AND AERODYNAMICS	3	0	0	3
AE1017	P	VEHICLE PERFORMANCE AND TESTING	3	2	0	4
AE1018	P	VEHICLE DYNAMICS LABORATORY	0	0	2	1
AE1019	P	VEHICLE TESTING LABORATORY	0	0	2	1
AE1048	P	INDUSTRIAL TRAINING II (Training to be undergone after VI semester)	0	0	1	1
	P	Dep. Elective IV	3	0	0	3
	P	Dep. Elective V	3	0	0	3
TOTAL			**17**	**6**	**5**	**23**
Total contact hours			**28**			

SEMESTER VIII						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
AE1050	P	MAJOR PROJECT / PRACTICE SCHOOL	0	0	24	12
Total			**0**	**0**	**24**	**12**
Total contact hours			**24**			

DEPARTMENTAL ELECTIVES

DESIGN						
Course Code	**Category**	**Course Name**	**L**	**T**	**P**	**C**
AE1101	P	DESIGN FOR SAFETY AND COMFORT	3	0	0	3
AE1102	P	ENGINE AND DRIVE LINE DESIGN	3	0	0	3
AE1103	P	NEW PRODUCT DEVELOPMENT	3	0	0	3
AE1104	P	AUTOMOTIVE SYSTEM DESIGN	3	0	0	3
AE1105	P	COMPUTER AIDED VEHICLE DESIGN	3	0	0	3
AE1106	P	FINITE ELEMENT ANALYSIS	3	0	0	3
AE1107	P	OPTIMIZATION FOR ENGINEERING DESIGN	3	0	0	3
AE1108	P	QUALITY CONTROL AND RELIABILITY ENGINEERING	3	0	0	3
MANUFACTURING						
AE1121	P	PRODUCT DEVELOPMENT AND COSTING	3	0	0	3
AE1122	P	MODERN MANUFACTURING PROCESSES	3	0	0	3
AE1123	P	COMPUTER INTEGRATED MANUFACTURING	3	0	0	3
AE1124	P	ROBOTICS AND ROBOT APPLICATIONS	3	0	0	3
AE1125	P	THEORY AND DESIGN OF JIGS AND FIXTURES	3	0	0	3
AE1126	P	NON-DESTRUCTIVE TESTING METHODS	3	0	0	3
AE1127	P	COMPOSITE MATERIALS AND STRUCTURES	3	0	0	3
AE1128	P	CAD/CAM TECHNOLOGY IN AUTOMOTIVE ENGINEERING	3	0	0	3
AE1129	P	WELDING AND JOINING TECHNOLOGIES	3	0	0	3
AE1130	P	PRODUCT LIFE CYCLE MANAGEMENT	3	0	0	3

VEHICLE TECHNOLOGY						
AE1142	P	COMPUTER SIMULATION OF I.C ENGINE PROCESSES	3	0	0	3
AE1143	P	HYBRID, ELECTRIC AND FUEL-CELL VEHICLES	3	0	0	3
AE1145	P	ELECTRONIC ENGINE MANAGEMENT SYSTEMS	3	0	0	3
AE1146	P	AUTOMOTIVE NVH	3	0	0	3
AE1147	P	HEAT, VENTILATION AND AIR CONDITIONING (HVAC)	3	0	0	3
AE1148	P	TYRE TECHNOLOGY	3	0	0	3
AE1149	P	AUXILIARY ENGINE SYSTEMS	3	0	0	3
SERVICE & MANAGEMENT						
AE1151	P	TROUBLE SHOOTING, SERVICING AND MAINTENANCE OF AUTOMOBILES	3	0	0	3
AE1154	P	TRANSPORT MANAGEMENT AND MOTOR INDUSTRY	3	0	0	3
AE1155	P	OFF ROAD VEHICLES	3	0	0	3
AE1156	P	VEHICLE MAINTENANCE	3	0	0	3
AE1157	P	PROJECT MANAGEMENT	3	0	0	3
AE1159	P	MANAGEMENT INFORMATION SYSTEMS	3	0	0	3

Summary of credits										
Category	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**	**%**
G (Excluding open and departmental electives)	4	4	3	3	1	1			16	8.888
B (Excluding open and departmental electives)	14	9	4	4	4				35	19.77
E (Excluding open and departmental electives)	6	7							13	7.34
P (Excluding open and departmental electives)		5	17	19	19	21	23	12	116	64.44
Open Elective					3	6			9	5.08
Dep. Elective				3	3	3	6		15	8.47
Total	24	25	24	29	30	22	23	12	180	100

SEMESTER I

PD1001	SOFT SKILLS-I	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To develop inter personal skills and be an effective goal oriented team player.
2.	To develop professionals with idealistic, practical and moral values.
3.	To develop communication and problem solving skills.
4.	To re-engineer attitude and understand its influence on behavior.

UNIT I - SELF ANALYSIS **(4 hours)**

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem

UNIT II - ATTITUDE **(4 hours)**

Factors influencing Attitude, Challenges and lessons from Attitude.

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - MOTIVATION **(6 hours)**

Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

UNIT IV - GOAL SETTING **(6 hours)**

Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

Time Management

Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work.

UNIT V - CREATIVITY **(10 hours)**

Out of box thinking, Lateral Thinking

Presentation

ASSESSMENT

1. A practical and activity oriented course which has continuous assessment for 75 marks based on class room interaction, activities etc.
2. Presentation – 25 marks

TEXT BOOK

1. INSIGHT 2012, Career Development Centre, SRM Publications.

REFERENCES

1. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972.
4. Daniel Coleman, *Emotional Intelligence*, Bantam Book, 2006.

PD1001 - SOFT SKILLS-I												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X		X	X		X		
2.	Mapping of instructional objectives with student outcome				1		2	3		4		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

MA1001	CALCULUS AND SOLID GEOMETRY	L	T	P	C
		3	2	0	4
	Total Contact Hours-75				
	(Common to all Branches of Engineering except Bio group)				
PURPOSE					
To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.					
INSTRUCTIONAL OBJECTIVES					

1.	To apply advanced matrix knowledge to Engineering problems.
2.	To equip themselves familiar with the functions of several variables.
3.	To familiarize with the applications of differential equations.
4. 4	To improve their ability in solving geometrical applications of differential calculus problems
5.	To expose to the concept of three dimensional analytical geometry.

UNIT I - MATRICES (15 hours)

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley – Hamilton theorem orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT II - FUNCTIONS OF SEVERAL VARIABLES (15 hours)

Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangian Multiplier method – Jacobians – Euler's theorem for homogeneous function.

UNIT III - ORDINARY DIFFERENTIAL EQUATIONS (15 hours)

Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form – Variation of parameter – Simultaneous first order with constant co-efficient.

UNIT IV - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS (15 hours)

Curvature – Cartesian and polar coordinates – Circle of curvature – Involutes and Evolutes – Envelopes – Properties of envelopes.

UNIT V - THREE DIMENSIONAL ANALYTICAL GEOMETRY (15 hours)

Equation of a sphere – Plane section of a sphere – Tangent Plane – Orthogonal Sphere - Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

TEXT BOOKS

1. Kreyszig E, "*Advanced Engineering Mathematics*", John Wiley & Sons. Singapore, 10th edition, 2012.

2. Ganesan K, Sundarammal Kesavan, Ganapathy Subramanian K.S. & Srinivasan V, "*Engineering Mathematics*", Gamma publications, Revised Edition, 2013.

REFERENCES

1. Grewal B.S, Higher Engineering Mathematics, Khanna Publications, 42nd Edition,2012.
2. Veerajan T, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
3. Kandasamy P et.al. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan S, Manicavachagom Pillay T.K, Ramanaiah G, "*Advanced Mathematics for Engineering students*", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman M.K, "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

MA1001 CALCULUS AND SOLID GEOMETRY												
Course designed by		**Department of Mathematics**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--			x			--		--		
4.	Approval	23rd meeting of academic council, May 2013										

PY1001	**PHYSICS**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.

INSTRUCTIONAL OBJECTIVES	
1.	To understand the general scientific concepts required for technology
2.	To apply the Physics concepts in solving engineering problems
3.	To educate scientifically the new developments in engineering and technology
4.	To emphasize the significance of Green technology through Physics principles

UNIT I – MECHANICAL PROPERTIES OF SOLIDS AND ACOUSTICS (9 hours)

Mechanical properties of solids: Stress-strain relationship – Hooke's law – Torsional Pendulum – Young's modulus by cantilever – Uniform and non-uniform bending –– Stress-strain diagram for various engineering materials – Ductile and brittle materials – Mechanical properties of Engineering materials (Tensile strength, Hardness, Fatigue, Impact strength, Creep) – Fracture – Types of fracture (Elementary ideas).

Acoustics: Intensity – Loudness – Absorption coefficient and its determination – Reverberation – Reverberation time – Factors affecting acoustics of buildings and their remedies – Sources and impacts of noise – Sound level meter – Strategies on controlling noise pollution – Ultrasonic waves and properties – Methods of Ultrasonic production (Magnetostriction and Piezoelectric) – Applications of Ultrasonics in Engineering and medicine.

UNIT II – ELECTROMAGNETIC WAVES, CIRCUITS AND APPLICATIONS (9 hours)

Del operator – grad, div, curl and their physical significances - displacement current –Maxwell's equations (derivation) – Wave equation for electromagnetic waves – Propagation in free space – Poynting theorem – Characteristic of Transverse electric and magnetic waves – Skin depth – Rectangular and circular waveguides – High powered vacuum-based cavity magnetrons – Applications including radars, microwave oven and lighting systems.

UNIT III – LASERS AND FIBER OPTICS (9 hours)

Lasers: Characteristics of Lasers – Einstein's coefficients and their relations – Lasing action – Working principle and components of CO_2 Laser, Nd-YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser – Applications in Remote sensing, holography and optical switching – Mechanism of Laser cooling and trapping.

Fiber Optics: Principle of Optical fiber – Acceptance angle and acceptance cone – Numerical aperture – V-number – Types of optical fibers (Material, Refractive

index and mode) – Photonic crystal fibers – Fiber optic communication – Fiber optic sensors.

UNIT IV – QUANTUM MECHANICS AND CRYSTAL PHYSICS (9 hours)

Quantum mechanics: Inadequacies of Classical Mechanics – Duality nature of electromagnetic radiation – De Broglie hypothesis for matter waves – Heisenberg's uncertainty principle –Schrödinger's wave equation – Particle confinement in 1D box (Infinite Square well potential). **Crystal Physics:** Crystal directions – Planes and Miller indices – Symmetry elements – Quasi crystals – Diamond and HCP crystal structure – Packing factor – Reciprocal lattice – Diffraction of X-rays by crystal planes – Laue method and powder method – Imperfections in crystals.

UNIT V – GREEN ENERGY PHYSICS (9 hours)

Introduction to Green energy – **Solar energy:** Energy conversion by photovoltaic principle – Solar cells – **Wind energy:** Basic components and principle of wind energy conversion systems – **Ocean energy:** Wave energy – Wave energy conversion devices – Tidal energy – single and double basin tidal power plants – Ocean Thermal Electric Conversion (OTEC) – **Geothermal energy:** Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma) – **Biomass:** Biomass and bio-fuels – bio-energies from wastages – **Fuel cells**: H_2O_2 – **Futuristic Energy:** Hydrogen – Methane Hydrates – Carbon capture and storage (CCS).

* One problem sheet consisting of 10 to 15 problems is to be prepared for each unit and discussed in the class.
* Few problems based on design considerations related to appropriate branches of engineering can be incorporated in each problem sheet.

TEXT BOOKS

1. Thiruvadigal J. D, Ponnusamy S, Sudha D and Krishnamohan M, "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013.
2. Dattu R.Joshi, "Engineering Physics", Tata McGraw- Hill,New Delih, 2010.

REFERENCES

1. Wole Soboyejo, "*Mechanical Properties of Engineering Materials*", Marcel Dekker Inc., 2003.
2. Frank Fahy, "*Foundations of Engineering Acoustics*", Elsevier Academic Press, 2005.
3. Alberto Sona, "*Lasers and their applications*", Gordon and Breach Science Publishers Ltd., 1976.

4. David J. Griffiths, "*Introduction to electrodynamics*", 3rd ed., Prentice Hall, 1999.
5. Leonard. I. Schiff, "*Quantum Mechanics"*, Third Edition, Tata McGraw Hill, 2010.
6. Charles Kittel, "*Introduction to Solid State Physics*", Wiley India Pvt. Ltd, 7th ed., 2007.
7. Godfrey Boyle, "*Renewable Energy: Power sustainable future*", 2nd edition, Oxford University Press, UK, 2004.

PY1001 PHYSICS												
Course designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x		x		x						x
2.	Mapping of instructional objectives with student outcome	1		4		2						3
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--			x			--			--	
4.	Approval	23rd meeting of Academic Council, May 2013										

PY1002	PHYSICS LABORATORY	L	T	P	C
	Total Contact Hours - 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to develop scientific temper in experimental techniques and to reinforce the physics concepts among the engineering students

INSTRUCTIONAL OBJECTIVES

1.	To gain knowledge in the scientific methods and learn the process of measuring different Physical variables
2.	Develop the skills in arranging and handling different measuring instruments
3.	Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

LIST OF EXPERIMENTS

1. Determination of Young's modulus of a given material – Uniform / Non-uniform bending methods.
2. Determination of Rigidity modulus of a given material – Torsion pendulum
3. Determination of dispersive power of a prism – Spectrometer
4. Determination of laser parameters – divergence and wavelength for a given laser source –laser grating/ Particle size determination using laser
5. Study of attenuation and propagation characteristics of optical fiber cable
6. Calibration of voltmeter / ammeter using potentiometer
7. Construction and study of IC regulation properties of a given power supply
8. Study of electrical characteristics of a solar cell
9. Mini Project – Concept based Demonstration

TEXT BOOKS

1. Thiruvadigal J. D, Ponnusamy S, Sudha D and Krishnamohan M, "*Physics for Technologists"*, Vibrant Publication, Chennai, 2013.
2. Shukla R.K and Anchal Srivastava, "*Practical Physics*", 1st Edition, New Age International (P) Ltd, New Delhi, 2006.

REFERENCES

1. Souires G.L, "*Practical Physics*", 4th Edition, Cambridge University, UK, 2001.
2. Chattopadhyay D, Rakshit P. C, and Saha B, "*An Advanced Course in Practical Physics*", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

PY1002 PHYSICS LABORATORY												
Course designed by		**Department of Physics and Nanotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x			x						
2.	Mapping of instructional objectives with student outcome	1	3			2						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects (P)		
		--	x			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

CY1003	**PRINCIPLES OF ENVIRONMENTAL SCIENCE**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

The course provides a comprehensive knowledge in environmental science, environmental issues and the management.

INSTRUCTIONAL OBJECTIVES

To enable the students

1.	To gain knowledge on the importance of environmental education and ecosystem.
2.	To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.
3.	To understand the treatment of wastewater and solid waste management.
4.	To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.
5.	To be aware of the national and international concern for environment for protecting the environment

UNIT I - ENVIRONMENTAL EDUCATION AND ECOSYSTEMS (6 hours)

Environmental education: Definition and objective. Structure and function of an ecosystem – ecological succession –primary and secondary succession - ecological pyramids – pyramid of number, pyramid of energy and pyramid of biomass.

UNIT II - ENVIRONMENTAL POLLUTION (6 hours)

Environmental segments – structure and composition of atmosphere - Pollution – Air, water, soil , thermal and radiation – Effects – acid rain, ozone layer depletion and green house effect – control measures – determination of BOD, COD, TDS and trace metals.

UNIT III - WASTE MANAGEMENT (6 hours)

Waste water treatment (general) – primary, secondary and tertiary stages.
Solid waste management: sources and effects of municipal waste, bio medical waste - process of waste management.

UNIT IV - BIODIVERSITY AND ITS CONSERVATION (6 hours)

Introduction: definition - genetic, species and ecosystem diversity – bio diversity hot spots - values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - threats to biodiversity: habitat loss, poaching of wildlife – endangered and endemic species of India, Conservation of biodiversity: in-situ and ex-situ conservations.

UNIT V - ENVIRONMENTAL PROTECTION (6 hours)

National concern for environment: Important environmental protection acts in India – water, air (prevention and control of pollution) act, wild life conservation and forest act – functions of central and state pollution control boards - international effort – key initiatives of Rio declaration, Vienna convention, Kyoto protocol and Johannesburg summit.

TEXT BOOKS

1. Kamaraj P & Arthanareeswari M, "*Environmental Science – Challenges and Changes"*, 4th Edition, Sudhandhira Publications, 2010.
2. Sharma B.K and Kaur, "*Environmental Chemistry",* Goel Publishing House, Meerut, 1994.

REFERENCES

1. De.A.K, "*Environmental Chemistry"*, New Age International, New Delhi, 1996.
2. Helen P Kavitha, "*Principles of Environmental Science*", Sci tech Publications, 2nd Edition, 2008.

CY1003 – PRINCIPLES OF ENVIRONMENTAL SCIENCE												
	Course designed by	**Department of Chemistry**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
				x		x	x		x	x	x	
2.	Mapping of instructional objective with student outcome			5		2	4		1,3	3	2, 5	
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects(P)	
					x			--			--	
4.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER – II

PD1002	**SOFT SKILLS-II**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE	
To enhance holistic development of students and improve their employability skills.	
INSTRUCTIONAL OBJECTIVES	
1.	To develop inter personal skills and be an effective goal oriented team player.
2.	To develop professionals with idealistic, practical and moral values.
3.	To develop communication and problem solving skills.
4.	To re-engineer attitude and understand its influence on behavior.

UNIT I - INTERPERSONAL SKILLS **(6 hours)**

Understanding the relationship between Leadership Networking & Team work, Realizing Ones Skills in Leadership, Networking & Team Work, and Assessing Interpersonal Skills Situation description of Interpersonal Skill.

Team Work

Necessity of Team Work Personally, Socially and Educationally

UNIT II - LEADERSHIP **(4 hours)**

Skills for a good Leader, Assessment of Leadership Skills

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - STRESS MANAGEMENT **(6 hours)**

Causes of Stress and its impact, how to manage & distress, Understanding the circle of control, Stress Busters.

Emotional Intelligence

What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions.

UNIT IV - CONFLICT RESOLUTION **(4 hours)**

Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

UNIT V - DECISION MAKING **(10 hours)**

Importance and necessity of Decision Making, process of Decision Making, Practical way of Decision Making, Weighing Positives & Negatives.

Presentation

ASSESSMENT

1. A practical and activity oriented course which has a continuous assessment for 75 marks based on class room interaction, activities etc.,
2. Presentation - 25 marks

TEXT BOOK

1. INSIGHT, 2009. Career Development Centre, SRM Publications.

REFERENCE

1. Covey Sean, "*Seven Habit of Highly Effective Teens"*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, "*How to win Friends and Influence People"*, New York: Simon & Schuster, 1998.
3. Thomas A Harris, "*I am ok, You are ok* ", New York-Harper and Row, 1972
4. Daniel Coleman, "*Emotional Intelligence"*, Bantam Book, 2006.

PD1002 - SOFT SKILLS-II												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X		X	X		X		
2.	Mapping of instructional objectives with student outcome				1		2	3		4		
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts(E)			Professional Subjects (P)		
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

MA1002	ADVANCED CALCULUS AND COMPLEX ANALYSIS	L	T	P	C
	Total Contact Hours -75	3	2	0	4
	(Common to all Branches of Engineering except Bio group)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1	To have knowledge in multiple calculus
2	To improve their ability in Vector calculus
3	To equip themselves familiar with Laplace transform
4	To expose to the concept of Analytical function
5	To familiarize with Complex integration

UNIT I - MULTIPLE INTEGRALS (**15 hours)**

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as a double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar – Volume as a Triple Integral.

UNIT II - VECTOR CALCULUS **(15 hours)**

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities (without proof) – Directional derivatives – Line, surface and volume integrals – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification and applications to cubes and parallelopipeds only.

UNIT III - LAPLACE TRANSFORMS **(15 hours)**

Transforms of simple functions – Basic operational properties – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – periodic functions – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only.

UNIT IV - ANALYTIC FUNCTIONS **(15 hours)**

Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: 1/z, az, az+b and bilinear transformation.

UNIT V - COMPLEX INTEGRATION **(15 hours)**

Line integral – Cauchy's integral theorem (without proof) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem – Contour integration – Unit circle and semi circular contour.

TEXT BOOKS

1. Kreyszig E, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons. Singapore, 2012.
2. Ganesan K, Sundarammal Kesavan, Ganapathy Subramanian K.S & Srinivasan V, "*Engineering Mathematics*", Gamma Publications, Revised Edition, 2013.

REFERENCES

1. Grewal B.S, "*Higher Engg Maths*", Khanna Publications, 42nd Edition, 2012.
2. Veerajan T, "*Engineering Mathematics I*", Tata McGraw Hill Publishing Co., New Delhi, 5th edition, 2006.
3. Kandasamy P etal. "*Engineering Mathematics*", Vol.I (4th revised edition), S.Chand &Co., New Delhi, 2000.
4. Narayanan S, Manicavachagom Pillay T.K, Ramanaiah G, "*Advanced Mathematics*" for Engineering students, Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.
5. Venkataraman M.K., "*Engineering Mathematics*" – First Year (2nd edition), National Publishing Co., Chennai, 2000.

<table>
<tr><th colspan="13">MA1002 ADVANCED CALCULUS AND COMPLEX ANALYSIS</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Mathematics</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>x</td><td></td><td></td><td></td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1-5</td><td></td><td></td><td></td><td>1-5</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
<tr><td colspan="2">--</td><td colspan="3">x</td><td colspan="3">--</td><td colspan="3">--</td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd meeting of academic council, May 2013</td></tr>
</table>

PY1003	MATERIAL SCIENCE	L	T	P	C
	Total Contact Hours - 60	2	0	2	3
	Prerequisite				
	Nil				

PURPOSE

The course introduces several advanced concepts and topics in the rapidly evolving field of material science. Students are expected to develop comprehension of the subject and to gain scientific understanding regarding the choice and manipulation of materials for desired engineering applications.

INSTRUCTIONAL OBJECTIVES

1.	To acquire basic understanding of advanced materials, their functions and properties for technological applications
2.	To emphasize the significance of materials selection in the design process
3.	To understand the principal classes of bio-materials and their functionalities in modern medical science
4.	To get familiarize with the new concepts of Nano Science and Technology
5.	To educate the students in the basics of instrumentation, measurement, data acquisition, interpretation and analysis

UNIT I – ELECTRONIC AND PHOTONIC MATERIALS (6 hours)

Electronic Materials: Fermi energy and Fermi–Dirac distribution function – Variation of Fermi level with temperature in intrinsic and extrinsic semiconductors – Hall effect – Dilute Magnetic Semiconductors (DMS) and their applications

Superconducting Materials: Normal and High temperature superconductivity – Applications.

Photonic Materials: LED – LCD – Photo conducting materials – Photo detectors – Photonic crystals and applications – Elementary ideas of Non-linear optical materials and their applications.

UNIT II – MAGNETIC AND DIELECTRIC MATERIALS (6 hours)

Magnetic Materials: Classification of magnetic materials based on spin – Hard and soft magnetic materials – Ferrites, garnets and magnetoplumbites – Magnetic bubbles and their applications – Magnetic thin films – Spintronics and devices (Giant magneto resistance, Tunnel magneto resistance and Colossal magneto resistance).

Dielectric Materials: Polarization mechanisms in dielectrics – Frequency and temperature dependence of polarization mechanism – Dielectric loss – Dielectric

waveguide and dielectric resonator antenna – Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT III – MODERN ENGINEERING AND BIOMATERIALS (6 hours)

Modern Engineering Materials: Smart materials – Shape memory alloys – Chromic materials (Thermo, Photo and Electro) – Rheological fluids – Metallic glasses – Advanced ceramics – Composites.

Bio-materials: Classification of bio-materials (based on tissue response) – Comparison of properties of some common biomaterials – Metallic implant materials (stainless steel, cobalt-based and titanium-based alloys) – Polymeric implant materials (Polyamides, polypropylene, Acrylic resins and Hydrogels) – Tissue replacement implants – Soft and hard tissue replacements – Skin implants – Tissue engineering – Biomaterials for organ replacement (Bone substitutes) – Biosensor.

UNIT IV – INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY (6 hours)

Basic concepts of Nanoscience and Nanotechnology – Quantum wire – Quantum well – Quantum dot – fullerenes – Graphene – Carbon nanotubes – Material processing by chemical vapor deposition and physical vapor deposition – Principle of SEM, TEM, AFM, Scanning near-field optical microscopy (SNOM) – Scanning ion-conducting microscopy (SCIM) – Potential uses of nanomaterials in electronics, robotics, computers, sensors, sports equipment, mobile electronic devices, vehicles and transportation – Medical applications of nanomaterials.

UNIT V – MATERIALS CHARACTERIZATION (6 hours)

X-ray diffraction, Neutron diffraction and Electron diffraction– X-ray fluorescence spectroscopy – Fourier transform Infrared spectroscopy (FTIR) – Ultraviolet and visible spectroscopy (UV-Vis) – Thermogravimetric Analysis (TGA) – Differential Thermal Analysis (DTA) – Differential Scanning Calorimetry (DSC).

PRACTICAL EXPERIMENTS (30 hours)

1. Determination of resistivity and band gap for a semiconductor material – Four probe method / Post-office box
2. Determination of Hall coefficient for a semiconducting material
3. To study V-I characteristics of a light dependent resistor (LDR)
4. Determination of energy loss in a magnetic material – B-H curve
5. Determination of paramagnetic susceptibility – Quincke's method
6. Determination of dielectric constant for a given material
7. Calculation of lattice cell parameters – X-ray diffraction

8. Measurement of glucose concentration – Electrochemical sensor
9. Visit to Advanced Material Characterization Laboratory (Optional)

TEXT BOOKS

1. Thiruvadigal J. D, Ponnusamy S, Sudha D and Krishnamohan M, "*Materials Sciences"*, Vibrant Publication, Chennai, 2013.
2. Rajendran V, "*Materials Science*", Tata McGraw- Hill, New Delhi, 2011.

REFERENCES

1. Rolf E. Hummel, "*Electronic Properties of Materials"*, 4th ed., Springer, New York, 2011.
2. Dennis W. Prather, "*Photonic Crystals: Theory, Applications, and Fabrication"*, John Wiley & Sons, Hoboken, 2009.
3. James R. Janesick, "*Scientific Charge-Coupled Devices",* Published by SPIE-The International Society for Optical Engineering, Bellingham, Washington, 2001.
4. David M. Pozar, "*Microwave Engineering*", 3rd ed., John Wiley & Sons, 2005.
5. Silver F and Dillion C, "*Biocompatibility: Interactions of Biological and Implantable Materials*", VCH Publishers, New York, 1989.
6. Severial Dumitriu, "*Polymeric Biomaterials*" Marcel Dekker Inc, CRC Press, Canada 2001.
7. Cao G, "*Nanostructures and Nanomaterials: Synthesis, Properties and Applications*", Imperial College Press, 2004.
8. Pradeep T, "*A Text Book of Nanoscience and Nanotechnology*", Tata McGraw Hill, New Delhi, 2012.
9. Sam Zhang, "*Materials Characterization Techniques*", CRC Press, 2008.

PY1003 MATERIAL SCIENCE												
Course designed by		**Department of Physics and Nanotechnology**										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x		x	x						x
2	Mapping of instructional objectives with student outcome	1	5		4	2						3
3	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)					Professional Subjects(P)	
		--	x			--					--	
4	Approval	23rd meeting of Academic Council, May 2013										

CY1001	CHEMISTRY	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the students to acquire knowledge in the principles of chemistry for engineering applications

INSTRUCTIONAL OBJECTIVES

1.	The quality of water and its treatment methods for domestic and industrial applications.
2.	The classification of polymers, different types of polymerizations, preparation, properties and applications of important polymers and FRPs.
3.	The phase rule and its application to one and two component systems.
4.	The principle, types and mechanism of corrosion and protective coatings.
5.	The classification and selection of lubricants and their applications.
6.	The basic principles, instrumentation and applications of analytical techniques

UNIT I - WATER TREATMENT (9 hours)

Water quality parameters: Physical, Chemical & Biological significance - Hardness of water - estimation of hardness (EDTA method) - Dissolved oxygen – determination (Winkler's method), Alkalinity - determination - disadvantages of using hard water in boilers: Scale, sludge formation - disadvantages - prevention - treatment: Internal conditioning - phosphate, carbon and carbonate conditioning methods - External: Zeolite, ion exchange methods - desalination - reverse osmosis and electrodialysis - domestic water treatment.

UNIT II - POLYMERS AND REINFORCED PLASTICS (9 hours)

Classification of polymers - types of polymerization reactions - mechanism of addition polymerization: free radical, ionic and Ziegler - Natta - effect of structure on the properties of polymers - strength, plastic deformation, elasticity and crystallinity -Preparation and properties of important resins: Polyethylene, PVC, PMMA, Polyester, Teflon, Bakelite and Epoxy resins - compounding of plastics - moulding methods - injection, extrusion, compression and calendaring - reinforced plastics - FRP – Carbon and Glass- applications.

UNIT III - PHASE EQUILIBRIA, LUBRICANTS AND ADHESIVES (9 hours)

Phase rule: Statement - explanation of the terms involved - one component system (water system only). Condensed phase rule - thermal analysis - two component systems: simple eutectic, Pb-Ag; compound formation, Zn-Mg.

Lubricants: Classification –solid, semi solid, liquid, emulsion- properties – selection of lubricants for different purposes, Adhesives: classification-natural, synthetic, inorganic- Adhesive action - applications.

UNIT IV - CORROSION AND ITS CONTROL (9 hours)

Corrosion: Basic concepts - mechanism of chemical, electrochemical corrosion - Pilling Bedworth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion - pitting corrosion - stress corrosion – Measurement of corrosion (wt. loss method only) - factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method - corrosion inhibitors. Protective coatings: surface preparation for metallic coatings - electro plating (copper plating) and electroless plating (Nickel plating) - chemical conversion coatings - anodizing, phosphating & chromate coating.

UNIT V - INSTRUMENTAL METHODS OF ANALYSIS (9 hours)

Basic principles, instrumentation and applications of potentiometry, UV - visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy and flame photometry .

TEXT BOOKS

1. Kamaraj P & Arthanareeswari M, "*Applied Chemistry", 9th Edition*, Sudhandhira Publications, 2012.
2. Dara S.S, A Text book of Engineering Chemistry, 10th Edition, S.Chand & Company Ltd., New Delhi, 2003

REFERENCES

1. Jain.P.C and Monika Jain, "*Engineering Chemistry*", Danpat Rai publishing company (P) Ltd, New Delhi, 2010.
2. Helen P Kavitha, "*Engineering Chemistry – I", Scitech* Publications, 2nd edition, 2008.

CY1001 CHEMISTRY												
Course designed by		Department of Chemistry										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x	x		x						x
2.	Mapping of instructional objective with student outcome	1-6	1,5	3		2						4
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--	x			--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

CY1002	CHEMISTRY LABORATORY	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To apply the concepts of chemistry and develop analytical skills for applications in engineering.

INSTRUCTIONAL OBJECTIVES

1. To enable the students to understand the basic concepts involved in the analyses.

LIST OF EXPERIMENTS

1. Preparation of standard solutions
2. Estimation of total, permanent and temporary hardness by EDTA method
3. Conductometric titration - determination of strength of an acid
4. Estimation of iron by potentiometry.
5. Determination of molecular weight of polymer by viscosity average method
6. Determination of dissolved oxygen in a water sample by Winkler's method
7. Determination of Na / K in water sample by Flame photometry (Demonstration)
8. Estimation of Copper in ore
9. Estimation of nickel in steel
10. Determination of total alkalinity and acidity of a water sample
11. Determination of rate of corrosion by weight loss method.

REFERENCES

1. Kamaraj & Arthanareeswari, "*Practical Chemistry*" (work book) Sudhandhira Publications , 2011.
2. Helen P. Kavitha, "*Chemistry Laboratory Manual*", Scitech Publications, 2008.

CY1002 CHEMISTRY LABORATORY												
Course designed by		Department of Chemistry										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x	x									x
2.	Mapping of instructional objective with student outcome	1	1									1
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects(P)	
		--		x			--				--	
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1002	ENGINEERING MECHANICS	L	T	P	C
	Total Contact Hours - 75	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To develop the ability, in the engineering student, to understand, formulate, and solve a given problem in a logical manner and to apply it to solve a few basic problems in engineering mechanics.

INSTRUCTIONAL OBJECTIVES

At the end of this course the student should be able to apply concepts of

1.	Static equilibrium of particles and rigid bodies
2.	Analysis of trusses and friction
3.	Properties of surfaces and volumes
4.	Dynamic equilibrium of particles
5.	Dynamic equilibrium of rigid bodies in solving basic problems in engineering mechanics

UNIT I - STATICS OF PARTICLES (16 hours)

Equilibrium of Particles: Fundamental concepts and principles of engineering mechanics - Forces on particles –vector addition- Concurrent forces in a plane - Resolution of forces - Resultant of several concurrent forces - Free body diagram –Forces in space. **Equilibrium of rigid bodies**: Principles of transmissibility - Moment of a force - Varignon's theorem - Equivalent system of forces - Reduction of system of forces into single force and couple-Equipollent system of forces - Types of supports and corresponding reactions - Equilibrium of rigid bodies in two dimensions.- Equilibrium of a two force body , statically determinate and indeterminate structures

UNIT II - ANALYSIS OF TRUSSES AND FRICTION (14 hours)

Trusses: Definition of a truss - Simple Trusses - Analysis of Trusses - Method of joints- Method of sections. **Friction**: Laws of Friction - Angle of Friction –Dry friction- Wedges - Rolling friction - Belt Friction - Thrust and Journal bearings.

UNIT III - PROPERTIES OF SURFACES AND VOLUMES (15 hours)

Centre of Gravity: - Centroids of lines, areas, and volumes –Determination of centroids by integration - Theorem of Pappus-Guldinus - **Moment of Inertia**: Second moment or Moment of inertia of an area**-** Determination of moment of inertia of area by integration - Radius of gyration - Parallel and perpendicular axis theorems - Polar moment of inertia - Mass moment of inertia.

UNIT IV - DYNAMICS OF PARTICLES (15 hours)

Rectilinear motion –uniform velocity and uniformly accelerated motion- Rectangular components of velocity and acceleration- Curvilinear motion –Normal and tangential components- Radial and transverse components-Newton second law – D'Alembert's principle- Principle of work and energy –Applications- Conservative forces-Principle of impulse and momentum - Impulsive motion - Impact of elastic bodies – Direct central- Oblique central impact.

UNIT V - DYNAMICS OF RIGID BODIES (15 hours)

Introduction to Kinematics of rigid bodies - Translation and rotation of rigid bodies - Fixed axis rotation – General plane motion –Absolute and Relative velocity in plane motion - Instantaneous center of rotation in plane motion - Principle of work and energy for a rigid body - Principle of impulse and momentum for the plane motion of a rigid body.

TEXT BOOKS

1. Ferdinand P. Beer, E. Russell Johnston Jr., David Mazurek, Philip J Cornwell, "*Vector Mechanics for Engineers: Statics and Dynamics"*, McGraw - Hill, New Delhi, Tenth Edition 2013.
2. Palanichamy M. S, and Nagan S, "*Engineering Mechanics (Statics and Dynamics)"*, Tata McGraw Hill, New Delhi Eighth reprint 2011(Third edition).

REFERENCES

1. Timoshenko and Young, "*Engineering Mechanics"*, Tata Mc-Graw Hill Book Company, Edition 4, New Delhi, 1988.
2. Mclean, and Nelson, *"Theory and problems of Engineering Mechanics" (Statics and Dynamics)*, 3rd Edition Schaum Series, 1980.
3. Rajasekaran S, & Sankarasubramanian G, "*Engineering Mechanics"*, Vikas Publishing House Pvt Ltd, 2011.
4. Shames I.H, and Krishna Mohana Rao G," *Engineering Mechanics (Statics and Dynamics)"*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2006.
5. Dr.R.K.Bansal & Sanjay Bansal, "*A Text book of Engineering Mechanics"*, Lakshimi Publications, Edition 7, 2011.

ME1002 - ENGINEERING MECHANICS												
Course Designed by		**Department of Mechanical Engineering**										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		×				×					×	
2	Mapping of instructional objectives with student outcome	1,2, 3,4,5				1,2,3, 4,5					1,2,3, 4,5	
3	Category	General (G)	Basic Sciences(B)			Engineering Sciences & Technical Art (E)					Professional Subjects(P)	
			X									
4	Approval	23rd meeting of the Academic Council , May 2013										

AE1001	**ARTIFACT DISSECTION**	**L**	**T**	**P**	**C**
	Total Contact Hours 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

"Artifact Dissection" is an approach to teaching students about engineering concepts and design principles by having them explore the engineered products around them. "Dissection" in this context refers to a process of studying the intent and function of a mechanical system, disassembling it in order to see how this intent is realized, then reassembling it. This exploration involves having students work in small teams which lead to insight on materials, function, design alternatives, human factors and manufacturing.

INSTRUCTIONAL OBJECTIVES

The objectives of this course are to give automobile engineering students:

1.	A number of experiences in disassembling and reassembling mechanical systems / artifacts in order to be able to reason about function
2.	Insight into the importance of functional specifications in design and how they map into specific functions
3.	Awareness of the non-unique mapping between functional specifications and the final design solution (i.e., multiple solutions)
4.	The ability to communicate (orally, graphically, and textually) about the function of mechanical components.
5.	Appreciation of technological history.

LIST OF EXPERIMENTS

The dissection of a,

1. Bicycle,
2. Hand Drilling Machine,
3. Sewing Machine and
4. Two Stroke Engine.

REFERENCES

Laboratory Manuals / Manufacturers Manuals

AE1001 – ARTIFACT DISSECTION												
Course Designed by		**Department of Automobile Engineering**										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X							X		
2	Mapping of instructional objectives with student outcome	1,2,3, 4,5	1,2,3, 4,5							1,2, 3,4, 5		
3	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
							X					
4	Approval	23rd meeting of the Academic Council , May 2013										

TABLE – I
COURSES WHICH CAN BE REGISTERED FOR EITHER IN I OR II SEMESTER

SEMESTER I / II

LE1001	**ENGLISH**	**L**	**T**	**P**	**C**
	Total Contact Hours-45	**1**	**2**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE	
To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.	
INSTRUCTIONAL OBJECTIVES	
1.	To enable students improve their lexical, grammatical and communicative competence.
2.	To enhance their communicative skills in real life situations.
3	To assist students understand the role of thinking in all forms of communication.
4.	To equip students with oral and appropriate written communication skills.
5.	To assist students with employability and job search skills.

UNIT I - INVENTIONS **(9 hours)**

1. Grammar and Vocabulary – Tense and Concord:
2. Listening and Speaking – Common errors in Pronunciation (Individual sounds); Process description (Describing the working of a machine, and the manufacturing process)
3. Writing – Interpretation of data (Flow chart, Bar chart)
4. Reading – (Reading Comprehension – Answering questions)

UNIT II - ECOLOGY **(9 hours)**

1. Grammar and Vocabulary – Error Analysis – Synonyms and Antonyms, Parallelisms
2. Listening and Speaking - Conducting Meetings
3. Writing – Notice, Agenda, Minutes , letters to the editor via email : Email etiquette
4. D Reading Comprehension – Summarizing and Note-making

UNIT III - SPACE **(9 hours)**

1. Grammar and Vocabulary – tense and concord; word formation

2. Listening and Speaking – Distinction between native and Indian English (Speeches by TED and Kalam) – accent, use of vocabulary and rendering;
3. Writing – Definitions and Essay writing
4. Reading Comprehension – Predicting the content

UNIT IV - CAREERS **(9 hours)**

1. Grammar and Vocabulary –Homonyms and Homophones
2. Listening and Speaking – – Group Discussion
3. Writing Applying for job, cover letter and resume
4. Reading, etymology (roots ; idioms and phrases), Appreciation of creative writing.

UNIT V - RESEARCH **(9 hours)**

1. Grammar and Vocabulary – Using technical terms, Analogies
2. Listening and Speaking -- Presentation techniques (Speech by the learner)
3. Writing – Project Proposal
4. Reading Comprehension -- Referencing Skills for Academic Report Writing (Research Methodology – Various methods of collecting data) Writing a report based on MLA Handbook

TEXTBOOK

1. Department of English and Foreign Languages. "*English for Engineers*", SRM University Publications, 2013.

REFERENCES

1. Dhanavel S.P, "*English and Communication Skills for Students of Science and Engineering*"**,** Orient Blackswan Ltd., 2009.
2. Meenakshi Raman and Sangeetha Sharma**.** "*Technical Communication-Principles and Practice*", Oxford University Press, 2009.
3. Day R A, Scientific English: "*A Guide for Scientists and Other Professionals*", 2nd ed. Hyderabad: Universities Press, 2000.

LE1001 ENGLISH												
Course designed by		**Department of English and Foreign Languages**										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
					x		x	x		x		
2	Mapping of instructional objectives with student outcome				1-5		1-5	1-5		1-5		

3	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
		x	--	--	--
4	Approval	23rd meeting of Academic Council, May 2013			

LE1002	**VALUE EDUCATION**	**L**	**T**	**P**	**C**
	Total Contact Hours- 15	**1**	**0**	**0**	**1**
	Prerequisite				
	Nil				

PURPOSE

To provide guiding principles and tools for the development of the whole person recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

INSTRUCTIONAL OBJECTIVES

1.	To help individuals think about and reflect on different values.
2.	To deepen understanding, motivation and responsibility with regard to making personal and social choices and the practical implications of expressing them in relation to themselves, others, the community and the world at large
3.	To inspire individuals to choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening

UNIT I – INTRODUCTION (3 hours)

Definition, Relevance, Types of values, changing concepts of values

UNIT II - INDIVIDUAL AND GROUP BEHAVIOUR (3 hours)

Personal values – Self – Strengths (self-confidence, self-assessment, self-reliance, self-discipline, determination, self-restraint, contentment, humility, sympathy and compassion, gratitude, forgiveness) Weaknesses (Influences -- Peer pressure, familial and societal expectations, media)

UNIT III - SOCIETIES IN PROGRESS (3 hours)

Definition of society; Units of society; Communities – ancient and modern – Agents of change – Sense of survival, security, desire for comfort and ease sense of belonging, social consciousness and responsibility

UNIT IV - ENGINEERING ETHICS (3 hours)

Definition - Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research -- Ethical and Unethical practices – case studies – situational decision making

UNIT V - SPIRITUAL VALUES (3 hours)

What is religion? -- Role of religion – Misinterpretation of religion – moral policing – Consequences -- Religion as spiritual quest – Aesthetics and religion

TEXT BOOK

1. Department of English and Foreign Languages SRM University, "*Rhythm of Life",* SRM Publications, 2013.

REFERENCE

1. Values **(**Collection of Essays). Published by: Sri Ramakrishna Math, Chennai-4. 1996.

LE1002 VALUE EDUCATION												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	J	K
							x			x		
2.	Mapping of instructional objectives with student outcome						1-3			1-3		
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		x		--			--			--		
4.	Approval	23rd meeting of Academic Council, May 2013										

	PROGRAMMING USING MATLAB	**L**	**T**	**P**	**C**
CS1001	Total Contact Hours - 45	**0**	**1**	**2**	**2**
	Prerequisite				
	Nil				
PURPOSE					
This Laboratory Course will enable the students to understand the fundamentals and programming knowledge in MATLAB.					

INSTRUCTIONAL OBJECTIVES	
1.	To learn the MATLAB environment and its programming fundamentals
2.	Ability to write Programs using commands and functions
3.	Able to handle polynomials, and use 2D Graphic commands

LIST OF EXPERIMENTS

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing Labels, Grid & Axes box, Text in plot, Bar and Pie chart.

TEXT BOOK

1. Bansal R.K, Goel A.K, Sharma M.K, "*MATLAB and its Applications in Engineering*", Pearson Education, 2012.

REFERENCES

1. Amos Gilat, *"MATLAB-An Introduction with Applications"*, Wiley India, 2009.
2. Stephen.J.Chapman, *"Programming in MATLAB for Engineers"*, Cengage Learning, 2011.

CS1001 PROGRAMMING USING MATLAB												
Course designed by		Department of Computer Science and Engineering										
1	Student outcome	a	b	c	d	e	f	g	h	i	j	K
		x	x									X
2	Mapping of instructional objective with student outcome	2,3	1-3									1

3	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)	Professional Subjects (P)
		x	--		--	--	
4	Approval	23rd meeting of Academic Council, May 2013					

BT1001	BIOLOGY FOR ENGINEERS	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the students with the basic organization of organisms and subsequent building to a living being
2.	To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
3.	To provide knowledge about biological problems that require engineering expertise to solve them

UNIT I - BASIC CELL BIOLOGY (6 hours)

Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism-Homoeostasis- Cell growth, reproduction, and differentiation.

UNIT II - BIOCHEMISTRY AND MOLECULAR ASPECTS OF LIFE (5 hours)

Biological Diversity --Chemistry of life: chemical bonds--Biochemistry and Human biology--Protein synthesis—Stem cells and Tissue engineering.

UNIT III - ENZYMES AND INDUSTRIAL APPLICATIONS (5 hours)

Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases—Photosynthesis

UNIT IV - MECHANOCHEMISTRY **(7 hours)**

Molecular Machines/Motors—Cytoskeleton—Bioremediation—Biosensors

UNIT V - NERVOUS SYSTEM, IMMUNE SYSTEM, AND CELL SIGNALING **(7 hours)**

Nervous system--Immune system- General principles of cell signaling

TEXT BOOK

1. ThyagaRajan S, Selvamurugan N, Rajesh M. P, Nazeer R. A, Richard W. Thilagaraj, Barathi S, and Jaganathan M. K, "*Biology for Engineers*," Tata McGraw-Hill, New Delhi, 2012.

REFERENCES

1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "*Biochemistry*," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
2. Robert Weaver, "*Molecular Biology*," MCGraw-Hill, 5th Edition, 2012.
3. Jon Cooper, "*Biosensors A Practical Approach*" Bellwether Books**, 2**004.
4. Martin Alexander, "*Biodegradation and Bioremediation,"* Academic Press, 1994.
5. Kenneth Murphy, "*Janeway's Immunobiology*," Garland Science; 8th edition, 2011.
6. Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, *"Principles of Neural Science"*, McGraw-Hill, 5th Edition, 2012.

BT1001 BIOLOGY FOR ENGINEERS												
Course designed by		**Department of Biotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x			x						x	
2.	Mapping of instructional objectives with student outcome	1			2						3	
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)			
					x							
4.	Approval	23rd meeting of Academic Council, May 2013										

CE1001	BASIC CIVIL ENGINEERING	L	T	P	C
	Total Contact Hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE	
To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.	
INSTRUCTIONAL OBJECTIVES	
1.	To know about different materials and their properties
2.	To know about engineering aspects related to buildings
3.	To know about importance of surveying and the transportation systems
4.	To get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal

UNIT I - BUILDING MATERILAS (6 hours)

Introduction – Civil Engineering – Materials: Bricks – composition – classifications – properties –uses. Stone – classification of rocks – quarrying – dressing – properties –uses. Timber - properties –uses –ply wood. Cement – grades –types – properties –uses. Steel – types – mild steel – medium steel – hard steel – properties – uses – market forms. Concrete – grade designation – properties – uses.

UNIT II - MATERIAL PROPERTIES (6 hours)

Stress – strain – types – Hook's law – three moduli of elasticity – poisons ratio – relationship – factor of safety. Centroid - center of gravity – problems in symmetrical sections only (I, T and channel sections). Moment of inertia, parallel, perpendicular axis theorems and radius of gyration (definitions only).

UNIT III - BUILDING COMPONENTS (6 hours)

Building – selection of site – classification – components. Foundations –functions – classifications – bearing capacity. Flooring – requirements – selection – types – cement concrete marble – terrazzo floorings. Roof – types and requirements.

UNIT IV - SURVEYING AND TRANSPORTATION (6 hours)

Surveying – objectives – classification – principles of survey. Transportation – classification – cross section and components of road – classification of roads. Railway – cross section and components of permanent way –functions. Water way – docks and harbor – classifications – components. Bridge – components of bridge.

UNIT V - WATER SUPPLY AND SEWAGE DISPOSAL (6 hours)

Dams – purpose – selection of site – types –gravity dam (cross section only). Water supply – objective – quantity of water – sources – standards of drinking

water – distribution system. Sewage – classification – technical terms – septic tank – components and functions.

TEXT BOOKS

1. Raju K.V.B, Ravichandran P.T, "*Basics of Civil Engineering"*, Ayyappa Publications, Chennai, 2012.
2. Rangwala S.C, " *Engineering Materials"*, Charotar Publishing House, Anand, 2012.

REFERENCES

1. Ramesh Babu, "*Civil Engineering"* , VRB Publishers, Chennai, 2000.
2. National Building Code of India, Part V, "*Building Material"s*, 2005.
3. Surendra Singh, "*Building Material"s*, Vikas Publishing Company, New Delhi, 1996.

CE1001 - BASIC CIVIL ENGINEERING												
Course designed by		**Department of Biotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x				x						X
2.	Mapping of instructional objectives with student outcome	1-4				1-4						2-4
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
							x					
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1001	**BASIC MECHANICAL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the basics of Mechanical Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize with the basic machine elements
2.	To familiarize with the Sources of Energy and Power Generation
3.	To familiarize with the various manufacturing processes

UNIT I – MACHINE ELEMENTS– I (5 hours)

Springs: Helical and leaf springs – Springs in series and parallel. **Cams:** Types of cams and followers – Cam profile.

UNIT II - MACHINE ELEMENTS– II (5 hours)

Power Transmission: Gears (terminology, spur, helical and bevel gears, gear trains). Belt drives (types). Chain drives. Simple Problems.

UNIT III - ENERGY (10 hours)

Sources: Renewable and non-renewable (various types, characteristics, advantages/disadvantages). **Power Generation:** External and internal combustion engines – Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). Simple Problems.

UNIT IV - MANUFACTURING PROCESSES - I (5 hours)

Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages). **Welding:** Types – Equipments – Tools and accessories – Techniques employed -applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

UNIT V - MANUFACTURING PROCESSES– II (5 hours)

Lathe Practice: Types - Description of main components – Cutting tools – Work holding devices – Basic operations. Simple Problems. **Drilling Practice:** Introduction – Types – Description – Tools. Simple Problems.

TEXT BOOKS

1. Kumar T, Leenus Jesu Martin and Murali G, *"Basic Mechanical Engineering"*, Suma Publications, Chennai, 2007.
2. Prabhu T. J, Jai Ganesh V and Jebaraj S, *"Basic Mechanical Engineering"*, Scitech Publications, Chennai, 2000.

REFERENCES

1. Hajra Choudhary S.K and HajraChoudhary A. K, "*Elements of Workshop Technology", Vols. I & II*, Indian Book Distributing Company Calcutta, 2007.
2. Nag P.K, "*Power Plant Engineering"*, Tata McGraw-Hill, New Delhi, 2008.
3. Rattan S.S, "*Theory of Machines"*, Tata McGraw-Hill, New Delhi, 2010.

ME1001 BASIC MECHANICAL ENGINEERING												
Course designed by		Department of Biotechnology										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x				x						
2.	Mapping of instructional objectives with student outcome	1-3				1-3						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
						x						
4.	Approval	23rd meeting of Academic Council, May 2013										

EE1001	BASIC ELECTRICAL ENGINEERING	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about circuit analysis, working principles of machines and common measuring instruments.

INSTRUCTIONAL OBJECTIVES

1.	Understand the basic concepts of magnetic circuits, AC & DC circuits.
2.	Explain the working principle, construction, applications of DC & AC machines and measuring instruments.
3.	Gain knowledge about the fundamentals of wiring and earthing

UNIT I – FUNDAMENTALS OF DC CIRCUITS (6 hours)

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor , Kirchhoff's laws, Mesh analysis, Nodal analysis, Ideal sources –equivalent resistor, current division, voltage division

UNIT II – MAGNETIC CIRCUITS (6 hours)

Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, induced emfs and inductances

UNIT III – AC CIRCUITS (6 hours)

Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator. Analysis of R-L, R-C, R-L-C circuits. Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV – ELECTRICAL MACHINES & MEASURING INSTRUMENTS (6 hours)

Working principle, construction and applications of DC machines and AC machines (1 - phase transformers, single phase induction motors: split phase, capacitor start and capacitor start & run motors). Basic principles and classification of instruments -Moving coil and moving iron instruments.

UNIT V – ELECTRICAL SAFETY, WIRING &INTRODUCTION TO POWER SYSTEM (6 hours)

Safety measures in electrical system- types of wiring- wiring accessories- staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing- Simple layout of generation, transmission & distribution of power.

TEXT BOOK

1. Dash S.S, Subramani C, Vijayakumar K, *"Basic Electrical Engineering",* First edition, Vijay Nicole Imprints Pvt.Ltd, 2013.

REFERENCES

1. Smarajt Ghosh, "*Fundamentals of Electrical & Electronics Engineering*", Second edition, PHI Learning, 2007.
2. Metha V.K, Rohit Metha, "*Basic Electrical Engineering*", Fifth edition, S.Chand & Co, 2012.
3. Kothari D P and Nagrath I J, "*Basic Electrical Engineering*", Second edition, Tata McGraw - Hill, 2009.
4. Bhattacharya S. K, "*Basic Electrical and Electronics Engineering"*, First edition, Pearson Education, 2011.

EE1001 - BASIC ELECTRICAL ENGINEERING													
Course designed by		**Department of Biotechnology**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K	
		x				x							
2.	Mapping of instructional objectives with student outcome	1-3				1							
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
							x						
4.	Approval	23rd meeting of Academic Council, May 2013											

EC1001	BASIC ELECTRONICS ENGINEERING	L	T	P	C
	Total Contact Hours – 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

This course provides comprehensive idea about working principle, operation and characteristics of electronic devices, transducers, Digital Electronics and Communication Systems.

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able to gain knowledge about the

1.	Fundamentals of electronic components, devices, transducers
2.	Principles of digital electronics
3.	Principles of various communication systems

UNIT I - ELECTRONIC COMPONENTS (4 hours)

Passive components – resistors, capacitors & inductors (properties, common types, I-V relationship and uses).

UNIT II - SEMICONDUCTOR DEVICES (7 hours)

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, optocouplers)

UNIT III - TRANSDUCERS (5 hours)

Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

UNIT IV - DIGITAL ELECTRONICS (7 hours)

Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

UNIT V - COMMUNICATION SYSTEMS (7 hours)

Block diagram of a basic communication system – frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse analog and

pulse digital modulation – AM / FM transmitters & receivers (block diagram description only)

TEXT BOOKS

1. Thyagarajan T, SendurChelvi K.P, Rangaswamy T.R, *"Engineering Basics: Electrical, Electronics and Computer Engineering"*, New Age International, Third Edition, 2007.
2. Somanathan Nair B, Deepa S.R, "*Basic Electronics",* I.K. International Pvt. Ltd., 2009.

REFERENCES

1. Thomas L. Floyd, *"Electronic Devices",* Pearson Education, 9th Edition, 2011.
2. Rajput R.K, *"Basic Electrical and Electronics Engineering"*, Laxmi Publications, First Edition, 2007.

EC1001 BASIC ELECTRONICS ENGINEERING												
Course designed by		**Department of Biotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x				x						
2.	Mapping of instructional objectives with student outcome	1,2,3										
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
						x						
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1005	**ENGINEERING GRAPHICS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 75	**0**	**1**	**4**	**3**
	Prerequisite				
	Nil				

First Angle Projection is to be followed - Practice with Computer Aided Drafting tools

PURPOSE	
1.	To draw and interpret various projections of 1D, 2D and 3D objects
2.	To prepare and interpret the drawings of buildings.
INSTRUCTIONAL OBJECTIVES	
1.	To familiarize with the construction of geometrical figures

2.	To familiarize with the projection of 1D, 2D and 3D elements
3.	To familiarize with the sectioning of solids and development of surfaces
4.	To familiarize with the Preparation and interpretation of building drawing

UNIT I - FUNDAMENTALS OF ENGINEERING GRAPHICS (2 hours)

Lettering – Two dimensional geometrical constructions – Conics – Representation of three-dimensional objects – Principles of projections – Standard codes – Projection of points.

UNIT II- PROJECTION OF LINES AND SOLIDS (4 hours)

Projection of straight lines – Projection of planes - Projection of solids – Auxiliary projections.

UNIT III- SECTIONS AND DEVELOPMENTS (3 hours)

Sections of solids and development of surfaces.

UNIT IV- PICTORIAL PROJECTIONS (4 hours)

Conversion of Projections: Orthographic projection – Isometric projection of regular solids and combination of solids.

UNIT V- BUILDING DRAWING (2 hours)

Plan, Elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course) with electrical wiring diagram.

PRACTICAL (60 hours)

TEXT BOOKS:

1. Venugopal K and Prabhu Raja V, "*Engineering Graphics"*, Eighth Edition (Revised), New Age International Publishers, Chennai, 2007.
2. Natarajan K.V, "*A Text Book of Engineering Graphics"*, 21st Edition, Dhanalakshmi Publishers, Chennai, 2012.
3. Jeyapoovan T, "*Engineering Drawing and Graphics using AutoCAD"*, Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCES

1. Bethune J.D, "Engineering Graphics with AutoCAD 2013", PHI Learning Private Limited, Delhi, 2013.
2. Bhatt N.D, "*Elementary Engineering Drawing (First Angle Projection)"*, Charotar Publishing Co., Anand, 1999.

3. Narayanan K. L and Kannaiah P, "*Engineering Graphics"*, Scitech Publications, Chennai, 1999.
4. Shah M. B and Rana B. C, "*Engineering Drawing"*, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2005.

ME1005 ENGINEERING GRAPHICS												
Course designed by		Department of Biotechnology										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x	x					X				
2.	Mapping of instructional objectives with student outcome	1-4	1-4					1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
						x						
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1004	WORKSHOP PRACTICE	L	T	P	C
	Total contact hours - 45	0	0	3	2
	Prerequisite				
	Nil				

PURPOSE

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize with the basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy
2.	To familiarize with the production of simple models in the above trades.

UNIT I - FITTING **(9 hours)**

Tools & Equipments – Practice in filing.
Making Vee Joints, Square, Dovetail joints and Key making - plumbing.
Mini project – Assembly of simple I.C. engines.

UNIT II - CARPENTRY **(9 hours)**

Tools and Equipments- Planning practice.
Making Half Lap, Dovetail, Mortise &Tenon joints.
Mini project - model of a single door window frame.

UNIT III - SHEET METAL **(9 hours)**

Tools and equipments– practice.
Making rectangular tray, hopper, scoop, etc.
Mini project - Fabrication of a small cabinet, dust bin, etc.

UNIT IV - WELDING **(9 hours)**

Tools and equipments -
Arc welding of butt joint, Lap joint, Tee fillet.
Demonstration of gas welding, TIG & MIG welding.

UNIT V - SMITHY **(9 hours)**

Tools and Equipments –
Making simple parts like hexagonal headed bolt, chisel.

TEXT BOOKS

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

REFERENCES

1. Kannaiah P, and Narayanan K. C, "*Manual on Workshop Practice"*, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy V.S, "*First year Engineering Workshop Practice"*, Ramalinga Publications, Madurai, 1999.
3. Laboratory Manual.

ME1005 ENGINEERING GRAPHICS												
Course designed by		**Department of Biotechnology**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
			x	X				X				
2.	Mapping of instructional objectives with student outcome	1,2	1,2					1,2				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
						x						
4.	Approval	23rd meeting of Academic Council, May 2013										

EC1002	ELECTRONICS ENGINEERING PRACTICES	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To equip the students with the knowledge of PCB design and fabrication processes.

INSTRUCTIONAL OBJECTIVES

1.	To familiarize the electronic components and basic electronic instruments.
2.	To make familiar with PCB design and various processes involved.
3.	To provide in-depth core knowledge in the and fabrication of Printed Circuit Boards.
4.	To provide the knowledge in assembling and testing of the PCB based electronic circuits.

Expt.1: INTRODUCTION TO BASICS OF ELECTRONIC COMPONENTS AND INSTRUMENTS (4 hours)

Study of electronic components- active & passive, Electronic Instruments: CRO, Function generator, Power Supply, Multi-meter, IC tester. Solder practice.

Expt. 2: SCHEMATIC CAPTURE (6 hours)

Introduction to ORCAD schematic capture tool, Simulation of simple electronic circuit, Schematic to layout transfer, Layout Printing

Expt. 3: PCB DESIGN PROCESS (6 hours)

Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Netlist, Making Netlist Files, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout, DRC, Pattern Transfer

Expt. 4: PCB FABRICATION PROCESS (6 hours)

Etching, cleaning, drying and drilling

Expt. 5: ASSEMBLING AND TESTING (8 hours)

Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality

TEXT BOOKS

1. Orcad User manual.
2. Raghbir Singh Khandpur, *"Printed Circuit Boards: Design, Fabrication, and Assembly"*, Tata McGraw-Hill Education, 2005.

REFERENCES

1. Department Laboratory Manual.

EC1002 ELECTRONICS ENGINEERING PRACTICE												
Course designed by		Department of Biotechnology										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
		x	x	X								x
2.	Mapping of instructional objectives with student outcome	1	2,3	2,3								1-4
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
							x					
4.	Approval	23rd meeting of Academic Council, May 2013										

EE1002	ELECTICAL ENGINEERING PRACTICE	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To provide exposure to the students with hands on experience on various Electrical Engineering practices.

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able

1.	To learn the residential wiring and various types of wiring.
2.	To measure the various electrical quantities.
3.	To gain knowledge about the fundamentals of various electrical gadgets and their working and trouble shooting of them.
4.	To design a prototype of a transformer.
5.	To know the necessity and types of earthing and measurement of earth resistance.

LIST OF EXPERIMENTS

1. Residential wiring (using Energy meter, fuses, switches, indicator, lamps, etc)
2. Types of wiring (fluorescent lamp wiring, staircase wiring, godown wiring, etc)
3. Measurement of electrical quantities (like voltage, current, power, power factor in RLC circuits)
4. Measurement of energy (using single phase and three phase energy meter)
5. Study of Earthing and Measurement of Earth resistance.
6. Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc)
7. Study of various electrical gadgets (Induction motor, transformer, CFL, LED, PV cell, etc)
8. Assembly of choke or small transformer.

REFERENCES

1. Subhransu Sekhar Dash & K.Vijayakumar, "*Electrical Engineering Practice Laboratory Manual".* Vijay Nicole Imprints Private Ltd., First Edition, 2013.
2. Jeyachandran K, Natarajan S & Balasubramanian S, "*A Primer on engineering practices Laboratory*", Anuradha Publications, 2007.
3. Jeyapoovan T, Saravanapandian M & Pranitha S, "*Engineering practices Laboratory manual*", Vikas Publishing House Pvt., Ltd., 2006.

<table>
<tr><th colspan="13">EE1002- ELECTICAL ENGINEERING PRACTICE</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Biotechnology</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>K</td></tr>
<tr><td>x</td><td>x</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1-5</td><td>2,5</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences and Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
<tr><td colspan="3"></td><td colspan="3"></td><td colspan="3">x</td><td colspan="3"></td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd meeting of Academic Council, May 2013</td></tr>
</table>

NC1001/ NS1001/ SP1001/ YG1001	NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO) / YOGA	L	T	P	C
	Total Contact Hours – 15 (minimum, but may vary depending on the course)	0	0	1	1
	Prerequisite				
	Nil				

PURPOSE
To imbibe in the minds of students the concepts and benefits of NCC/NSS/NSO/YOGA and make them practice the same

INSTRUCTIONAL OBJECTIVES	
1.	To enable the students to gain knowledge about NCC/NSS/NSO/YOGA and put the same into practice.

NATIONAL CADET CORPS (NCC)

Any student enrolling as a member of National Cadet Core (NCC) will have to attend sixteen parades out of twenty parades each of four periods over a span of academic year.

Attending eight parades in first semester will qualify a student to earn the credits specified in the curriculum. Grading shall be done based on punctuality, regularity in attending the parades and the extent of active involvement.

NATIONAL SERVICE SCHEME (NSS)

A student enrolling as member of NSS will have to complete 60 hours of training / social service to be eligible to earn the credits specified in the curriculum.

Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

NATIONAL SPORTS ORGANIZATION (NSO)

Each student must select one of the following games/sports events and practice for one hour per week. An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

List of games/sports:

Basket Ball, Football, Volley Ball, Ball Badminton, Cricket, Throw-ball, Track events Field events or any other game with the approval of faculty member.

YOGA

Benefits of Agnai Meditation -Meditation - Agnai, Asanas, Kiriyas, Bandas, Muthras

Benefits of santhi Meditation - Meditation Santhi Physical Exercises (I & II)

Lecture & Practice - Kayakalpa Yoga Asanas, Kiriyas, Bandas, Muthras

Analysis of Thought - Meditation Santhi Physical Exercises III & IV

Benefits of Thuriyam - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Attitude - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Importance of Arutkappy & Blessings - Meditation Thuriyam Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Benefits of Blessings - Meditation Santhi Kayakalpa Asanas, Kiriyas, Bandas, Muthras

Assessment

An attendance of 75% is compulsory to earn the credits specified in the curriculum. Grading shall be done by the faculty member handling the course based on punctuality, regularity in attending the classes and the extent of active involvement.

TEXT BOOKS

1. Yogiraj Vethathiri Maharishi, "*Yoga for Modern Age*", Vethathiri Publishers, 1989
2. Vethathiri Maharishi T, "*Simplified Physical Exercises*", Vethathiri Publishers, 1987.

NATIONAL CADET CORPS (NCC)/ NATIONAL SERVICE SCHEME (NSS)/ NATIONAL SPORTS ORGANIZATION (NSO)/YOGA												
Course designed by		**NCC/NSS/NSO/YOGA PRACTITIONERS**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	K
2.	Mapping of instructional objectives with student outcome				X					X		
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)					Professional Subjects (P)	
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER – III

LE1003	GERMAN LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours – 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

Germany offers infinite opportunities for students of engineering for higher studies, research and employment in Germany. B.Tech Students are offered German Language during their second year. Knowledge of the language will be helpful for the students to adjust themselves when they go for higher studies.

INSTRUCTIONAL OBJECTIVES

1.	To introduce the language, phonetics and the special characters in German language
2.	To introduce German culture & traditions to the students.
3.	By the end of Phase – I, the students will be able to introduce themselves and initiate a conversation.
4.	We endeavor to develop the ability among the students to read and understand small texts written in German
5.	To enable the students to elementary conversational skills.

UNIT I (**6 hours)**

Wichtige Sprachhandlungen: Phonetics – Sich begrüßen - Sich und andere vorstellen formell / informell - Zahlen von 1 bis 1 Milliarde - verstehen & sprechen
Grammatik: regelmäßige Verben im Präsens - "sein" und haben im Präsens - Personalpronomen im Nominativ

UNIT II **(6 hours)**

Wichtige Sprachhandlungen Telefon Nummern verstehen und sprechen
Uhrzeiten verstehen und sagen Verneinung "nicht und kein" (formell und informell)
Grammatik : Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/Nein Frage) Nomen buchstabieren und notieren bestimmter und unbestimmter Artikel und Negativartikel im Nom. & Akkusativ

UNIT III **(6 hours)**

Wichtige Sprachhandlungen Tageszeiten verstehen und über Termine sprechen -Verabredungen verstehen - Aufgaben im Haushalt verstehen **Grammatik** Personalpronomen im Akkusativ und Dativ - W-Fragen "wie, wer, wohin,wo, was usw.- Genitiv bei Personennamen - Modalverben im Präsens "können, müssen, möchten"

UNIT IV **(6 hours)**

Wichtige Sprachhandlungen Sich austauschen, was man kann, muss – Bezeichnungen Lebensmittel – Mengenangaben verstehen – Preise verstehen und Einkaufzettel schreiben

Grammatik Wortstellung in Sätzen mit Modalverben – Konnektor "und" – "noch"-kein-------mehr – "wie viel, wie viele, wie alt, wie lange" –Possessivartikel im Nominativ.

UNIT V **(6 hours)**

Wichtige Sprachhandlungen Freizeitanzeigen verstehen – Hobbys und Sportarten Anzeigen für Freizeitpartner schreiben bzw. darauf antworten – Vorlieben und Abneigungen ausdrucken

Grammatik Verben mit Vokalwechsel im Präsens – Modalverben im Präsens " dürfen, wollen und mögen - "haben und sein" im Präteritum – regelmäßige Verben im Perfekt – Konnektoren "denn, oder, aber

TEXT BOOK

1. Studio d A1. Deutsch als Fremdsprache with CD (Kursbuch und Sprach training).

REFERENCES

1. German for Dummies
2. Schulz Griesbach

LE1003 GERMAN LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-5				
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts(E)			Professional Subjects (P)		
		x		--			--			--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1004	FRENCH LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

To enable the student learners acquire a basic knowledge of the French language and concepts of general French for everyday interactions and technical French at the beginner's level and also to get to know the culture of France.

INSTRUCTIONAL OBJECTIVES

1.	To enable students improve their grammatical competence.
2.	To enhance their listening skills.
3	To assist students in reading and speaking the language.
4.	To enhance their lexical and technical competence.
5.	To help the students introduce themselves and focus on their communication skills.

UNIT I **(6 hours)**

1. Grammar and Vocabulary: Usage of the French verb "se presenter", a verb of self- introduction and how to greet a person- "saluer"
2. Listening and Speaking – The authentic sounds of the letters of the French alphabet and the accents that play a vital role in the pronunciation of the words.
3. Writing – correct spellings of French scientific and technical vocabulary.
4. Reading -- Reading of the text and comprehension – answering questions.

UNIT II **(6 hours)**

1. Grammar and Vocabulary – Definite articles , "prepositions de lieu" subject pron ouns
2. Listening and Speaking – pronunciation of words like Isabelle, presentez and la liaison – vous etes, vous appelez and role play of introducing each other – group activity
3. Writing – particulars in filling an enrollment / registration form
4. Reading Comprehension – reading a text of a famous scientist and answering questions.

UNIT III **(6 hours)**

1. Grammar and Vocabulary – verb of possession "avoir' and 1st group verbs "er", possessive adjectives and pronouns of insistence- moi, lui..and numbers from 0 to 20
2. Listening and Speaking –nasal sounds of the words like feminine, ceinture , parfum and how to ask simple questions on one's name, age, nationality, address mail id and telephone number.
3. Writing –conjugations of first group verbs and paragraph writing on self – introduction and introducing a third person.
4. Reading Comprehension – reading a text that speaks of one's profile and answering questions

UNIT IV **(6 hours)**

1. Grammar and Vocabulary –negative sentences, numbers from 20 to 69, verb "aimer"and seasons of the year and leisure activities.
2. Listening and Speaking – To express one's likes and dislikes and to talk of one's pastime activities (sports activities), je fais du ping-pong and nasal sounds of words – janvier, champagne
3. Writing- conjugations of the irregular verbs – faire and savoir and their usage. Paragraph writing on one's leisure activity- (passé temps favori)
4. Reading- a text on seasons and leisure activities – answering questions.

UNIT V **(6 hours)**

1. Grammar and Vocabulary – les verbes de direction- to ask one's way and to give directions, verbes- pouvoir and vouloir and 2nd group verbs , a droite, la premiere a gauche and vocabulary relating to accommodation.
2. Listening and Speaking – to read and understand the metro map and hence to give one directions – dialogue between two people.
3. Writing –paragraph writing describing the accommodation using the different prepositions like en face de, derriere- to locate .
4. Reading Comprehension -- a text / a dialogue between two on location and directions- ou est la poste/ la pharmacie, la bibliotheque?.....

TEXT BOOK

1. *"Tech French"*

REFERENCES

1. French for Dummies.
2. French made easy-Goyal publishers
3. Panorama

LE1004 FRENCH LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-5				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE 1005	JAPANESE LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To enable students achieve a basic exposure on Japan, Japanese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Japanese scripts viz. hiragana and a few basic kanji.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Japan and Japanese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Japan.

UNIT I **(8 hours)**

Introduction to Japanese language. Hiragana Chart 1 - vowels and consonants and related vocabulary.
Self introduction
Grammar – usage of particles wa, no, mo and ka and exercises
Numbers (1-100)
Kanji – introduction and basic kanjis – naka, ue, shita, kawa and yama
Greetings, seasons, days of the week and months of the year
Conversation – audio
Japan – Land and culture

UNIT II **(8 hours)**

Hiragana Chart 1 (contd.) and related vocabulary

Grammar – usage of kore, sore, are, kono, sono, ano, arimasu and imasu.
Particles – ni (location) and ga. Donata and dare.
Numbers (up to 99,999)
Kanji – numbers (1-10, 100, 1000, 10,000 and yen)
Family relationships and colours.
Conversation – audio
Festivals of Japan

UNIT III (**5 hours)**

Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary
Lesson 3
Grammar - particles ni (time), kara, made and ne. Koko, soko, asoko and doko.
Time expressions (today, tomorrow, yesterday, day before, day after)
Kanji – person, man, woman, child, tree and book
Directions – north, south, east and west

UNIT IV **(5 hours)**

Grammar - directions,-kochira, sochira, achira and dochira. Associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)
Conversation – audio
Japanese art and culture like ikebana, origami, etc.

UNIT V **(4hours)**

Kanji – hidari, migi, kuchi
Japanese sports and martial arts

TEXT BOOK

1. First lessons in Japanese, ALC Japan

REFERENCES

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation

LE1005 JAPANESE LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1006	KOREAN LANGUAGE PHASE I	L	T	P	C
	Total Contact Hours-30	**2**	**0**	**0**	**2**
	Prerequisite				
	Nil				

PURPOSE

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the scripts.
2.	To make the students acquire basic conversational skill.
3	To enable students to know about Korean culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea.

UNIT I **(6 hours)**

Lesson 1 < Introduction to Korean Language >, Lesson2 < Consonants and Vowels >, <Basic Conversation, Vocabularies and Listening >

UNIT II **(10 hours)**

Lesson 3 < Usage of "To be" >, Lesson 4 < Informal form of "to be" >, Lesson 5 <Informal interrogative form of "to be" >, Lesson 6 < To be, to have, to stay >, < Basic Conversation, Vocabularies and Listening >

UNIT III (**10 hours)**

Lesson 7 < Interrogative practice and Negation >, < Basic Conversation, Vocabularies and Listening >

UNIT IV **(4 hours)**

Lesson 8 < Korean Culture and Business Etiquette >, < Basic Conversation, Vocabularies and Listening

TEXT BOOK

1. Korean Through English 1 (Basic Korean Grammar and Conversation).

REFERENCES

1. Bharati Korean (Intermediate Korean Grammar).
2. Hand-outs.
3. Various visual mediums such Movie CD, Audio CD.
4. Collection of vocabularies for engineering field.

LE1006 KOREAN LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)			Professional Subjects (P)			
		x		--		--			--			
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1007	**CHINESE LANGUAGE PHASE I**	**L**	**T**	**P**	**C**
	Total contact hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	NIL				

PURPOSE

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Chinese scripts.
2.	To make the students acquire basic conversational skill.

3	To enable students to know about China and Chinese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china.

NIT I

Introduction of Chinese Language

UNIT II

Phonetics and Notes on pronunciation

a) 21 Initials:

b p m f d t n l g k h j q x z c s zh ch sh r

b) 37 Finals:

a	o	e	i	u	ü
ai	ou	ei	ia	ua	üe
an	ong	en	ian	uai	üan
ang		eng	iang	uan	ün
ao		er	iao	uang	
			ie	uei(ui)	
			in	uen(un)	
			ing	ueng	
			iong	uo	
			iou(iu)		

c) The combination of Initials and Finals - Pinyin

UNIT III

Introduction of Syllables and tones

a) syllable=initial+final+tone
b) There are four tones in Chinese: the high-and-level tone, the rising tone, the falling-and-rising tone, and the falling tone. And the markers of the different tones.

UNIT IV

A. Tones practice

B. the Strokes of Characters

1. Introduction of Chinese Characters
2. The eight basic strokes of characters

UNIT V

1. **Learn to read and write the Characters:**

八(eight) 不(not) 马(horse) 米(rice) 木(wood).

2. **classes are organized according to several Mini-dialogues.**

TEXT BOOK

1. A New Chinese Course 1- Beijing Language and Culture University Press.

REFERENCES

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press.
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press.
3. My Chinese Classroom - East China Normal University Press.

LE1007 CHINESE LANGUAGE PHASE I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

PD1003	**APTITUDE-I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				
PURPOSE					
To enhance holistic development of students and improve their employability skills.					
INSTRUCTIONAL OBJECTIVES					
1.	To improve aptitude, problem solving skills and reasoning ability of the student.				
2.	To collectively solve problems in teams & group.				

UNIT I – NUMBERS **(6 hours)**

Types and Properties of Numbers, LCM, GCD, Fractions and decimals, Surds

UNIT II - ARITHMETIC – I **(6 hours)**

Percentages, Profit & Loss, Simple Interest & Compound Interest, , Clocks & calendars

UNIT III - ALGEBRA - I **(6 hours)**

Logarithms, Problems on ages

UNIT IV - MODERN MATHEMATICS - I **(6 hours)**

Permutations, Combinations, Probability

UNIT V - REASONING **(6 hours)**

Logical Reasoning, Analytical Reasoning

ASSESSMENT

1. Objective type – Paper based / Online – Time based test

REFERENCES

1. Agarwal R.S *, "Quantitative Aptitude for Competitive Examinations",* S.Chand Limited 2011.
2. Abhijit Guha*, "Quantitative Aptitude for Competitive Examinations",* Tata McGraw Hill, 3rd Edition*,* 2011.
3. Edgar Thrope, *"Test Of Reasoning for Competitive Examinations",* Tata McGraw Hill, 4th Edition, 2012.
4. *Other material related to quantitative aptitude.*

PD1003 – APTITUDE-I												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		x			x							
2.	Mapping of instructional objectives with student outcome	1			2							
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

MA1013	FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS	L	T	P	C
	Total contact hours = 60 hours	4	0	0	4
	(Common to Auto, Aero, Mech, Nano, Civil & Chemical)				

PURPOSE:

To inculcate the problem solving ability in the minds of students so as to apply the theoretical knowledge to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES:

1.	To formulate and solve partial differential equations
2.	To have thorough knowledge in Fourier series
3.	To learn to solve boundary value problems
4.	To be familiar with applications of PDE in two dimensional heat equation
5.	To gain good knowledge in the application of Fourier transform

UNIT I - PARTIAL DIFFERENTIAL EQUATIONS (12 hours)

Formation - Solution of standard types of first order equations - Lagrange's equation - Linear Homogeneous partial differential equations of second and higher order with constant coefficients.

UNIT II - FOURIER SERIES (12 hours)

Dirichlet's conditions - General Fourier series - Half range sine and cosine series- Parseval's identity - Harmonic analysis.

UNIT III - BOUNDARY VALUE PROBLEMS (12 hours)

Classification of second order linear partial differential equations - Solutions of one-dimensional wave equation - one-dimensional heat equation

UNIT IV - TWO DIMENSIONAL HEAT EQUATION (12 hours)

Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates & Polar coordinates.

UNIT V - FOURIER TRANSFORMS (12 hours)

Statement of Fourier integral theorem (without proof) - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

TEXT BOOKS

1. Kreyszig E, *"Advanced Engineering Mathematics",* 10th edition, John Wiley & Sons. Singapore 2012.
2. Grewal B. S, *"Higher Engineering Mathematics",* 42nd edition, Khanna Publishers, New Delhi, 2012.

REFERENCES

1. Sivaramakrishna Das P and Vijayakumari C, "*A text book of Engineering Mathematics-III"*, Viji's Academy, 2010.
2. Kandasamy P., etal., "*Engineering Mathematics, Vol. II & Vol. III"* (4th revised edition), S.Chand & Co., New Delhi, 2000.
3. Narayanan S, Manickavachagom Pillay T, and Ramanaiah G, *"Advanced Mathematics for Engineering students*", Volume II & III (2nd edition), S,Viswanathan Printers and Publishers, 1992.
4. Venkataraman M K, *"Engineering Mathematics - Vol.III - A & B" (*13th edition), National Publishing Co., Chennai, 1998.
5. Sankara Rao, *"Introduction to Partial Differential Equations",* 2nd Edition, PHI Learning Pvt. Ltd., 2006.

MA 1013 - FOURIER SERIES, PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	H	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts(E)			Professional Subjects (P)			
		-		x		--			--			
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1008	**MANUFACTURING TECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To make the students aware of different manufacturing processes like casting, metal forming, metal cutting and gear manufacturing

INSTRUCTIONAL OBJECTIVES

To familiarize the students with

1.	Concepts of casting Technology
2.	Mechanical working of metals
3.	Theory of metal cutting
4.	Gear manufacturing process
5.	Surface finishing processes
6.	Milling machine & other machine tools

UNIT I - CASTING (8 hours)

Introduction to casting - Patterns - Types - Pattern materials - Allowances. Moulding - types - Moulding sand - Gating and Risering - Core making. Special Casting Process – Shell- Investment - Die casting - Centrifugal Casting - Design of Casting, defects in casting.

UNIT II - MECHANICAL WORKING OF METALS (9 hours)

Hot and Cold Working: Rolling, Forging, Wire Drawing, Extrusion - types – Forward-backward and tube extrusion.

Sheet Metal Operations: Blanking - blank size calculation, draw ratio, drawing force, Piercing, Punching, Trimming, Stretch forming, Shearing, Bending - simple problems - Bending force calculation, Tube forming - Embossing and coining, Types of dies: Progressive, compound and combination dies, defects in forming.

UNIT III - THEORY OF METAL CUTTING (9 hours)

Orthogonal and oblique cutting - Classification of cutting tools: single, multipoint - Tool signature for single point cutting tool - Mechanics of orthogonal cutting - Force relations : Merchant circle – Determination of Shear angle - Chip formation- Cutting tool materials - Tool wear and tool life - Machinability - Cutting Fluids - Simple problems.

UNIT IV - GEAR MANUFACTURING AND SURFACE FINISHING PROCESS (9 hours)

Gear manufacturing processes: Extrusion, Stamping, and Powder Metallurgy. Gear Machining: Forming. Gear generating process - Gear shaping, Gear hobbing. Surface Finishing Process: Grinding process, various types of grinding machine, Grinding Wheel - types - Selection of Cutting speed and work speed, dressing and truing. Fine Finishing - Lapping, Buffing, Honing, and Super finishing.

UNIT V - MACHINE TOOLS (10 hours)

Milling Machine - Types, Types of cutters, operations, Indexing methods. Shaping, Planing and Slotting Machine – Operations and quick return mechanisms, Work and tool holding devices. Boring machine - Operations, Jig

boring machine. Broaching machine - operations, Tool nomenclature-Simple Problems.

TEXT BOOKS

1. Sharma P.C, "*Production Technology : Manufacturing Processes", 7th Edition"*, S. Chand Publisher, 2008.
2. Rao P.N, "*Manufacturing Technology, Vol I and II",* Tata McGraw Hill Publishing Co., 2nd edition, 2009.

REFERENCES

1. Hajra Choudhary S. K and Hajra Choudhary A. K, "*Elements of Manufacturing Technology"*, Vol II, Media Publishers, Bombay, 2007
2. Jain R. K, "*Production Technology : Manufacturing Processes, Technology and Automation"*, 17th Edition, Khanna Publishers, 2011.
3. Kalpakjian, "*Manufacturing Engineering and Technology"*, 4th edition, Addison Wesley Congmen Pvt. Ltd., Singapore, 2009.
4. Chapman W. A. J, "*Workshop Technology Vol. I and II"*, Arnold Publisher, New Delhi, 2001.

ME1008 – MANUFACTURING TECHNOLOGY												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	J	k
		x	x									
2.	Mapping of instructional objectives with student outcome	1,2,3,4 ,5,6				1,2,3, 4,5,6						
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Arts(E)			Professional Subjects (P)		
		-		-			--			**X**		
4.	Approval	23rd meeting of Academic Council, May 2013										

ME1009	**FLUID MECHANICS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	**2**	**2**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To be familiar with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to fluid flow problems

INSTRUCTIONAL OBJECTIVES	
After completion of the course, students are able	
1.	To understand the properties of the fluid.
2.	To understand and solve the fluid flow problems.
3.	To understand the mathematical techniques of practical flow problems.
4.	To understand the energy exchange process in fluid machines.

UNIT I - PROPERTIES OF FLUIDS AND FLUID STATICS (9 hours)

Fluid properties: Mass density, specific weight, specific volume, specific gravity, viscosity, vapour pressure, compressibility, surface tension and capillarity. Fluid statics: fluid pressure at a point, variation of pressure within a static fluid, hydrostatic law - Pressure head, Pascal's law. Measurement of pressure - Piezometric tube, manometry.

UNIT II - FLUID KINEMATICS AND FLUID DYNAMICS (12 hours)

Fluid kinematics: Lagrangian and Eulerian description of fluid flow - Velocity and acceleration of fluid particles - Different types of fluid flow. Description of flow pattern: Stream line, streak line, path line. Principle of conservation of mass - Continuity equation. Fluid dynamics: Euler's equation of motion along a stream line - Bernoulli's equation. Practical applications of Bernoulli's equation in flow measurement devices like venturimeter, orificemeter and pitot tube. Concept of impulse momentum equation & angular momentum principle with applications.

UNIT III - DIMENSIONAL AND MODEL ANALYSIS (9 hours)

Dimensional analysis: dimensions, dimensional homogeneity, methods of dimensional analysis-Buckingham Pi theorem. Model analysis - Advantages and applications of model testing. similitude, derivations of important dimensionless numbers, model laws.

UNIT IV -FLOW THROUGH PIPES (9 hours)

Laminar and turbulent flow characteristics, laminar flow through circular pipes - Hagen Poiseuille law, major and minor losses in pipes, pipe friction, Darcy - Weisbach equation, parallel, series and branched pipes.

UNIT V-BOUNDARY LAYER THEORY AND FLUID FLOW OVER BODIES (9 hours)

Boundary layer development on a flat plate and its characteristics - Boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Momentum equation for boundary layer by Vonkarman, drag on flat plate,

boundary layer separation and its control. Aerofoil theory, lift and drag coefficients, streamlined and bluff bodies.

UNIT VI-HYDRAULIC MACHINES (12 hours)

Hydraulic turbine: Classification, difference between impulse and reaction turbine. Construction and working of Pelton turbine, Francis turbine and Kaplan turbine, velocity triangle, heads and efficiencies. Pumps: classification, difference between positive and non-positive displacement pumps. construction and working of reciprocating pump. Centrifugal pump-heads of a centrifugal pump, priming, velocity triangle, work done, efficiencies of centrifugal pump.

TEXT BOOKS

1. Rajput R. K, *"A text book of Fluid Mechanics and Hydraulic Machines"*, S. Chand & Company Ltd., New Delhi, Fourth edition, 2010.
2. Bansal R. K, *"Fluid Mechanics and Hydraulics Machines"*, 5th edition, Laxmi publications (P) Ltd., New Delhi, Ninth Edition, 2006.

REFERENCES

1. White F.M, "*Fluid Mechanics"*, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
2. Streeter V. L, and Wylie E.B, *"Fluid Mechanics",* McGraw Hill, 1983.
3. Modi P.N, & Seth S.M, *"Hydraulics and Fluid Mechanics*", Standard Book House, New Delhi, 14th edition, 2002.
4. Shiv Kumar, "*Fluid Mechanics & Fluid Machines: Basic Concepts & Principles",* Ane Books Pvt. Ltd., New Delhi, 2010.
5. Yunus A Cengel & John M. Cimbala, "*Fluid Mechanics"*, Tata McGraw Hill Edition, New Delhi, 2006.

<table>
<tr><th colspan="13">ME1009 FLUID MECHANICS</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Department of Mechanical Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>X</td><td></td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1, 2, 3, 4</td><td></td><td></td><td></td><td>1, 2, 3, 4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td>General (G)</td><td colspan="3">Basic Sciences(B)</td><td colspan="3">Engineering Sciences and Technical Art (E)</td><td colspan="3">Professional Subjects(P)</td></tr>
<tr><td>--</td><td colspan="3">--</td><td colspan="3">--</td><td colspan="3">X</td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd meeting of the Academic Council , May 2013</td></tr>
</table>

	THERMODYNAMICS AND ENGINEERING	L	T	P	C
AE1002	Total contact hours-75	3	2	0	4
	Prerequisite				
	(Use of standard steam tables, Mollier chart, refrigeration tables and heat transfer data book are permitted)				

PURPOSE

This course provides the basic knowledge about thermodynamic laws and relations. On completion of this course, the students are exposed to understand the concept and working of various automotive systems and their thermal relationship.

INSTRUCTIONAL OBJECTIVES

1.	To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.
2.	To integrate the basic concepts into various thermal applications like Steam engines, IC engines, Air compressors, Refrigeration and Air conditioning.
3.	To enlighten the various modes of heat transfer and their engineering applications.

UNIT I - BASIC CONCEPTS (15 hours)

Macroscopic vs Microscopic aspects- Thermodynamic system and surrounding. Properties of a system- State and equilibrium- Forms of energy- Quasi static process- Zeroth law of Thermodynamics- Work and Heat transfer- Point and path functions. First law of thermodynamics for open and closed systems. SFEE equations [steady flow energy equation] & applications

Second law of thermodynamics, Heat engines, Refrigerators & Heat pumps

UNIT II - ENTROPY (15 hours)

Carnot theorem & Clausius inequality- Concept of entropy- Entropy transfer and Entropy generation- Available energy (Introduction only),Maxwell's Equations, Relation between C_p&C_v, Clapeyron equation, Joule Thomson coefficient, Dalton's law of partial pressures

UNIT III - THERMODYNAMIC CYCLES AND AIR COMPRESSOR (15 hours)

Thermodynamic assumptions - Otto cycle, Diesel cycle and Dual Cycle (Air standard efficiency, Mean effective pressure, Power)

Vapour power cycles

Simple Steam Engines (Classification, Construction & Working) - Rankine cycle - Simple, Reheat. Reciprocating air compressors – Types, Construction &

Working.Work done by the compressor without clearance & with clearance, various efficiencies and mean effective pressure. Multistage compression - Advantages, effect of inter-cooling (Simple problems) Rotary compressors – Advantages over reciprocating compressors

UNIT IV - REFRIGERATION (15 hours)

Types of refrigeration systems, Refrigerants – Properties, Eco-friendly refrigerants. Unit of refrigeration, Vapour compression system – Construction & working, Analysis, Use of p-h chart, effect of sub-cooling and super heating, COP calculations. Vapour absorption system - Construction & working

UNIT V - PSYCHROMETRY & AIR CONDITIONING (15 hours)

Properties of atmospheric air - Use of Psychrometric chart - Sensible heating, Sensible cooling - Cooling & Dehumidification - Heating & Humidification. - Summer air conditioning system, winter air conditioning system, Year around air conditioning system

(Construction & Working)

Application of air conditioning in automobiles - Cooling load calculations (Simple problems only),

One-dimensional Heat Conduction

Plane wall, Cylinder, Sphere, Composite walls, Critical thickness of insulation, Heat transfer through extended surfaces (simple fins)

Convection

Free convection and forced convection - Internal and external flow, Empirical relations

Radiation:

Black, Gray bodies - Radiation Shape Factor (RSF)

TEXT BOOKS

1. Nag P. K, *"Basic and Applied Engineering Thermodynamics"*, 2nd edition, Tata McGraw Hill, 2009.
2. Rajput R. K, *"Thermal Engineering"*, 6th edition, Laxmi Publications, 2006.

REFERENCES

1. Arora S. C, Domkundwar C. S, *"A course in Refrigeration and Air Conditioning"*, 4th Edition, New Age International (p) Ltd., New Delhi, 2002.
2. Kothandaraman C. P, *"Fundamentals of Heat and Mass transfer"*, 4th edition, New Age International (p) Ltd., 2012.

AE1002 - THERMODYNAMICS & ENGINEERING												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X									
2.	Mapping of instructional objectives with student outcome	1,2, 3	1,2, 3									
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)			Professional Subjects(P)			
									X			
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing			Engines and Management systems			
		-		-		-			X			
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1003	INSTRUMENTATION FOR AUTOMOBILE ENGINEERS	L	T	P	C
	Total contact hours - 30	2	0	0	2
	Prerequisite				
	Nil				

PURPOSE

The aim of this course is to familiarize the student with the principle of operation, capabilities and limitation of Electronics and instrumentation so that he will be able to use this knowledge effectively.

INSTRUCTIONAL OBJECTIVES

1.	To study the Characteristics of Transistor.
2.	To study the application of Semiconductor Devices like JFET, MOSFET and UJT.
3.	To study the Basics of Measurement System for Electronic devices.
4.	To study the use of Primary sensing element and Signal Conditioning Unit.
5.	Automotive Sensors and Actuators.

UNIT I - TRANSISTOR & ITS BIASING (6 hours)

Transistor Symbols – Transistor as an Amplifier– Connections– CB, CE,&CC– Characteristics– Comparison of Transistor Connection. Transistor biasing: Methods of transistor Biasing– Base resistor method– Biasing with feedback resistor– Voltage divider bias method.

UNIT II - JFET, MOSFET, SCR & UJT (6 hours)

JFET – JFET as an Amplifier and its Output Characteristics –JFET Applications– MOSFET Working Principles, SCR – Equivalent Circuit and V-I Characteristics. SCR as a Half wave and full wave rectifier– Application of SCR, UJT– Equivalent Circuit of a UJT and its Characteristics.

UNIT III - MEASUREMENT SYSTEM (6 hours)

Methods of Measurements, Classification of Instruments and application, Static and Dynamic Characteristics of an Instruments, Errors in Measurement Systems– Units, System, Dimension and standards.

UNIT IV - PRIMARY SENSING ELEMENTS AND SIGNAL CONDITIONING (6 hours)

Transducers and inverse transducers. Characteristics and Choice of transducers, Input, Transfer and output Characteristics and its application. Operational Amplifier, Characteristics of Operational Amplifier, Attenuator, Amplitude Modulation and Demodulation, Basic Filters, A/D Converters.

UNIT V - AUTOMOTIVE SENSORS AND ACTUATORS (6 hours)

Introduction, basic sensor arrangement, Types of sensors such as - oxygen sensors, Crank angle position sensors -Fuel metering, vehicle speed sensor and detonation sensor -Altitude sensor, flow sensor. Throttle position sensors, solenoids, stepper motors, relays.

TEXT BOOKS

1. Sawhney A. K, *"A Course in Electrical and Electronic Measurement and Instrumentation"*, Dhanpat Rai & Sons, New Delhi, 2001.
2. Millman and Halkias, *"Electronic devices and Circuits"*, Tata McGraw Hill International Edition, 1994.
3. Mithal G. K, *"Electronic Devices and Circuits"*, Khanna Publishers, New Delhi, 2008.

REFERENCES

1. *"BOSCH Automotive Handbook"*, 8th Edition, Bentley publishers, 2011.
2. Sze S. M, *"Semiconductor Devices – Physics and Technology*", 2nd Edtion, John Wiley & Sons, New York, 2002.
3. Ben G. *"Streetman and Sanjay Banerjee, Solid State Electronic Devices"*, 6th Edition, PHI Learning, 2009.

AE1003 - INSTRUMENTATION FOR AUTOMOBILE ENGINEERS												
Course Designed by		**Department of Automobile Engineering**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X					X	X
2.	Mapping of instructional objectives with student outcome	1,2, 3,4, 5	1,2, 3,4, 5			4,5					4,5	1,2,3 ,4,5
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences & Technical Arts (E)				Professional Subjects (P)		
		-		-		-				X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
		-		-		-				X		
5.	Approval	23rd meeting of Academic Council, May 2013										

ME1018	MANUFACTURING AND ASSEMBLY DRAWING	L	T	P	C
	Total contact hours - 60	0	1	3	2
	Prerequisite				
	Nil				

PURPOSE

To enable the students to prepare a detailed assembly drawing for given machine components and jigs and fixtures.

INSTRUCTIONAL OBJECTIVES

At the end of this course the student should be able to

1.	Understand Indian standards for machine drawing.
2.	Understand Fits and Tolerances in technical drawing.
3.	Prepare assembly drawing of joints, couplings and machine elements.
4.	Design and prepare Jigs and fixtures for given components

UNIT I - TECHNICAL DRAWING STANDARDS (4 hours)

BIS Code of practice for Engineering Drawing: General principles of presentation, conventional representation of dimensioning and sectioning, threaded parts, gears, springs and common features. Abbreviations and symbols used in technical drawings. Symbols and method of indication on the drawing for surface finish, welding and riveted joints.

UNIT II - FITS AND TOLERANCES (4 hours)

Tolerance types and representation on the drawing – Fits types and selection for different applications – Basic hole systems - Basic shaft systems – Allowances. Geometric tolerances – Form and positional. Datum and datum features symbols used to represent geometric tolerances.

UNIT III - ASSEMBLY DRAWING OF JOINTS, COUPLING AND BEARINGS (4 hours)

Preparation of drawing for keys and keyways, cotter joints, knuckle joints and threaded fasteners. Preparation of drawing for Couplings - Flange coupling and universal coupling, Bearings, Plummer block - Representation of tolerances in drawing.

UNIT IV - ASSEMBLY DRAWING OF MACHINE ELEMENTS (4 hours)

Preparation of assembled views using parts details - Lathe tail stock - Lathe chuck - Connecting rod – Screw jack - Machine vice - Tool head of shaper.

UNIT V - JIGS AND FIXTURES (4 hours)

Jigs types-plate, latch, channel, box, post, pot jigs, automatic drill jigs - lathe, milling and broaching fixtures- Grinding, planning, shaping fixtures, and welding fixtures. Preparation of Jigs/Fixtures for basic components.

NOTE:

1. Computer aided approach shall be followed.
2. Examination must include an assembly drawing of machine elements.

PRACTICAL (40 hours)

TEXT BOOKS (CAD approach)

1. Narayana K.L, Kanniah P and Venkata Reddy K, "*Machine "Drawing"*, New Age International, New Delhi, 2006.
2. Gopalakrishnan K.R, "*Machine Drawing",* Subash Publishers, Bangalore, 2000.
3. Joshi P.H, "*Jigs & Fixtures",* New Delhi -Tata McGraw Hill Pub. Co. Ltd., 11th print 1999.

REFERENCES

1. Sidheswar Kannaiah N, Sastry P.V.V.V, "*Machine Drawing",* Tata McGraw Hill, New Delhi, 1997.
2. Bhatt N. D, "*Machine Drawing",* Charotar Publishing House, Anand, 1999.

3. Junnarkar N. D, "*Machine Drawing"*, First Indian print, Pearson Education (Singapore) Pvt. Ltd., 2005.
4. *P.S.G. "Design Data Book",* Coimbatore, 2001.
5. Revised IS codes: 10711, 10712, 10713, 10714, 9609, 11665, 10715, 10716, 11663, 11668, 10968, 11669, and 8000.

ME1018 – MANUFACTURING AND ASSEMBLY DRAWING												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
				X				X				X
2.	Mapping of instructional objectives with student outcome			1,2, 3,4, 5				1,2,3,4 ,5				1,2, 3,4,5
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Approval	23rd meeting of the Academic Council , May 2013										

ME1015	FLUID DYNAMICS LABORATORY	L	T	P	C
	Total Contact Hours = 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To enable the students to acquire knowledge of fluid flow concepts, working principles of flow meters, pumps and turbines.

INSTRUCTIONAL OBJECTIVES

On completion of this course, the students are able to

1.	Understand the working of flow meters
2.	Gain knowledge on different forms of energy of flowing fluids
3.	Estimate the various losses in pipes
4.	Study the performance of pumps and turbines

LIST OF EXPERIMENTS

1. Determination of coefficient of discharge of orifice meter
2. Determination of coefficient of discharge of venture-meter
3. Verification of Bernoulli's theorem
4. Major loss due to friction in pipe flow
5. Minor losses due to pipe fittings in pipes

6. Performance test on centrifugal pump
7. Performance test on reciprocating pump
8. Performance test on gear pump
9. Performance test on submersible pump
10. Performance test on jet pump
11. Performance test on Pelton turbine
12. Performance test on Francis turbine
13. Effect of water jet on vane
14. Determination of type of flow by Reynolds apparatus

REFERENCE

1. Laboratory manual

ME1015 - FLUID DYNAMICS LABORATORY												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1, 2, 3, 4	1, 2, 3, 4			1, 2, 3, 4						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
		-		-		-				X		
4.	Approval	23rd meeting of the Academic Council , May 2013										

	MANUFACTURING LABORATORY FOR AUTOMOBILE ENGINEERS	**L**	**T**	**P**	**C**
AE1004	Total Contact Hours = 60	**0**	**1**	**3**	**2**
	Prerequisite				
	Nil				

PURPOSE

To expose hands-on training to the students on various machines like lathe, Shaper, Slotter, Milling, Gear hobbing, grinding machines.

INSTRUCTIONAL OBJECTIVES

To familiarize the students the with

1.	Various types of lathe operations.
2.	Production of flat surface and contour shapes on the given component.
3.	Gear making processes
4.	Surface finishing process

LIST OF EXPERIMENTS

1. Introduction- lathe machine, plain turning, Step turning & grooving (Including lathe mechanisms, simple problems).
2. Taper turning-compound rest/offset method & Drilling using lathe (Including Drilling feed mechanism, Twist drill nomenclature, and Different types of taper turning operations).
3. External threading-Single start (Including Thread cutting mechanism-simple problems).
4. Eccentric turning-Single axis.
5. Shaping-V-Block (Including Shaper quick return mechanism).
6. Grinding-Cylindrical /Surface/Tool & cutter.
7. Slotting-Keyways (Including Broaching tool nomenclature and Slotter mechanism).
8. Milling-Polygon /Spur gear (Including Milling mechanism, simple problems).
9. Gear hobbing-Helical gear.
10. Drilling, reaming, counter boring.
11. Planning/Capstan lathe/Burnishing process (Planner Mechanism, Description of capstan and turret lathe).
12. Application oriented products using above experiments.

REFERENCES

1. Laboratory Manual.
2. Hajra Choudhary S. K and Hajra Choudhary A. K, Elements of Manufacturing Technology Vol II, Media Publishers, 2007.
3. Rajendra Simha, Introduction to Basic Manufacturing Process and Workshop Technology, New Age International, 2006.

AE1004- MANUFACTURING LABORATORY FOR AUTOMOBILE ENGINEERS												
Course Designed by		Department of Automobile Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X									
2.	Mapping of instructional objectives with student outcome	1,2,3,4	1,2,3,4									
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
						X						
4.	Approval	23rd meeting of the Academic Council , May 2013										

SEMESTER – IV

LE1008	**GERMAN LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1003-German Language Phase I				

PURPOSE

Familiarity in German language will be helpful for the students in preparing their resumes in German. Proficiency in the language will be an added asset for the students to have an edge in the present day highly competitive and global job market.

INSTRUCTIONAL OBJECTIVES

1.	To enable the students to speak and understand about most of the activities in the day to day life.
2.	The students will be able to narrate their experiences in Past Tense.
3.	The students will be able to understand and communicate even with German Nationals.
4.	By the end of Phase – II the students will have a reasonable level of conversational skills.

UNIT I **(6 hours)**

Wichtige Sprachhandlungen: Zimmersuche, Möbel

Grammatik: Verben mit trennbaren Vorsilben im Präsens und Perfekt. Verben mit trennbaren Vorsilben und Modalverben imPräsens. Verben mit untrennbaren Vorsilben im Perfekt. Unregelmäßige und gemischte Verben im Perfekt.

UNIT II **(6 hours)**

Wichtige Sprachhandlungen: Kleidung ,Farben , Materialien.

Grammatik : formelle Imperativsätze mit “Sie” informelle Imperativsätze Vorschläge mit “wir” – “sollen/wollenwir”—Soll ich? Modalpartikeln “doch” “mal” “doch mal.

UNIT III **(6 hours)**

Wichtige Sprachhandlungen : Sehenswürdigkeite (Prater, Brandenburger Tör,Kolossium, Eifeltürm)

Grammatik : Ortsangaben mit Akk. und Dativ “alle”,”man” Indefinitepronomen “etwas”, “nichts”,

UNIT IV **(6 hours)**

Wichtige Sprachhandlungen : Wegbeschreibung/ Einladung interkulturelle Erfahrung.

Grammatik : Verwendung von Präsens für zukünftigen Zeitpunkt.

UNIT V **(6 hours)**

Wichtige Sprachhandlungen: Essen und Trinken im Restaurant , Partyvorbereitung und Feier

Grammatik: Nomen aus Adjektiven nach "etwas"und "nichts" Nomen aus dem Infinitiv von Verben, zusammegesetzte Nomen und ihre Artikel. Adjektive im Nom. und Akk. nach unbestimmten Artikel, Negativartikel und Possessivartikel.

TEXT BOOK

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprachtraining).

REFERENCES

1. German for Dummies
2. Schulz Griesbach

LE01008 GERMAN LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	A	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1009	**FRENCH LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1004- French Language Phase I				
PURPOSE					
To enable the students communicate effectively with any French speaker and have a competitive edge in the international market.					

INSTRUCTIONAL OBJECTIVES	
1.	To enable students access information on the internet
2.	To receive and send e mails
3.	To assist students in gaining a certain level of proficiency to enable them to give the level 1 exam conducted by Alliance Française de Madras.
4.	To enhance their lexical and technical competence.

UNIT I **(6 hours)**

1. Grammar and Vocabulary: The second group verbs: Finir, rougir, grossir, grandir . "Les preposition de temps": à, en, le, de 7h à 8h, jusqu' à, vers.
2. Listening and Speaking – the semi- vowels: Voilà, pollutant. Writing –the days of the week. Months, technical subjects, time, "les spécialités scientifiques et l' année universitaire, paragraph writing about time table.
3. Reading -- Reading of the text and comprehension – answering questions

UNIT II **(6 hours)**

Grammar and Vocabulary – The adjectives, the nationality, feminine & masculine noun forms "les métiers scientifiques".
Listening and Speaking – Vowels: soirée, année, près de, très.
Writing – Countries name, nationality, "les métiers scientifiques", numbers from: 69 to infitive and some measures of unit.
Reading Comprehension – reading a text.

UNIT III **(6 hours)**

Grammar and Vocabulary – near future, The demonstrative adjectives, Express the aim by using the verb, Listening and Speaking –"La liaison interdite – en haut". Writing – some scientific terms, French expressions to accept an invitation. Sentence framing. Reading Comprehension – reading a text.

UNIT IV **(6 hours)**

Grammar and Vocabulary –the verbs: manger, boire , the partitive articles
Listening and Speaking – "le 'e' caduc Writing- the food, the ingredients, fruits, vegetables, expression of quantity, paragraph writing about food habits. Reading – reading a text.

UNIT V **(6 hours)**

Grammar and Vocabulary – " les prepositions de lieu": au à la, à l', chez, the reflexives verbs, verbs to nouns. Listening and Speaking – "le 'e' sans accents ne se prononce pas. C'est un "e" caduc. Ex: quatre, octobre. " les sons (s) et (z)-

salut, besoin. Writing –paragraph writing about one's everyday life, French culture. Reading Comprehension -- reading a text or a song.....

TEXT BOOK

1. "Tech French"

REFERENCES

1. French for Dummies
2. French made easy: Goyal publishers
3. Panorama

LE1009 FRENCH LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts(E)			Professional Subjects (P)		
		x		--			--			--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE 1010	JAPANESE LANGUAGE PHASE II	L	T	P	C
	Total Contact Hours- 30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1005- Japanese Language Phase I				

PURPOSE

To enable students to learn a little advanced grammar in order to improve their conversational ability in Japanese.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn Katakana script (used to write foreign words)
2.	To improve their conversational skill.
3.	To enable students to know about Japan and Japanese culture.
4.	To improve their employability by companies who are associated with Japan.

UNIT I **(8 hours)**

Introduction to Verbs; Ikimasu, okimasu, nemasu, tabemasu etc.
Grammar – usage of particles de, o, to, ga(but) and exercises
Common daily expressions and profession.
Katakana script and related vocabulary.
Religious beliefs, Japanese housing and living style.
Conversation – audio

UNIT II **(8 hours)**

Grammar :Verbs –Past tense, negative - ~mashita, ~masen deshita..
i-ending and na-ending adjectives - introduction
Food and transport (vocabulary)
Japanese food, transport and Japanese tea ceremony.
Kanji Seven elements of nature (Days of the week)
Conversation – audio

UNIT III **(6 hours)**

Grammar - ~masen ka, mashou
Adjectives (present/past – affirmative and negative)
Conversation – audio

UNIT IV **(4 hours)**

Grammar – ~te form
Kanji – 4 directions
Parts of the body
Japanese political system and economy
Conversation – audio

UNIT V **(4 hours)**

Stationery, fruits and vegetables
Counters – general, people, floor and pairs

TEXT BOOK

1. First lessons in Japanese, ALC Japan

REFERENCES

1. Japanese for dummies. Wiley publishing co. Inc., USA.
2. Kana workbook, Japan foundation.

LE1010 JAPANESE LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)			Professional Subjects (P)		
		x		--			--			--		
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1011	KOREAN LANGUAGE PHASE II	L	T	P	C
	Total Contact Hours-30	2	0	0	2
	Prerequisite				
	LE1006-Korean Language Phase I				

PURPOSE

To enable students achieve a basic exposure on Korea, Korean language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the scripts.
2.	To make the students acquire basic conversational skill.
3.	To enable students to know about Korean culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Korea.

UNIT I **(9 hours)**

Lesson 1 <Review of Vowels and Consonants>, Lesson2 < Various Usages of "To be">, Lesson3 < Informal form of "to be"> <Basic Conversation, Vocabularies and Listening>

UNIT II **(9 hours)**

Lesson 4 < Informal interrogative form of "to be">, Lesson 5 < To be, to have, to stay>, Lesson 5 < Advanced Interrogative practice>, Lesson 6 < Types of Negation>, <Basic Conversation, Vocabularies and Listening>

UNIT III **(9 hours)**

Lesson 7 < Honorific forms of noun and verb2>, Lesson8 < Formal Declarative2>, Lesson 9 < Korean Business Etiquette>, <Basic Conversation, Vocabularies and Listening>

UNIT IV **(3 hours)**

Lesson 10 <Field Korean as an Engineer1>, <Field Korean as an Engineer2> <Basic Conversation, Vocabularies and Listening>

TEXT BOOK

1. Korean through English 2 (Basic Korean Grammar and Conversation)

REFERENCES

1. Bharati Korean (Intermediate Korean Grammar)
2. Hand-outs
3. Various visual media such Movie CD, Audio CD, and music
4. Collection of vocabularies for engineering field.

LE1011 KOREAN LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1-4				
3.	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Arts (E)				Professional Subjects (P)	
		x		--			--				--	
4.	Approval	23rd meeting of Academic Council, May 2013										

LE1012	**CHINESE LANGUAGE PHASE II**	**L**	**T**	**P**	**C**
	Total Contact Hours-30	**2**	**0**	**0**	**2**
	Prerequisite				
	LE1007-Chinese Language Phase I				

PURPOSE

To enable students achieve a basic exposure on China, Chinese language and culture. To acquire basic conversational skill in the language.

INSTRUCTIONAL OBJECTIVES

1.	To help students learn the Chinese scripts.

2.	To make the students acquire basic conversational skill.
3.	To enable students to know about China and Chinese culture.
4.	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with china.

UNIT I

A) Greetings
Questions and answers about names
Introducing oneself
Receiving a guest
Making corrections

New words: 你ˆyouˇ 好ˆgood 'well ˇ
工作ˆwork 'jobˇ人员ˆpersonnel 'staff memberˇ 请问ˆMay I ask…ˇ 贵ˆexpensive 'valuableˇ 姓ˆone's family name is ˇ

B) Questions and answers about the number of people in a family
Expressing affirmation/negation
Questions and answers about the identity of a person same or not.

New words: 家ˆfamily 'homeˇ 有ˆhaveˇ 几ˆseveralˇ
爸爸 (fatherˇ 妈妈 (mother) 哥哥 (elderly brotherˇ

UNIT II

A. About places
B. About numbers
C. if one knows a certain person
D. Expressing apology
E. Expressing affirmation/negation
F. Expressing thanks.

New Words:
客人ˆguest,visitorˇ这儿ˆhereˇ中文ˆChineseˇ 对ˆright, correctˇ
学生ˆstudentˇ 多ˆmany, a lotˇ

Grammar: Sentences with a verbal predicate

UNIT III

Introducing people to each other

A. Exchanging amenities
B. Making/Negating conjectures
C. Questions and answers about nationality

Grammar: Sentences with an adjectival predicate

UNIT IV

A) About places to go
Indicating where to go and what to do
Referring to hearsay.
Saying good-bye

B) Making a request
Questions and answers about postcodes and telephone numbers
Reading dates postcodes and telephone numbers
Counting Renmibi

Grammar: Sentences with a subject-verb construction as its predicate
Sentences with a nominal predicate

UNIT V

A. Asking and answering if someone is free at a particular time
B. Making proposals
C. Questions about answers about time
D. Making an appointment
E. Telling the time
F. Making estimations

TEXT BOOK

1. A New Chinese Course 1- Beijing Language and Culture University Press

REFERENCES

1. New Practical Chinese Reader Textbook (1) – Beijing Language and Culture University Press.
2. 40 Lessons For Basic Chinese Course I – Shanghai Translation Press.
3. My Chinese Classroom - East China Normal University Press.

LE1012 CHINESE LANGUAGE PHASE II												
Course designed by		**Department of English and Foreign Languages**										
1.	Student outcome	a	b	c	d	e	f	g	h	i	j	k
								x				
2.	Mapping of instructional objectives with student outcome							1 - 4				
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		x		--		--				--		
4.	Approval	23rd meeting of Academic Council, May 2013										

PD1004	APTITUDE-II	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To improve verbal aptitude, vocabulary enhancement and reasoning ability of the student.

UNIT I **(6 hours)**

Critical Reasoning – Essay Writing

UNIT II **(6 hours)**

Synonyms – Antonyms - Odd Word - Idioms & Phrases

UNIT III **(6 hours)**

Word Analogy - Sentence Completion

UNIT IV **(6 hours)**

Spotting Errors - Error Correction - Sentence Correction

UNIT V **(6 hours)**

Sentence Anagram - Paragraph Anagram - Reading Comprehension

ASSESSMENT

1. Objective type – Paper based /Online – Time based test

TEXT BOOK:

1. Personality Development -Verbal Work Book, Career Development Centre, SRM Publications

REFERENCE

1. Green Sharon Weiner M.A & Wolf Ira K.*Barron's* "*New GRE*", *19th Edition*. Barron's Educational Series, Inc, 2011.
2. Lewis Norman, "*Word Power Made Easy* ", Published by W.R.Goyal Pub, 2011.

3. Thorpe Edgar and Thorpe Showich, "*Objective English* ". Pearson Education 2012.
4. Murphy Raymond, "*Intermediate English Grammar*", (Second Edition), Cambridge University Press, 2012.

PD1004 - APTITUDE-II												
Course designed by		**Career Development Centre**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								X				
2.	Mapping of instructional objectives with student outcome							1				
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Arts(E)				Professional Subjects(P)		
		X										
4.	Approval	23rd meeting of Academic Council, May 2013										

MA1004	**NUMERICAL METHODS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	4	0	0	4
	(Common to Auto, Aero, Mech., Mechatronics, EEE, Civil , Chemical, ICE & EIE)				

PURPOSE

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

INSTRUCTIONAL OBJECTIVES

1.	To familiarise with numerical solution of equations
2.	To get exposed to finite differences and interpolation
3.	To be thorough with the numerical Differentiation and integration
4.	To find numerical solutions of ordinary differential equations
5	To find numerical solutions of partial differential equations

UNIT I - CURVE FITTING AND NUMERICAL SOLUTION OF EQUATIONS **(12 hours)**

Method of Least Squares – Fitting a straight line – Fitting a parabola – Fitting an exponential curve – Fitting a curve of the form $y = ax^b$ – Calculation of the sum of the squares of the residuals.- Newton-Raphson method – Gauss Elimination method – Gauss Jacobi method – Gauss Seidel method.

UNIT II - FINITE DIFFERENCES AND INTERPOLATION (12 hours)

First and Higher order differences – Forward differences and backward differences and Central Differences – Differences of a polynomial – Properties of operators – Factorial polynomials – Shifting operator E – Relations between the operators. Interpolation – Newton-Gregory Forward and Backward Interpolation formulae - Divided differences – Newton's Divided difference formula – Lagrange's Interpolation formula – Inverse interpolation.

UNIT III - NUMERICAL DIFFERENTIATION AND INTEGRATION (12 hours)

Newton's forward and backward differences formulae to compute first and higher order derivatives – The Trapezoidal rule – Simpson's one third rule and three eighth rule.

UNIT IV - NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS (12 hours)

Solution by Taylor's series – Euler's method – Improved and modified Euler method – Runge-Kutta methods of fourth order (No proof) – Milne's Method - Adam's Bashforth method.

UNIT V - NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS (12 hours)

Classification of Partial differential equations of the second order - Difference quotients – Laplace's equation and its solution by Liebmann's process – Solution of Poisson's equation – Solutions of Parabolic and Hyperbolic equations.

TEXT BOOKS

1. Grewal, "*Numerical Methods in engineering and science"*, Khanna Publishers, 42nd edition, 2012.
2. Sastry S.S, "*Introductory Methods of Numerical Analysis",* 4th edition, 2005.

REFERENCES

1. Dr. Venkataraman M.K*, "Numerical Methods in Science and Engineering"*, National Publishing Co., 2005.
2. Balagurusamy E, "*Computer Oriented Statistical and Numerical Methods"* – Tata McGraw Hill., 2000.
3. Jain M.K, SRK Iyengar and Jain R.L, "*Numerical Methods for Scientific and Engineering Computation"*, Wiley Eastern Ltd., 4th edition, 2003.
4. Jain M.K, "*Numerical Solution of Differential Equations"*, 2nd edition (Reprint), 2002.
5. Kandasamy etal P, "*Numerical Methods"*, S.Chand & Co., New Delhi, 2003.

MA1004 NUMERICAL METHODS												
Course designed by		**Department of Mathematics**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		x				x						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)				Professional Subjects (P)		
		--		x		--				--		
4.	Approval	23rd meeting of academic council, May 2013										

ME1010	MECHANICS OF SOLIDS	L	T	P	C
	Total Contact Hours 75	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the fundamentals of deformation, stresses, strains in structural elements.

INSTRUCTIONAL OBJECTIVES

Students will be able to

1.	Know the concepts of stress and strain
2.	Analyze the beam of different cross sections for shear force, bending moment, slope and deflection
3.	Understand the concepts necessary to design the structural elements and pressure vessels

UNIT I - CONCEPT OF STRESSES AND STRAINS (15 hours)

Concept of stress and strain, Hooke's law - Tension, Compression, and Shear, stress-strain diagram - Poisson's ratio, elastic constants and their relationship - Deformation of simple and compound bars. Thermal stresses – simple and Composite bars. Principal plane, principal stress, maximum shearing stress - Uniaxial, biaxial state of stress - Mohr's circle for plane stresses.

UNIT II - ANALYSIS OF BEAMS (15 hours)

Types of beams and loads - shear force and bending moment diagrams for cantilevers, simply supported and over hanging beams. Theory of pure bending -

Bending stresses in simple and composite beams. Shear stress distribution in beams of different sections.

UNIT III - TORSION OF SHAFTS (15 hours)

Theory of pure torsion, torsion of circular shafts and composite shafts.

UNIT IV - DEFLECTION OF BEAMS (15 hours)

Slope and deflection of cantilever, simply supported beam by double integration method - Macaulay's method - Moment area method - Castigliano's theorem.

UNIT V - COLUMNS AND CYLINDERS (15 hours)

Columns and struts: Member subjected to combined bending and axial loads, Euler's theory, Crippling load, Rankine's theory. **Cylinders And Shells:** Thin cylinder, thin spherical shells under internal pressure - Thick cylinders - Lame's equation - Shrink fit and compound cylinders.

TEXT BOOKS

1. Bansal R.K, "*A Text Book of Strength of Materials"*, Lakshmi Publications Pvt. Limited, New Delhi, 2010.
2. Prabhu T.J, "*Mechanics of solids"*, Private Publication, 2002.
3. Rajput R.K, *"Strength of materials"*, Fourth Edition, S. Chand Limited, 2007.
4. Ferdinand P.Beer, and Rusell Johnston E, "*Mechanics of Materials"*, SI Metric Edition, McGraw Hill, 2011(Hard cover).

REFERENCES

1. William A. Nash, "*Theory and Problems of Strength of Materials"*, Schaum's Outline Series, McGraw Hill International Edition, 3rd Edition, 2007.
2. Srinath L. S, "*Advanced Mechanics of Solids"*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
3. Egor P. Popov**.,** "*Engineering Mechanics Of Solids"*, 2nd edition, Prentice Hall of India Private Limited, New Delhi, 2009.
4. James M. Gere, "*Mechanics of Materials"* Eighth Edition, Brooks/Cole, USA, 2013.
5. Shigley J. E, *Applied Mechanics of Materials*, International Student Edition, McGraw Hill Koyakusha Limited, 2000.

ME1010 -MECHANICS OF SOLIDS												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1, 2, 3				1, 2,3						

3.	Category	General (G)	Basic Sciences(B)	Engineering Sciences and Technical Art (E)	Professional Subjects(P)
					X
4.	Approval	23rd meeting of the Academic Council , May 2013			

ME1022	**MATERIALS TECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To impart the knowledge about the behavior of materials and their applications.

INSTRUCTIONAL OBJECTIVES

This course will enable the students to know about

1. Elastic, plastic and fracture behavior of materials.
2. Phase diagram and heat treatment.
3. Modern metallic and non metallic materials

UNIT I - ELASTIC AND PLASTIC BEHAVIOUR (9 hours)

Elasticity in metals - Mechanism of plastic deformation - Role of yield stress, shear strength of perfect and real crystals - Strengthening mechanisms - work hardening, Solid solutioning, grain boundary strengthening, particle, fibre and dispersion strengthening - Effect of temperature, strain and strain rate on plastic behavior.

UNIT II - FRACTURE BEHAVIOUR (9 hours)

Griffith's theory, stress intensity factor and fracture toughness - Ductile to brittle transition - High temperature fracture, modes of fracture, creep - Deformation mechanism maps - Fatigue, Low and high cycle fatigue test, crack initiation and propagation mechanisms - Fracture of Non-metallic materials. Failure analysis, Sources of failure, procedure of failure analysis.

UNIT III - PHASE DIAGRAMS AND HEAT TREATMENTS (9 hours)

Introduction - Solid solutions - Intermediate phases - Phase rules - Free energy in intermediate phases - Phase diagrams - Phase changes in alloys - Determination of phase diagrams - Ternary phase diagrams - Cooling curves - Equilibrium diagrams of Iron and Iron -Carbide diagram - Definition of structures – Annealing – Normalizing – Tempering – Hardening.

UNIT IV - MODERN METALLIC MATERIALS (9 hours)

Dual phase alloys - Micro alloyed steels, High Strength Low alloy (HSLA) steel -

Transformation induced plasticity (TRIP) steel, Maraging steel - Intermettalics, Ni and Ti aluminides - Smart materials - Shape memory alloys - Metallic glasses - Quasi crystals and nano crystalline materials.

UNIT V - NON METALLIC MATERIALS (9 hours)

Polymeric materials - Formation of polymer structure - Production techniques of fibre, foams, adhesives and coating - structure and properties and applications of engineering polymers - Advanced structure ceramics, WC, TiC, Al_2O_3, SiC, Si_2N_4, CBN and Diamond - Properties, processing and applications. Composite materials: Types, production techniques, structure, properties and applications.

TEXT BOOKS

1. Flake C. Campbell, "*Elements of Metallurgy and Engineering Alloys",* ASM International, 2008.
2. Dieter G. E, "*Mechanical Metallurgy"*, McGraw Hill, Singapore, 2001.
3. Thomas H. Courtney, "*Mechanical Behaviour of Engineering materials"*, McGraw Hill, Singapore, 2000.

REFERENCES

1. Flinn R. A and Trojan P. K, "*Engineering Materials and their applications"*, Jaico, Bombay, 1990.
2. Budinski K.G and Budinski M. K, "*Engineering Materials Properties and selection"*, Prentice Hall of India Private Limited, New Delhi, 2004.
3. ASM Metals Hand book, "*Failure analysis and prevention"*, Vol: 10, 14th edition, New York, 2002.

ME1022 - MATERIALS TECHNOLOGY												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X								
2.	Mapping of instructional objectives with student outcome	1, 2, 3,4,5		1,2,3 ,4,5								
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
										X		
4.	Approval	23rd meeting of the Academic Council , May 2013										

ME1012	MACHINES AND MECHANISMS	L	T	P	C
	Total Contact Hours 75	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To expose the students to learn the fundamentals of various laws governing rigid bodies and its motions.

INSTRUCTIONAL OBJECTIVES

Students will be able to

1.	Basic mechanisms, velocity and acceleration of simple mechanisms
2.	Drawing the profile of cams and its analysis
3.	Gear train calculations , Gyroscopes
4.	Inertia force analysis and flywheels
5.	Balancing of rotating and reciprocating masses

UNIT I - MECHANISMS (15 hours)

Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Four bar chains - Terminology and definition - Planer, Spherical and Spatial Mechanisms - Grashoff's law - Kutzback criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms - Simple problems - Instantaneous centre - Kennedy's theorem - Velocity and Acceleration of Four bar and single slider crank mechanisms by relative velocity Method.

UNIT II - CAMS (15hours)

Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower types - pressure angle - Derivatives of Follower motion - High speed cams - circular arc and tangent cams – Standard cam motion - Pressure angle and undercutting.

UNIT III - GEAR TRAINS AND CONTROL MECHANISMS (15 hours)

Spur gear terminology and definition - Gear trains: simple, compound, reverted and epicyclic - Velocity ratio and torque calculation in gear trains - Automobile differential.Gyroscopes: Gyroscopic forces and couple - Forces on bearing due to gyroscopic action - Gyroscopic effect in ship, motor cycle, car and aircraft.

UNIT IV - FORCE ANALYSIS **(15 hours)**

Inertia force and inertia torque calculations – D'Alembert's principle – The principle of super position – Dynamic analysis in reciprocating engines – Gas forces – Equivalent masses – Bearing loads – crank shaft torque. Turning moment diagrams: Fly wheels - Application of flywheel - Punching presses.

UNIT V - BALANCING **(15 hours)**

Static and dynamic Balancing: Balancing of rotating masses - Balancing of single cylinder engine - Balancing of multi cylinder engine –partial balancing in locomotive engines – Hammer blow – Swaying couple – Tractive force - Balancing machines.

TEXT BOOKS

1. Ratan S.S, "*Theory of Machines"*, Tata McGraw Hill Publishing company Ltd., 2 nd Edition, 2005.
2. Thomas Bevan, "*Theory of Machines*", CBS Publishers and Distributors, 3rd Edition, 1984.

REFERENCES

1. Shigley J. E, and Uicker J. J, "*Theory of Machines and Mechanisms"*, McGraw Hill, 1995.
2. Ghosh A, and Mallick A. K, "*Theory of Mechanisms and Machines"*, Affiliated East-West Pvt Ltd., New Delhi, 1988.
3. Rao J. S, and Dukkipati R.V, "*Mechanism and Machine Theory"*, Wiley-Eastern Ltd., New Delhi, 1995.

ME1012 - MACHINES AND MECHANISMS												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1, 3, 4		1, 2, 3, 4, 5		1, 3, 4, 5						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1005	AUTOMOTIVE ENGINES	L	T	P	C
	Total contact hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to impart adequate knowledge on SI and CI Engines

INSTRUCTIONAL OBJECTIVES

1.	Construction and operation of IC Engine
2.	Fuels and Combustion in IC Engines
3.	Performance calculation

UNIT I - ENGINE CONSTRUCTION AND OPERATION (9 hours)

Four stroke SI and CI engines - Working principle - function, materials, constructional details of engine components - Valve timing diagram - Firing order and its significance - relative merits and demerits of SI and CI engines

Two stroke engine construction and operation. Comparison of four-stroke and two-stroke engine operation.

UNIT II - FUELS AND COMBUSTION (9 hours)

Combustion equation, conversion of gravimetric to volumetric analysis - Determination of theoretical minimum quantity of air for complete combustion - Determination of air fuel ratio for a given fuel.

Properties and rating of fuels (petrol and diesel), chemical energy of fuels, reaction equation, combustion temperature, combustion chart.

UNIT III - COMBUSTION IN SI ENGINES (9 hours)

Combustion in premixed and diffusion flames - Combustion process in IC engines. Stages of combustion - Flame propagation - Flame velocity and area of flame front - Rate of pressure rise - Cycle to cycle variation - Abnormal combustion - Theories of detonation - Effect of engine operating variables on combustion. Combustion chambers - types, factors controlling combustion chamber design.

UNIT IV - COMBUSTION IN CI ENGINES (9 hours)

Importance of air motion - Swirl, squish and turbulence - Swirl ratio. Fuel air mixing - Stages of combustion - Delay period - Factors affecting delay period, Knock in CI engines - methods of controlling diesel knock. CI engine combustion chambers - Combustion chamber design objectives - open and divided. Induction

swirl, turbulent combustion chambers. - Air cell chamber - M Combustion chamber.

UNIT V - ENGINE PERFORMANCE (9 hours)

Performance parameters - BP, FP, IP, Torque specific fuel consumption, Specific Energy consumption, volumetric efficiency, thermal efficiency, mechanical efficiency, Engine specific weight, and heat balance. Testing of engines - different methods. Numerical problems

TEXT BOOKS

1. Ganesan V, *"Internal combustion engines"*, 4th edition, Tata McGraw Hill Education, 2012.
2. Rajput R. K, *"A textbook of Internal Combustion Engines"*, 2nd edition, Laxmi Publications (P) Ltd, 2007.

REFERENCES

1. John. B, Heywood, "*Internal Combustion Engine Fundamentals"*, McGraw Hill Publishing Co., New York, 1990 .
2. Ramalingam K. K, *"Internal Combustion Engines"*, Second Edition, Scitech Publications.
3. Sharma S. P, Chandramohan, "*Fuels and Combustion",* Tata McGraw Hill Publishing Co, 1987.
4. Mathur and Sharma, *"A course on Internal combustion Engines"*, Dhanpat Rai & Sons, 1998.
5. Edward F, Obert, *"Internal Combustion Engines and Air Pollution"*, Intext Education Publishers.

<table>
<tr><th colspan="14">AE1005 - AUTOMOTIVE ENGINES</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Mechanical Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>X</td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1, 2,3</td><td></td><td>1, 2, 3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="3">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="4">Engineering Sciences and Technical Art (E)</td><td colspan="2">Professional Subjects(P)</td></tr>
<tr><td colspan="3"></td><td colspan="3"></td><td colspan="4"></td><td colspan="2">X</td></tr>
<tr><td>4.</td><td>Broad Area</td><td colspan="3">Design</td><td colspan="3">Vehicle body and Engineering</td><td colspan="4">Manufacturing</td><td colspan="2">Engines and Management systems</td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="12">23rd meeting of the Academic Council , May 2013</td></tr>
</table>

ME1016	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
	Total Contact Hours 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the use of stress, strain measuring instruments.

INSTRUCTIONAL OBJECTIVES

1.	The students will be able to understand procedures for conducting tensile, torsion tests on mild steel specimens
2.	Determine the Young's modulus using deflection test on beams and tensile test on rods, tension and compression test on springs, bricks, concrete, and impact tests on steel

LIST OF EXPERIMENTS

1. Tensile test on Mild steel rod
2. Compression test of Concrete cubes and cylinders
3. Open Coil spring test
4. Izod –imapct test
5. Charpy-Impact test
6. Digital Torsion test on Graded steels
7. Closed coil spring test
8. Deflection test using Maxwell reciprocal theorem for central and non central loading
9. Rockwell hardness testing of metals
10. Brinell Hardness testing of hardened alloys
11. Ductility testing of metals using bend test
12. Strain aging factor determination in metals using Rebend test
13. Fatigue testing of materials

REFERENCES

1. Kazimi S. M. A, "*Solid Mechanics"*, First Revised Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 1994.
2. Laboratory Manual.

ME1016 - STRENGTH OF MATERIAL LABORATORY												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
2.	Mapping of instructional objectives with student outcome											
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
			X									
4.	Approval	23rd meeting of the Academic Council , May 2013										

ME1029	MATERIALS TECHNOLOGY LABORATORY	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To acquire the knowledge of identifying the metals and understanding the metallurgical concepts.

INSTRUCTIONAL OBJECTIVES

The course will help the student to

1.	Prepare different metal specimen for identification
2.	Study the microstructure of metals
3.	Understand the treatment procedures

LIST OF EXPERIMENTS

1. Specimen preparation for metallographic examination
2. Study of metallurgical microscope, different types and their operations
3. Microstructural study of ferrous materials like low, medium and high carbon steels, quenched and tempered steel, Stainless steel, S.G. Iron, Malleable iron, Grey CI, White CI and Cold worked and recrystallised specimens.
4. Microstructural study of non-ferrous materials like Al, Brass, Bronze
5. Microstructural study of steel weldment
6. Study of hardness of heat treated steel.
7. Jomney end quench test.
8. Grain size measurement by comparison with ASTM Charts
9. Wear analysis using Pin-on-Disc machine and Dry Abrasion tester

REFERENCES

Laboratory Manual

ME1029 - MATERIALS TECHNOLOGY LABORATORY												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
				x								
2.	Mapping of instructional objectives with student outcome			1,2,3								
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)	
											X	
4.	Approval	23rd meeting of the Academic Council , May 2013										

SEMESTER – V

PD1005	APTITUDE-III	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	Understand the importance of effective communication in the workplace.
2.	Enhance presentation skills – Technical or general in nature.
3.	Improve employability scope through Mock GD, Interview

UNIT I **(6 hours)**

Video Profile

UNIT II **(6 hours)**

Tech Talk / Area of Interest / Extempore / Company Profile

UNIT III **(6 hours)**

Curriculum Vitae

UNIT IV **(6 hours)**

Mock Interview

UNIT V **(6 hours)**

Group Discussion / Case Study

ASSESSMENT

1. Objective type – Paper based / Online – Time based test
2. 50% marks based on test, 50 % based on Continuous Communication assessment

REFERENCES

1. Bovee Courtland and Throill John, *Business Communication Essentials: A skills-Based Approach to Vital Business English*. Pearson Education Inc., 2011.
2. Dhanavel S.P, *English & Communication Skills for Students of Science and Engineering*. Orient Black Swan, 2009.
3. Rizvi M. Ashraf *Effective Technical Communication*, Tata McGraw-Hill Publishing Company Limited, 2006.

PD1005 – APTITUDE-III												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
								X		X	X	
2.	Mapping of instructional objectives with student outcome							1,2, 3		1,2	2,3	
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
		x										
4.	Approval	23rd meeting of the Academic Council , May 2013										

MA 1005	PROBABILITY AND STATISTICS	L	T	P	C
	Total contact hours = 60 hours	4	0	0	4
	(Common to Auto, Aero, Mech, Mectr, Civil , Chemical, ICE & EIE)				

PURPOSE

To develop an understanding of the methods of probability and statistics which are used to model engineering problems.

INSTRUCTIONAL OBJECTIVES

1.	To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
2.	To appropriately choose, define and/or derive probability distributions such as the Binomial, Poisson and Normal etc to model and solve engineering problems.
3.	To learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.
4.	To understand how regression analysis can be used to develop an equation that estimates how two variables are related and how the analysis of variance procedure can be used to determine if means of more than two populations are equal.
5.	To understand the fundamentals of quality control and the methods used to control systems and processes.

UNIT I - PROBABILITY AND RANDOM VARIABLES (12 hours)

Sample space, Random experiments and random variables, Concept of probability, Conditional probability, Addition and multiplication laws, Baye's theorem - One dimensional Random Variables- Expectation, Variance, Covariance, and Moments.

UNIT II - THEORETICAL DISTRIBUTIONS (12 hours)

Discrete: Binomial, Poisson, Geometric, Negative Binomial; Continuous: Exponential and Normal Distributions, their properties and applications to industrial problems.

UNIT III - TESTING OF HYPOTHESIS (12 hours)

Introduction – Large sample tests based on normal distribution - Test for single mean, difference between means, proportion, difference between proportions - Small sample tests based on t, F distributions- Test for single mean, difference between means, standard deviation, difference between standard deviation - Chisquare test for goodness of fit - Independence of attributes.

UNIT IV - CORRELATION, REGRESSION AND ANALYSIS OF VARIANCE (12 hours)

Pearson's Correlation coefficient- Spearman's Rank correlation coefficient. Regression-Concepts – Regression lines – Multiple correlation and regression. Analysis of Variance- One-way classification and two way classification.

UNIT V - STATISTICAL QUALITY CONTROL (12 hours)

Introduction – Process control – control charts for variables - X and R, X and S charts control charts for attributes: p chart, np chart, c chart and their applications in process control.

TEXT BOOKS

1. Gupta S.C and Kapoor V.K, *"Fundamentals of Mathematical Statistics",* 11th extensively revised edition, Sultan Chand & Sons, 2007.
2. Veerarajan T, "*Probability, Statistics and Random Processes"*, Tata McGraw Hill,3rd edition, 2008.

REFERENCES

1. Ross S, "*A first Course in Probability*", Fifth Edition, Pearson Education, Delhi 2002.
2. Johnson R. A, "*Miller & Freund's Probability and Statistics for Engineers*", Sixth Edition, Pearson Education, Delhi, 2000.

3. Walpole R. E, Myers R. H, Myers R. S. L and Ye. K, "*Probability and Statistics for Engineers and Scientists*", Seventh Edition, Pearsons Education, Delhi, 2002.
4. Lipschutz. S and Schiller. J, "*Schaum's outlines - Introduction to Probability and Statistics*", McGraw-Hill, New Delhi, 1998.

MA 1005 - PROBABILITY AND STATISTICS												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1-5				1-5						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
			X									
4.	Approval	23rd meeting of the Academic Council , May 2013										

AE1006	**DESIGN OF AUTOMOTIVE COMPONENTS**	**L**	**T**	**P**	**C**
	Total contact hours - 75	**3**	**2**	**0**	**4**
	Prerequisite				
	Nil				

PURPOSE

To provide knowledge about design of automotive components

INSTRUCTIONAL OBJECTIVES

To familiarize the students with the design of:

1.	Cylinder, Piston, connecting rod
2.	Gears
3.	Crank Shaft
4.	Flywheels

UNIT I - ENGINEERING MATERIALS (15 hours)

Engineering materials - Introduction endurance limit, notch sensitivity. Tolerances, types of tolerances and fits, design considerations for interference fits, surface finish, surface roughness, Rankine's formula - Tetmajer's formula - Johnson formula- design of pushrods.

UNIT II - DESIGN OF CYLINDER, PISTON AND CONNECTING ROD (15 hours)

Choice of material for cylinder and piston, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly. Material for connecting rod, determining minimum length of connecting rod, small end design, shank design, design of big end cap bolts.

UNIT III - DESIGN OF GEARS (15 hours)

Spur Gears: Nomenclature, Standard involute gears, Beam strength of tooth, Lewis'equation, Form factor & velocity factor, Stress in gear teeth, Dynamic loads on gear teeth, Wear Strength.

Helical Gears: Nomenclature, Formative number of teeth, Helix angle, Face width, Velocity factor, Static Strength, Dynamic strength, Wear strength.

Bevel Gears: Nomenclature, Straight teeth bevel gears, Cone angle, Virtual number of teeth, Face width, Static strength, Dynamic Strength, Wear Strength.

Worm Gears: Nomenclature, Materials, Reversibility, Mechanical advantage, Strength design, Efficiency, Heat dissipation.

UNIT IV - DESIGN OF CRANKSHAFT (15 hours)

Balancing of I.C. engines, MI of Crankshaft, significance of firing order. Material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations, development of short and long crankarms. Front and rear-end details.

UNIT V - DESIGN OF FLYWHEEL (15 hours)

Determination of the mass of a flywheel for a given co- efficient of speed fluctuation. MI of flywheel, Engine flywheel - stresses on the rim of the flywheels. Design of hubs and arms of the flywheel, turning moment diagram.

TEXT BOOKS

1. Kulkarni S. G, *"Machine Design",* Tata McGraw-Hill Education, 2008.
2. Bhandari V, *"Design of Machine Elements",* Tata McGraw-Hill Education, 2010.

REFERENCES

1. William Orthein, *"Machine Component Design"*, Jaico Publishing House, 1998 - 99.
2. Prabhu T. J, *"Design of Transmission Systems"*, Private Publication, 2000.
3. Shigley J, *"Mechanical Engineering Design"*, Mc Graw Hill, 2001.
4. Joseph Edward Shigley and Charles R.Mischke, *"Mechanical Engineering Design"*, McGraw-Hill International Edition, 1989.

5. Gitin M.Maitra and LN Prasad, "*Hand Book of Mechanical Design"*, Tata McGraw Hill, 1985.
6. Norton R.L, "*Design of Machinery"*, McGraw Hill, 1999.
7. Spots M. F, "*Design of Machine Elements"*, Prentice Hall of India Private Ltd., New Delhi, 1983.
8. William Orthwein, "*Machine Component Design"*, Vol. I and II, Jaico Publising house, Chennai, 1996.
9. Maitra, "*Handbook of Gear Design"*, Tata McGraw-Hill, New Delhi, 1986
10. *Design Data,* PSG College of Technology, 2008.

AE1006 - DESIGN OF AUTOMOTIVE COMPONENTS												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	C	d	e	f	g	h	i	j	k
		X	X									
2.	Mapping of instructional objectives with student outcome	1,2, 3,4	1,2, 3,4									
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
		X										
4.	Broad Area	Design		Vehicle body and Engineering			Manufacturing			Engines and Management systems		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1007	**AUTOMOTIVE CHASSIS**	**L**	**T**	**P**	**C**
	Total contact hours - 60	**2**	**2**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students with the fundamentals of Automobile Chassis.

INSTRUCTIONAL OBJECTIVES

Students will be able to

1.	Know the basics of Automobile Chassis Components.
2.	Construction and Working principle of Front Axle, Rear Axle, Wheels, Tyres, Final Drive, Steering System, Brakes and Suspension System.

INTRODUCTION **(4 hours)**

Types of chassis layout with reference to power plant locations and drive. Vehicle frames. Various types of frames. Constructional details. Materials. Testing of vehicles frames. Unitised frame body construction, Loads acting on vehicle frame.

UNIT I - FRONT AXLE AND STEERING SYSTEM **(12 hours)**

Types of front axle. Constructions details. Materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe-in. Conditions for true rolling motion of wheels during steering. Steering geometry. Ackerman and Davis steering system. Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts. Power and Power assisted steering. Steering of crawler tractors.

UNIT II - DRIVE LINE AND FINAL DRIVE **(12 hours)**

Effect of driving thrust and torque reactions. Hotchkiss drive, torque tube drive and radius rods. Propeller shaft. Universal joints. Constants velocity universal joints. Front wheel drive.

Different types of final drive. Worm and worm wheel, Straight bevel gear, Spiral bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential principles. Construction details of differential unit. Non-slip differential. Differential locks. Differential housings.

UNIT III - REAR AXLES AND SUSPENSION SYSTEM **(12 hours)**

Construction of rear axles. Types of loads acting on rear axles. Full floating. Three quarter floating and semi floating rear axles. Rear axle housing. Construction of different types of axle housings. Multi axles vehicles. Construction details of multi drive axle vehicles.

Need for suspension system, types of suspension, suspension springs, constructional details and characteristics of leaf, coil and torsion bar springs. Independent suspension, Rubber suspension, Pneumatic suspension, Shock absorbers.

UNIT IV - BRAKING SYSTEM **(12 hours)**

Classification of brakes, drum brake & disc brakes. Constructional details-Theory of braking. Mechanical hydraulic and Pneumatic brakes. Servo brake. Power and power assisted brakes-different types of retarders like eddy current and hydraulic retarder. Anti lock braking systems. Regenerative braking system.

UNIT V - WHEELS AND TYRES **(8 hours)**

Types of wheels - construction. Function of tyres - Solid and pneumatic Tyres. Constructional details of pneumatic tyres.

TEXT BOOKS

1. Tim Gilles, "*Automotive Chassis-Brakes, Steering and Suspension"*, Thomson Delmer Learning, 2005.
2. Heldt.P.M, *"Automotive Chassis",* Chilton Co., New York,1990.

REFERENCES

1. Jornsen Reimpell, Helmut Stoll, *"Automotive Chassis: Engineering Principles",* Elsevier, 2nd edition, 2001.
2. Newton. Steeds & Garrot, *"Motor Vehicles"*, SAE International and Butterworth Heinemann, 2001
3. Judge.A.W. *"Mechanism of the car"*, Chapman and Halls Ltd., London, 1986.
4. Giles.J.G, "*Steering Suspension and tyres"*, Iliffe Book Co.,London,1988.
5. Crouse.W.H, "*Automotive Chassis and Body"*, McGraw Hill New York, 1971.

AE1007 - AUTOMOTIVE CHASSIS												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	C	d	e	f	g	h	i	j	k
				X								
2.	Mapping of instructional objectives with student outcome			1,2								
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)					Professional Subjects(P)	
											X	
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing			Engines and Management systems			
			X									
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1008	**AUTOMOTIVE ENGINE SYSTEMS**	**L**	**T**	**P**	**C**
	Total contact hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to impart adequate knowledge on Automotive Engine Systems

INSTRUCTIONAL OBJECTIVES

1.	Intake and Exhaust Systems

2.	Carburetion and injection in Engines
3.	Supercharging, Turbocharging and Scavenging in Engines

UNIT I - INTAKE AND EXHAUST SYSTEMS (9 hours)

Intake system components - Discharge coefficient, Pressure drop - Air filter, intake manifold, Connecting Pipe - Exhaust system components - Exhaust manifold and exhaust pipe - Spark arresters - Exhaust mufflers, Types, operation

UNIT II - CARBURETION AND GASOLINE INJECTION (9 hours)

Mixture requirements for steady state and transient operation, Mixture formation studies of volatile fuels, design of elementary carburetor Chokes - Effects of altitude on carburetion - Carburetor for 2-stroke and 4-stroke engines - carburetor systems for emission control.

Petrol injection - Open loop and closed loop systems, mono point, multi point and direct injection systems - Principles and Features, Bosch injection systems.

UNIT III - DIESEL INJECTION (9 hours)

Requirements - Air and solid injection - Function of components - Jerk and distributor type pumps- pump calibration .Pressure waves - Injection lag - Unit injector - Mechanical and pneumatic governors - Fuel injector - Types of injection nozzle - Nozzle tests - Spray characteristics - Injection timing - Factors influencing fuel spray atomization, penetration and dispersion of diesel

UNIT IV - LUBRICATION AND COOLING (9 hours)

Need for cooling system - Types of cooling system - Liquid cooled system: Thermosyphon system, Forced circulation system, pressure cooling system - properties of coolant, additives for coolants

Need for lubrication system - Mist lubrication system, wet sump any dry sump lubrication - Properties of lubricants, consumption of oil.

UNIT V - SUPERCHARGING AND SCAVENGING (9 hours)

Objectives - Effects on engine performance - engine modification required - Thermodynamics of supercharging and Turbocharging – Turbo lag-Windage losses- Turbo charging methods - Engine exhaust manifold arrangements.

Classification of scavenging systems -Mixture control through Reed valve induction - Charging Processes in two-stroke cycle engine - Terminologies - Shankey diagram - perfect displacement, perfect mixing.

TEXT BOOKS

1. Ganesan V, "*Internal combustion engines"*, 4th edition, Tata McGraw Hill Education, 2012.
2. Rajput R. K, *"A textbook of Internal Combustion Engines"*, 2nd edition, Laxmi Publications (P) Ltd, 2007.

REFERENCES

1. Ramalingam K. K, *"Internal Combustion Engine"*, Scitech Publication (India) Pvt.Ltd. 2000.
2. Duffy Smith, *"Auto Fuel Systems"*, The Good Heart Willcox Company Inc., Publishers, 1987.
3. Edward F, Obert, *"Internal Combustion Engines and Air Pollution"*, Intext Education Publishers, 1980.

AE1008 - AUTOMOTIVE ENGINE SYSTEM												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	C	d	e	f	g	h	i	j	k
		X	X									
2.	Mapping of instructional objectives with student outcome	1,2, 3	1,2, 3									
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing			Engines and Management systems			
									X			
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1009	**ENGINE AND FUEL TESTING LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours = 30 hours	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

This Laboratory course is intended to give the students, experimental knowledge on the performance and operations of I.C. Engines

INSTRUCTIONAL OBJECTIVES	
1.	On completing this course, the students will get knowledge to test engines, lubricants and fuels used for IC engines. They will get the knowledge of using various dynamometers used for testing IC engines and testing of fuels.

LIST OF EXPERIMENTS

1. a)Valve timing diagram for four stroke Engine
   b) Port timing diagram of a two stroke Engine
2. Performance test on constant speed diesel engine
3. Performance test of Petrol engine at full throttle and part throttle conditions
4. Performance test of Diesel engine at full load and part load conditions
5. Morse test on petrol engines
6. Test for optimum coolant flow rate in IC engines
7. Energy balance test on an Automotive Diesel engine
8. Determination of flash and fire point of fuels and lubricating oil by different methods
9. Determination of viscosity of oil by different methods like, Redwood, Saybolt and Engler's Viscometer
10. Study and use of pressure pickup, charge amplifier, storage oscilloscope and signal analyzers used for IC Engine testing

01

REFERENCE

1. Laboratory Manual

AE1009 - ENGINE AND FUEL TESTING LABORATORY												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X							
2.	Mapping of instructional objectives with student outcome	1			1							
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing			Engines and Management systems			
									X			
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1010	AUTOMOTIVE COMPONENTS LABORATORY	L	T	P	C
	Total Contact Hours = 30 hours	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To provide knowledge about Automotive Engine and Chassis components.

INSTRUCTIONAL OBJECTIVES

At the end of the course, students will be able to know

1. Different types of frames used in various automobiles.
2. Dismantling and assembling of various systems in automobile.
3. Seat layout

LIST OF EXPERIMENTS

1. Study of Frames used for HMV, LMV, Car, Three and Two Wheelers.
2. Dismantling and assembling of different types of engines
3. Dismantling and assembling of
    a. Fuel Supply System
    b. Steering System,
    c. Suspension System,
    d. Braking System,
    e. Wheels and Tyres
    f. Propeller Shaft, Universal Joints and Differential
4. Study of Driver Seat
5. Brake adjustment and bleeding.

REFERENCE

Laboratory manual

AE1010 - AUTOMOTIVE COMPONENTS LABORATORY												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X					X		
2.	Mapping of instructional objectives with student outcome				1					1,2, 3		
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		

			X		
5.	Approval	23rd meeting of the Academic Council , May 2013			

	INDUSTRIAL TRAINING I (Training to be undergone after IV semester)	L	T	P	C
AE1047	2 week practical training in industry	**0**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE

To expose the students to the industry working environment

INSTRUCTIONAL OBJECTIVES

1.	Students have to undergo two – week practical training in Automobile Engineering related project Fabrication, Service or design so that they become aware of the practical application of theoretical concepts studied in the class rooms.

Students have to undergo two-week practical training in Automobile Engineering related project Fabrication, Service or design of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

AE1047 INDUSTRIAL TRAINING I												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X		X	X	X	X	X	
2.	Mapping of instructional objectives with student outcome				1		1	1	1	1	1	
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)	
											X	
4.	Broad Area	Structural Engineering		Geotechnical Engineering			Water Resources Engineering				Geomatics Engineering	
		--		--			--				--	
5.	Approval	23rd meeting of the Academic Council , May 2013										

SEMESTER – VI

PD1006	APTITUDE-IV	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				

PURPOSE

To enhance holistic development of students and improve their employability skills.

INSTRUCTIONAL OBJECTIVES

1.	To improve aptitude, problem solving skills and reasoning ability of the student.
2.	To collectively solve problems in teams & group.

UNIT I – ARITHMETIC - II **(6 hours)**

Ratios & Proportions, Averages, Mixtures & Solutions

UNIT II – ARITHMETIC – III **(6 hours)**

Time, Speed & Distance, Time & Work

UNIT III – ALGEBRA – II **(6 hours)**

Quadratic Equations, Linear equations & inequalities

UNIT IV – GEOMETRY **(6 hours)**

2D Geometry, Trigonometry, Mensuration

UNIT V – MODERN MATHEMATICS – II **(6 hours)**

Sets & Functions, Sequences & Series, Data Interpretation, Data Sufficiency

ASSESSMENT

1. Objective type – Paper based / Online – Time based test

REFERENCE

1. Agarwal R.S, *"Quantitative Aptitude for Competitive Examination"s",* S Chand Limited 2011.
2. Abhijit Guha*, "Quantitative Aptitude for Competitive Examinations",* Tata Mcgraw Hill, 3rd Edition.
3. Edgar Thrope*, "Test Of Reasoning For Competitive Examinations",* Tata Mcgraw Hill, 4th Edition.
4. *Other material related to quantitative aptitude*

PD1006 - APTITUDE-IV												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X							
2.	Mapping of instructional objectives with student outcome	1			2							
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
		X										
4.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1011	**AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEMS**	**L**	**T**	**P**	**C**
	Total contact hours = 45 hours	**3**	**0**	**0**	**3**
	Prerequisite				
	Instrumentation for Automobile Engineers				

PURPOSE

To provide knowledge about application of electrical and electronics in automobile engineering

INSTRUCTIONAL OBJECTIVES

1.	In Automobiles the electrical systems are important. It has number of subsystems like starting system, Charging system etc.
2.	Details Related to the conversion mechanical to electronics systems are being described.
3.	In this course the function and construction of various electrical components and electronic components and system and different types of sensors are described

UNIT I - BATTERIES AND ACCESSORIES (9 hours)

Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging.

UNIT II - STARTING SYSTEM (9 hours)

Condition at starting, behavior of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.

UNIT III - CHARGING SYSTEM AND LIGHTING (9 hours)

Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout. Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

UNIT IV - FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS (9 hours)

Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT V - SENSORS AND ACTUATORS (9 hours)

Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.

TEXT BOOKS

1. Allan Bonnick, *"Automotive Computer Controlled Systems"*, 2011.
2. Tom Weather Jr and Cland C.Hunter, *"Automotive Computers and Control system"*, Prentice Hall Inc., New Jersey.
3. Young A. P & Griffiths L, *"Automobile Electrical and Electronic Equipments"*, English Languages Book Society & New Press, 1990.

REFERENCES

1. Santini Al, *"Automotive Electricity and Electronics"*, Cengage Learning, 2012.
2. Tom Denton, *"Automotive Electrical and Electronic System"*, SAE International, 2004.
3. William B. Ribbens, *"Understanding Automotive Electronics"*, 6th Edition, Newnes, 2003.
4. BOSCH, *"Automotive Handbook"*, 8th Edition, BENTLEY ROBERT Incorporated, 2011.
5. Norm Chapman, *"Principles of Electricity and electronics for the Automotive Technician"*, Delmar Cengage Learning, 2008.
6. Judge A.W, *"Modern Electrical Equipment of Automobiles"*, Chapman & Hall, London, 1992.

AE1011- AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEMS												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X					X	X
2.	Mapping of instructional objectives with student outcome	1,2, 3				1,2, 3						1,2, 3
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)					Professional Subjects(P)	
											X	
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing					Engines and Management systems	
											X	
5.	Approval	23rd meeting of the Academic Council , May 2013										

ME1035	METROLOGY AND QUALITY CONTROL	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To understand the need for metrology in the industries and its role in SQC

INSTRUCTIONAL OBJECTIVES

To make the student to understand

1.	Types of errors, design of limit gauges and various comparative measurements
2.	Fundamentals of gears, thread measurements and measurements of surface finish
3.	Non contact measurement techniques using optical methods and vision techniques
4.	Coordinate metrology and Form Measurement
5.	Use of control charts and acceptance sampling in SQC

UNIT I - INTRODUCTION TO METROLOGY (9 hours)

Basic Concepts - Legal Metrology - Precision - Accuracy - Types of errors -least square fit- Linear and Angular Measurements - Standards of Measurements - Calibration - Interchangeability and selective assembly- Gauges for inspection-types-Gauge design-Taylor's principle- Introduction to Comparators - Types of

Comparators - Mechanical, Mechanical - Optical, Electrical and Electronic, pneumatic- flow type-differential pressure type.

UNIT II - MEASUREMENTS OF SCREW THREAD - GEAR ELEMENTS – SURFACE FINISH (9 hours)

Internal and External screw threads: Measurements of various elements of thread - Best size wire - Two and three wire method. Gear: Measurements of various elements - Constant chord method - Base tangent method. Surface Finish: Surface topography definitions - Measurement of Surface Texture - Methods - Evaluation of Surface finish.

UNIT III - OPTICAL METROLOGY and NON CONTACT MEASUREMENT TECHNIQUES (9 hours)

Principle of light wave interference - Light sources –Measurement with optical flats- Types of Interferometers - Michelson, Twyman Green Specialisation of Michelson, NPL flatness Interferometers, The Pitter NPL gauge - laser interferometer- laser micrometer- surface roughness measurement using laser. Machine vision -Image processing techniques-edge detection-feature extraction-applications.

UNIT IV - COORDINATE METROLOGY and FORM Measurement (9 hours)

Coordinate Measuring Machine-components of CMM-types-measuring head - types of probe- alignment error-causes of error -measuring accuracy-calibration of CMM-performance of CMM-applications-measurement integration, Measurement of straightness - Flatness - squareness - parallelism - circularity – roundness and runout.

UNIT V - THEORY OF CONTROL CHARTS & ACCEPTANCE SAMPLING (9 hours)

Introduction - Definition of Quality - Chance Causes and assignable Causes - SQC Benefits and Limitations-**Theory of Control Charts**: Control Charts for Variables - $\bar{x}$ - R , $\bar{x}$-σ charts - run up - run down - Process capability studies. Control Charts for attributes – P chart, nP chart, C and U chart. acceptance sampling- OC curve - AQL - LTPD - AOQL - Sampling Plans - Simple - Double - Multiple and sequential sampling plans –simple problems

TEXT BOOKS

1. Jain R. K, "*Engineering Metrology"*, Khanna Publishers, New Delhi, 2012.
2. Gupta R. C, "*Statistical Quality Control"*, Khanna Publishers, New Delhi, 1994.

REFERENCES

1. Kevin Harding, *"Handbook of Optical Dimensional Metrology"*, CRC Press, A Taylor & Francis group, 2013.
2. Robert J. Hocken, Paulo H. *"Pereira, Coordinate Measuring Machines And Systems"*, CRC Press, Taylor & Francis Group, 2011.
3. Connie Dotson, Roger Harlow and Richard L. Thompson, *"Fundamentals of Dimensional Metrology"*, Thomson Delmar Learning, 4th edition, 2005.
4. Toru Yoshizawa, *"Handbook of Optical Metrology: Principles And Applications"*, CRC Press Grant E. L, Statistical Quality Control, McGraw Hill, New York, 2000.

ME1035 – METROLOGY AND QUALITY CONTROL												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X					X			
2.	Mapping of instructional objectives with student outcome	1		1		1			5			
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1012	**AUTOMOTIVE TRANSMISSION**	**L**	**T**	**P**	**C**
	Total contact hours = 60 hours	**2**	**2**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To impart knowledge of automotive transmission system.

INSTRUCTIONAL OBJECTIVES

1.	On completion of this course, The student will know about the clutch, gearbox, hydrodynamic drives, automatic transmission, hydrostatic drive and electric drive in automobiles, their principle of operation and performance.

2.	Problem solving on above aspects

UNIT I - CLUTCH AND GEAR BOX (12 hours)

Role of Clutch in driving system - Requirements of transmission system - Design aspects - Construction and working principle of different types of clutches - Designing the torque capacity, axial force of single plate clutch and typical problems involving the above principles.

Objective of the Gear Box - Setting top, bottom and intermediate gear ratios. Problems involving these derivations - Performance characteristics at different speeds - Construction and operations of Sliding-mesh gear box - Constant-mesh gear box - Synchro-mesh gear box - Planetary gear box - Problems on above aspects

UNIT II - FLUID COUPLING, TORQUE CONVERTERS (12 hours)

Fluid coupling - Principle of operation - Construction details - Torque capacity - Performance characteristics - Problems on design - Reduction of drag torque. Torque converter - Principle of operation - Constructional details - Performance characteristics. Converter coupling – Construction - Free wheel - Characteristic performance

UNIT III - MODERN HYDRO-KINETIC TORQUE CONVERTERS (12 hours)

Multi-stage hydro-kinetic torque converter - Poly-phase hydro-kinetic torque converter - Construction, working and performance.

UNIT IV - AUTOMATIC TRANSMISSION AND APPLICATIONS OF AUTOMATIC TRANSMISSION (12 hours)

Principle of working of epi-cyclic gear train - Construction and working principle of Ford-T model gear box - Wilson gear box- construction, working and derivation of gear ratios - Cotal electromagnetic transmission - Automatic over-drive - Hydraulic control system for automatic transmission.

Chevrolet automatic transmission - Turbo glide transmission - Power glide transmission - Toyota “ECT-i” [Automatic transmission with intelligent electronic control systems] - Mercedes Benz automatic transmission - Hydraulic clutch actuation system for automatic transmission.

UNIT V - HYDRO-STATIC DRIVE AND ELECTRIC DRIVES (12 hours)

Hydrostatic drive – principle, types, advantages, limitations - Comparison of hydrostatic drive with hydrodynamic drive - Construction and working of typical Janny hydrostatic drive.

Lay-out of elective drive - Principle of early and modified ward Leonard control systems – advantages, limitations, performance characteristics

TEXT BOOK

1. *"Automotive Transmissions: Fundamentals, Selection, Design and Application"*, 2nd Edition, Springer, 2011.

REFERENCES

1. Heldt P. M, *"Torque converters"*, Chilton Book Co., 1992.
2. Newton Steeds & Garrot, *"Motor Vehicles"*, SAE International and Butterworth Heinemann, 2001.
3. CDX Automotive, *"Fundamentals of Automotive Technology: Principles and Practice"*, Jones & Bartlett Publishers, 2013.
4. Judge A.W, *"Modern Transmission Systems"*, Chapman and Hall Ltd., 1990.
5. SAE Transactions 900550 & 930910.
6. Crouse W.H, Anglin D.L, *"Automotive Transmission and Power Trains construction",* McGraw Hill, 1976.

AE1012 - AUTOMOTIVE TRANSMISSION												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X									
2.	Mapping of instructional objectives with student outcome	1,2	1,2									
3.	Category	General (G)	Basic Sciences (B)				Engineering Sciences and Technical Art (E)				Professional Subjects(P)	
											X	
4.	Broad Area	Design	Vehicle body and Engineering				Manufacturing				Engines and Management systems	
		X										
5.	Approval	23rd meeting of the Academic Council , May 2013										

	METROLOGY AND QUALITY CONTROL LABORATORY	**L**	**T**	**P**	**C**
ME1039	Total Contact Hours = 30 hours	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

To understand the various measuring techniques in dimensional, optical and

computer aided inspection in the industries and its role in SQC	
INSTRUCTIONAL OBJECTIVES	
To make the student to work	
1.	Various standards of measurement(line, end and wavelength standards)
2.	On measurement of fundamental, gear, thread and form measurement
3.	On calibration of measuring instruments,
4.	Computer aided measurement techniques

LIST OF EXPERIMENTS

1. Use of Precision Measuring Instrument (linear and angular) and Gauges
2. Gear parameter measurement, Thread Parameter measurement
3. Calibration of Measuring Instruments
4. Indirect method of measurement using standard balls and rollers
5. Usage of various comparators(mechanical, electrical ,pneumatic etc)
6. Process capability study using mechanical Comparator
7. Various parameter measurement using Computerised profile projector
8. Straightness, flatness measurement using autocollimator
9. Surface roughness measurement
10. Interferometers and measurements using laser
11. Fundamental measurement using CMM, automatic probing

REFERENCE

1. Laboratory manual

ME1039 – METROLOGY AND QUALITY CONTROL LABORATORY												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X						X
2.	Mapping of instructional objectives with student outcome	1	2,3			1,4						4
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)					Professional Subjects(P)	
		--	--			--					X	
4.	Approval	23rd meeting of the Academic Council , May 2013										

AE1013	AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY	L	T	P	C
	Total Contact Hours = 30 hours	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To give a practical exposure to various electrical and electronic systems of an automobile.

INSTRUCTIONAL OBJECTIVES

To make the students to acquire hands on knowledge in

1.	Testing and serving of automotive batteries, starter motor and alternators
2.	Testing of regulators and cut outs
3.	Fault finding and rectification of ignition circuits and wiring
4.	Study of different types of sensors
5.	Study of engine management system and ABS

LIST OF EXPERIMENTS

a. Electrical Laboratory

1. Testing of batteries and battery maintenance
2. Testing of starting motors and Alternators
3. Testing of regulators and cut – outs relay
4. Diagnosis of ignition system faults
5. Study of automobile electrical wiring

b. Electronics Laboratory

1. Throttle Position Sensor
2. Lambda Sensor
3. Interfacing of analog sensors with micro-controller
4. Interfacing of frequency input from speed sensor to microcontroller
5. Study of Engine Management System
6. Study of Antilock Braking System

REFERENCE

1. Laboratory Manual / Manufacturers Manuals

AE1013 - AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X								X		
2.	Mapping of	1,2,								1,2,		

	instructional objectives with student outcome	3,4, 5								3,4, 5			
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)			
										X			
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems			
										X			
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1049	MINOR PROJECT	L	T	P	C
	Total Contact Hours - 30	0	0	2	1
	Prerequisite				
	--				

PURPOSE

To carry out a design project in one of the specializations of the program with substantial multidisciplinary component.

INSTRUCTIONAL OBJECTIVES

1.	To guide the students in such a way so that they carry out a work on a topic as a forerunner to the full fledged project work to be taken subsequently in VIII semester. The project work shall consist of substantial multidisciplinary component

The students will carry out a project in one of the specializations of program under study with substantial multidisciplinary component

Student groups will be formed and a faculty member will be allocated to guide them. Assessment will be based on internal reviews. Based on the reviews marks will be allotted out of 100.

AE1049MINOR PROJECT												
Course designed by		Department of Automobile Engineering										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X	X	X	X	X	X	X	X	X	X
2	Mapping of instructional objectives with student outcome	1	1	1	1	1	1	1	1	1	1	1
3	Approval	23rd meeting of Academic Council, May 2013										

SEMESTER – VII

AE1014	ALTERNATIVE FUELS AND POLLUTION CONTROL	L	T	P	C
	Total contact hours = 60 hours	2	2	0	3
	Prerequisite				
	Nil				

PURPOSE	
The purpose of this course is to impart adequate knowledge on Alternative fuels and pollution control in the Automobiles.	
INSTRUCTIONAL OBJECTIVES	
At the end of the course, the student will be able to understand;	
1.	Different types of Alternative fuels for Automobiles
2.	Performance of Alternative Fuels used in Automobiles
3.	Mechanism of pollutant formation in engines
4.	Treatment and control Techniques

INTRODUCTION

Various pollutants from SI and CI engines. Effects of pollutants on environment and human beings. Estimation of petroleum reserves. Need for alternative fuels. Potential alternative fuels (alcohols, oxygenates, hydrogen, LPG, NG, biogas, and vegetable oils), Merits and demerits of various alternative fuels.

UNIT I - EMISSIONS FROM SI ENGINES AND THEIR CONTROL (12 hours)

Emission formation in SI engines (CO, HC and NOx). Effect of design and operating variables on emission formation. Control techniques -Thermal reactor, exhaust gas recirculation, three way catalytic convertor and Charcoal canister control for evaporative emission- positive crank case ventilation for blow by gas control.

UNIT II - EMISSIONS FROM CI ENGINES AND THEIR CONTROL (12 hours)

Emission formation in CI engines (HC, CO, NOx, aldehydes, smoke and particulates), effect of design and operating variables on emission formation, control techniques, exhaust gas recirculation, NOx selective catalytic reduction, diesel oxidation catalytic convertor, diesel particulate filter, NOx versus particulates –trade off.

UNIT III - EMISSION MEASURING INSTRUMENTS AND TEST PROCEDURES (12 hours)

Principle of operation of emission measuring instruments used in SI and CI engines, Measurement of CO_2 and CO by NDIR, hydrocarbon emission by FID,

Chemiluminescent analyser for NOx, Liquid and Gas chromatograph, spot sampling and continuous indication type smoke meters (Bosch, AVL and Hartridge smoke meters) emission test procedures – FTP, Euro and Bharat norms

UNIT IV - ALCOHOL FUELS AND GASEOUS FUELS (12 hours)

Properties of alcohols, engine modifications required to use alcohols in SI engines, performance, combustion and emission characteristics in SI engines, alcohol – gasoline blends, fuel flexible vehicle, methanol reformed gas engine, use of alcohols in CI engines-emulsions, dual fuel system, spark assisted diesel engine, surface ignition engine, ignition accelerators, performance, combustion and emission characteristics in CI engines.

Properties of hydrogen, production and storage methods, safety precautions , use in SI and CI engines, biogas production and its properties, use in SI and CI engines, properties of LPG and CNG, use in SI and CI engines. Performance, combustion and emission characteristics of hydrogen, biogas, LPG and CNG in SI and CI engines.

UNIT V - VEGETABLE OILS (12 hours)

Various vegetable oils for diesel engines, structure and properties, problems in using vegetable oils in diesel engines, methods to improve the engine performance using vegetable oils-preheating, Esterification (biodiesel, blending with good secondary fuels, semi-adiabatic engine, surface ignition engine, ignition accelerators dual fuelling with gaseous and liquid fuels, performance, combustion and emission characteristics of vegetable oil fuelled diesel engines.

TEXT BOOK

1. Ganesan V, *"Internal combustion engines"*, 4th edition, Tata McGraw Hill Education, 2012.

REFERENCES

1. Michael F. Hordeski, *"Alternative Fuels: The Future of Hydrogen"*, The Fairmont Press, Inc., 2008.
2. Rajput R. K, *"A textbook of Internal Combustion Engines"*, 2nd edition, Laxmi Publications (P) Ltd, 2007.
3. *"Society of Automotive Engineers"*, *Alternative Fuels: Fuel Cells and Natural Gas,* Society of Automotive Engineers, Incorporated, 2000.
4. Thipse S. S, *"Alternative Fuels: Concepts, Technologies and Developments",* Jaico Publishing House, 2010.

AE1014 – ALTERNATIVE FUELS AND POLLUTION CONTROL												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X				X				
2.	Mapping of instructional objectives with student outcome	1,2,3,4		2,3,4				1,2,3,4				
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1015	VEHICLE DYNAMICS	L	T	P	C
	Total contact hours = 75 hours	3	2	0	4
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students in vehicle dynamics.

INSTRUCTIONAL OBJECTIVES:

Students will be able to know

1.	The concept of mechanical vibrating system
2.	About suspension and tyre related vibrations
3.	About the stability of vehicle

UNIT I - NUMERICAL SIMULATION AND VEHICLE MODEL (15 hours)

Simulation tools available - Benefits of Simulation Framework for Vehicle Models - Vehicle axis system - Ground-fixed axes - Euler angles and transformations of coordinate systems.

UNIT II - TIRE DYNAMICS (15 hours)

Tire Construction - Tire behavior - Squirm, etc - Longitudinal slip - Slip angle definitions - Tire models and force generation - Linear Models - Analytical Tire Modeling - Pure slip - Combined Slip - Magic Formula tire model.

UNIT III - ACCELERATION AND BRAKING PERFORMANCE (15 hours)

Longitudinal performance - Load transfer due to driveline torque - Transient Behavior - Simple IC engine modeling - Polynomial fits - ODE input-output models - Braking Performance - Transient behavior - Quarter car models - Half car models - 2 and 4 degree of freedom - Dynamic weight shift - Anti-lock brakes - Braking Stability.

UNIT IV - STEADY STATE ORNERING AND TRANSIENT VEHICLE CHARACTERISTICS (15 hours)

Understeer / Oversteer - Understeer Gradient - Lateral acceleration gain - Critical Speed - Characteristic Speed.

Two Degree of Freedom (DOF) - Bicycle Model - Transfer function descriptions - State space descriptions - Review of techniques - Dynamic Responses - Step responses – Stability - Variation of dynamics with respect to speed, c.g. location, etc. – Non-dimensional analysis of vehicle dynamics - Nonlinear Models - Higher DOF models.

UNIT V - SUSPENSION DYNAMICS, MULTI-BODY VEHICLES AND VEHICLE CONTROL (15 hours)

Commercial heavy vehicles - Equations of Motions for tractor-trailer - Linearizations

Suspension Kinematics - Suspension types - Roll Centers - Anti-Squat, Anti-Dive, Anti-Pitch geometries - Suspension Dynamics - Multi-body vibration - Body and Wheel hop modes - Invariant points - Controllable Suspension Elements – Active - Semi-Active.

Vehicle "Control" - Human guidance - Driver models - Interactions of Several Vehicles - Single lane platoons - With and without human driver models.

TEXT BOOKS

1. Thomas D. Gillespie, *"Fundamental of Vehicle Dynamics, Society of Automotive Engineers",* USA 1992.

REFERENCES

1. Karl Popp, Werner O. Schiehlen, *"Ground Vehicle Dynamics"*, Springer, 2010.
2. Rajesh Rajamani, *"Vehicle Dynamics and Control",* Springer, 2012.
3. Georg Rill, *"Road Vehicle Dynamics: Fundamentals and Modeling",* CRC Press, 2012.
4. Ellis. J.R, *"Vehicle Dynamics"*, Business Books Ltd., London, 1991.
5. Giles. J.G. Steering, *"Suspension and Tyres",* Iliffe Books Ltd., London 1998.

AE1015 - VEHICLE DYNAMICS												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1,2,3		1,2,3		2,3						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		-	x			-				-		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1016	VEHICLE BODY ENGINEERING AND AERODYNAMICS	L	T	P	C
	Total contact hours = 45 hours	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course provides the basic knowledge about construction & various types of automotive bodies. On completion of this course, the students are exposed to understand the concept of body construction techniques under the light of aerodynamics.

INSTRUCTIONAL OBJECTIVES

1.	To expose the fundamentals in various automotive body construction techniques.
2.	To integrate the concepts of aerodynamics in body engineering for better style and low drag.

UNIT I - CAR BODY DETAILS **(9 hours)**

Types of car bodies Constructional details of a passenger car. Visibility: Regulation, Driver's visibility, Methods of improving visibility. Safety: Safety aspects in design. Painting process of a passenger car body.

UNIT II - BUS BODY DETAILS (9 hours)

Classification of bus bodies – Based on distance traveled, Based on capacity of the bus and based on style & shape. Types of metal section used in the construction and regulations. Construction of conventional and integral type buses& comparison.

UNIT III - CAR AERODYNAMICS (9 hours)

Types of aerodynamic drag. Forces and moments influencing drag. Effects of forces and moments. Various body optimization techniques for minimum drag. Principle of wind tunnel technology. Flow visualization techniques. Testing with wind tunnel balance (scale models).

UNIT IV - COMMERCIAL VEHICLE DETAILS (9 hours)

Classification of commercial vehicle bodies. Construction of Tanker body and Tipper body. Dimensions of driver seat in relation to controls. Driver cabin design for compactness.

UNIT V - COMMERCIAL VEHICLE AERODYNAMICS (9 hours)

Effects of rounding sharp front body edges. Effects of various cabs on trailer body. Fore body pressure distribution. Effects of a cab to trailer body roof height. Commercial vehicles drag reduction devices.

TEXT BOOK

1. Heinz Heisler, *"Advanced Vehicle Technology"*, 2nd edition, Butterworth – Heinemann, 2002.
2. Wolf-Heinrich Hucho, *"Aerodynamics of road vehicles",* 4th edition, 2000.

REFERENCES

1. John Fenton, *"Vehicle Body layout and analysis",* Mechanical Engineering Publication Ltd., 1984

<table>
<tr><th colspan="14">AE1016 - VEHICLE BODY ENGINEERING & AERODYNAMICS</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="12">Department of Mechanical Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td>X</td><td></td><td>X</td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1,2</td><td></td><td>1,2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td>General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="4">Engineering Sciences and Technical Art (E)</td><td colspan="3">Professional Subjects(P)</td></tr>
<tr><td></td><td colspan="3"></td><td colspan="4"></td><td colspan="3">X</td></tr>
</table>

4.	Broad Area	Design	Vehicle body and Engineering	Manufacturing	Engines and Management systems
		-	x	-	-
5.	Approval	23rd meeting of the Academic Council , May 2013			

AE 1017	**VEHICLE PERFORMANCE AND TESTING**	**L**	**T**	**P**	**C**
	Total contact hours = 75 hours	**3**	**2**	**0**	**4**
	Prerequisite				
	Nil				

PURPOSE

To familiarize the students in vehicle testing and performance

INSTRUCTIONAL OBJECTIVES

1.	Know the concept of vehicle performance estimation
2.	Know about transmission performance
3.	Know about the Laboratory testing of vehicles

UNIT I - VEHICLE PERFORMANCE ESTIMATION & PREDICTION (15 hours)

Aerodynamic drag, methods of estimation of resistance to motion, power requirement for propulsion, Power plant characteristics & transmission related requirements, arrangement of power train, vehicle controls, vehicle acceleration, maximum speed, and gradiability drive systems comparison, hill climbing, handling and ride characteristics on different road surfaces. Effect of pressure, temperature and humidity on power output.

UNIT II – VEHICLE TRANSMISSION PERFORMANCE (15 hours)

Characteristics & features of friction clutches, mechanical gear transmission & Epicyclic gear boxes.

UNIT III - OPERATIONAL PERFORMANCE (15 hours)

Engine performance & operating characteristics, Operation at full load and part load conditions, fuel economy, effect of vehicle condition, tyre and road condition, traffic condition and driving habits on fuel economy, vehicle safety.

UNIT IV - CONTROL SYSTEMS (15 hours)

Braking arrangements & Characteristics, weight transfer, steering arrangements, rigid & independent suspension, roll centre, torsion bar, stabilizer, radius bar.

UNIT V - VEHICLE PERFORMANCE TESTING (15 hours)

Laboratory Testing – Testing of major components of vehicle like clutch, suspension, braking, steering etc., Engine testing – noise, vibrations, emission,

power & fuel consumption, Vehicle testing on chassis dynamometers, Road and Track Testing, Initial inspection, running in and durability, extensive driving, maximum speed & acceleration, Brake testing on the road, Hill climbing, handling & ride characteristics on different road surfaces, ride comfort.

TEXT BOOK

1. Martyr A. J, Plint M. A, *"Engine Testing Theory and Practice",* 3rd edition, Butterworth-Heinemann, 2007.

REFERENCES

1. Gousha H. M, *"Engine Performance Diagnosis & Tune Up Shop Manual"*.
2. Giles J. G, *"Vehicle Operation & Performance"*.
3. Crouse. W. H, Anglin. D. L, *"Motor Vehicle Inspection"*, McGraw Hill, 1978.

AE1017 – VEHICLE PERFORMANCE AND TESTING												
Course Designed by		**Department of Mechanical Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1,2,3	1,2,3			1,3						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		-	x			-				-		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1018	**VEHICLE DYNAMICS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	**0**	**0**	**2**	**1**
	Prerequisite				
	Nil				

PURPOSE

The subject matter will focus on the dynamic modeling and simulations of road vehicles and their subsystems.

INSTRUCTIONAL OBJECTIVES	
1.	The intended students for this course are senior undergraduate students. The subject matter will focus on the dynamic modeling and simulations of road vehicles and their subsystems. The key to the Laboratory is the understanding of various dynamic behavior of road vehicles under various loading conditions as well as computer simulation of the same.

LIST OF EXPERIMENTS

1. Suspension test(s) rig (Mac-Person Strut, Double Wishbone and Leaf Spring)
2. Steering test rig
3. Tire dynamics test rig
4. 16 channel Power train vibration test rig
5. 16 channel ride comfort and NVH test rig
6. Numerical simulation of suspensions' dimension optimization
7. Numerical simulation of steering geometry optimization
8. Multi body dynamic simulation of a on road passenger car
9. Multi body dynamic simulation of a HCV / LCV
10. Multi body dynamic simulation of a off road racing vehicle / on road racing vehicle

REFERENCES

1. Laboratory Manual
2. Gillespie T, *"Fundamentals of Vehicle Dynamics, Society of Automotive Engineers (SAE)"*, 1992.
3. Bosch R, *"Automotive Handbook"*, 12th edition, Society of Automotive Engineers (SAE), 2011.
4. Heinz Heisler, *"Advanced Vehicle Technology"*, Butterworth-Heinmann, Oxford, 2011.

AE1018 - VEHICLE DYNAMICS LABORATORY												
Course Designed by		Department of Mechanical Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
					X	X				X		
2.	Mapping of instructional objectives with student outcome				1	1				1		

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Art (E)	Professional Subjects(P)
					X

4.	Broad Area	Design	Vehicle body and Engineering	Manufacturing	Engines and Management systems
		-	x	-	-
5.	Approval	23rd meeting of the Academic Council , May 2013			

AE1019	VEHICLE TESTING LABORATORY	L	T	P	C
	Total Contact hours = 30 hours	0	0	2	1
	Prerequisite				
	Nil				

PURPOSE

To provide practical knowledge about Vehicle testing.

INSTRUCTIONAL OBJECTIVES

At the end of the course, students will be able to know

1.	About testing of automobiles using dynamometers and on Road
2.	Engine analysis using diagnostic Systems
3.	Wheel Balancing and alignment.
4.	Exhaust gas analysis

LIST OF EXPERIMENTS

1. 2 -wheeler testing on chassis dynamometer.
2. 4 –wheeler testing on chassis dynamometer.
3. Onboard diagnostics of SUV, MUV and LMV using OBD II scanner.
4. 4 wheeler vehicle test lane for
    a. Side Slip
    b. Suspension and tyre adhesion
    c. Braking
    d. Headlamp alignment
5. On road testing of vehicles for
    a. Braking
    b. Acceleration
    c. Fuel Economy
6. Engine Analysis using Engine Diagnostic System for
    a. Petrol Engine.
    b. Diesel Engine.
7. Wheel Balancing and Wheel Alignment
8. Study of Chemiluminescent NOx analyzer.
9. Measurement of HC, CO, CO_2, O_2 using exhaust gas analyzer.
10. Diesel smoke measurement.

REFERENCES

1. Manufacturer's Manual
2. Giles J.G, *"Vehicle Operation and performance"*, Iliffe Books Ltd., London, 1989.
3. Crouse W.H, Anglin D.L, *"Motor Vehicle Inspection"*, McGraw Hill Book Co., 1978.
4. Ganesan V, *"Internal Combustion Engines"*, 2nd edition, Tata McGraw Hill Co., 2012.

AE1019 - VEHICLE TESTING LABORATORY													
Course Designed by		**Department of Mechanical Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
					X	X				X			
2.	Mapping of instructional objectives with student outcome				1,2,3,4	1,2,3,4				1,2,3,4			
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)			Professional Subjects(P)			
										X			
4.	Broad Area	Design		Vehicle body and Engineering			Manufacturing			Engines and Management systems			
		-		x			-			-			
5.	Approval	23rd meeting of the Academic Council , May 2013											

	INDUSTRIAL TRAINING II (Training to be undergone after VI semester)	L	T	P	C
AE1048	2 week practical training in industry	**0**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE

To expose the students to the industry working environment

INSTRUCTIONAL OBJECTIVES

1.	Students have to undergo two – week practical training in Automobile Engineering related project Fabrication, Service or design so that they become aware of the practical application of theoretical concepts studied in the class rooms.

Students have to undergo two-week practical training in Automobile Engineering related project Fabrication, Service or design of their choice but with the approval

of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

<table>
<tr><th colspan="13">AE1047 INDUSTRIAL TRAINING II</th></tr>
<tr><td colspan="2">Course designed by</td><td colspan="11">Department of Automobile Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td></tr>
<tr><td></td><td></td><td></td><td>X</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td></td><td></td><td></td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="3">Basic Sciences (B)</td><td colspan="3">Engineering Sciences & Technical Arts (E)</td><td colspan="3">Professional Subjects (P)</td></tr>
<tr><td colspan="2">-</td><td colspan="3">-</td><td colspan="3">-</td><td colspan="3">X</td></tr>
<tr><td>4.</td><td>Approval</td><td colspan="11">23rd meeting of Academic Council, May 2013</td></tr>
</table>

SEMESTER – VIII

AE1050	**MAJOR PROJECT / PRACTICE SCHOOL**	**L**	**T**	**P**	**C**
	Total Contact Hours - 360	**0**	**0**	**24**	**12**
	Prerequisite				
	--				

PURPOSE

To simulate real life situations related to the program and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.

INSTRUCTIONAL OBJECTIVES

1. To guide the students such a way that the they carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations. The project work so chosen by the student shall culminate in gaining of major design experience in the related area of specialization.

MAJOR PROJECT

Each project will cover all the aspects (to the extent possible) of real life application of concepts studied under the program. . Alternately, a few research problems also may be identified for investigation. The project shall be driven by realistic constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability. The outcomes to be attained by students by doing the project work shall be spelt out clearly. A project report is to be submitted on the topic which will be evaluated during the final review. Assessment procedure will be as spelt out in the regulations.

PRACTICE SCHOOL

Alternately, a student is encouraged to take an industrial project with reputed organizations or firms chosen by the institute. In such cases the student will stay with the firm and carry out the project. The project will be guided by the faculty member and the concerned officer in the industry. All the requirements spelt out under 'MAJOR PROJECT' above, shall be incorporated under this work also. However reviews will be conducted in the institute which the student shall attend.

AE1050 MAJOR PROJECT												
Course designed by		**Department of Automobile Engineering**										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X	X	X	X	X	X	X	X	X	X
2	Mapping of instructional objectives with student outcome	1	1	1	1	1	1	1	1	1	1	1
3	Approval	23rd meeting of Academic Council, May 2013										

DEPARTMENTAL ELECTIVES
DESIGN

AE1101	**DESIGN FOR SAFETY AND COMFORT**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To provide an Understanding to the engineering principles that underpin the design of an automobile for the safety and comfort systems

INSTRUCTIONAL OBJECTIVES

1.	To provide an understanding to the automotive safety and comfort systems and its future prospects

UNIT I - DESIGN OF AUTOMOTIVE BODY AND SAFETY (9 hours)

Introduction to automotive safety systems - Design of the body for safety - engine location - concept of crumble zone - safety sandwich construction - deformation behavior of vehicle body - speed and acceleration characteristics of passenger compartment on impact.

UNIT II - SAFETY SYSTEMS (9 hours)

Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT III - CRASH WORTHINESS (9 hours)

Definition – Requirements – Tests – component, sled and full-scale barrier impacts-Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety

UNIT IV - COLLISION WARNING AND AVOIDANCE (9 hours)

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V-COMFORT SYSTEMS (9 hours)

NVH (noise, vibration and harshness) of chassis, engines and power train, ride quality and sound quality; heating, ventilation and air conditioning systems. Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TEXT BOOK

1. Vivek D. "*Ergonomics in the Automotive Design Process"* Bhise publisher CRC press, Taylor and Francis group.

REFERENCES

1. Ronald K Jurgen, *"Automotive Electronics Handbook"* - Second edition-McGraw-Hill Inc., - 1999.
2. Bosch, *"Automotive Handbook"*, 5th edition - SAE Publication - 2000.
3. Jullian Happian, *"Smith An Introduction to Modern Vehicle Design"*, SAE, 2002.
4. Johnson W and Mamalis A.G, *"Crashworthiness of Vehicles",* MEP, London.
5. Richard Bishop, "*Intelligent Vehicle Technology and Trends"* – 2005.
6. George A. Peters , Barbara J. Peters, *"Automotive Vehicle Safety*" – 2002.

AE1101 – DESIGN FOR SAFETY AND COMFORT												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	C	d	E	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1	1			1						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Art(E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		X										
5.	Approval	23rd meeting of Academic Council, May 2013										

AE1102	**ENGINE AND DRIVE LINE DESIGN**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

1.	Knowledge on the practical design of mechanisms and systems involved for dividing the power between the driving wheels.
2.	A fundamental knowledge on the factors influencing the driveline efficiency and dynamics can be acquired

INSTRUCTIONAL OBJECTIVES	
On completion of this module the student should be able to:	
1.	Describe power train components and sub-systems.
2.	Size an internal combustion engine, transmission and cooling system, and match them to achieve the required performance.
3.	Describe emission norms and analyse parameters that influence engine emission.
4.	Analyse engine combustion parameters and predict engine performance using RICARDO WAVE and VECTIS.
5.	Conduct performance test on an automotive engine.

INTRODUCTION TO IC ENGINES (5 hours)

Motor Vehicle - Purpose and Location of Engines - Engine Types and Working - Various subsystems of IC Engines - The functional requirement of IC Engines

UNIT I - IGNITION AND MIXTURE FORMATIONS (8 hours)

Ignition and Mixture Formation in SI Engines - Carburetor - Multi-point Fuel Injection - Gasoline Direct Injection - Ignition and Mixture Formation in CI Engines - Mixture formation in CI Engine - Fuel supply line in CI Engine - Distributed pump and common rail system and practices - Atomization and Spray Characteristics

UNIT II - INTAKE, EXHAUST AND IN- CYLINDER FLOW (8 hours)

In cylinder Flow of mixture - Air flow through intake system - Exhaust Flow - Flow through exhaust valve – Mufflers.

UNIT III - THERMO-CHEMISTRY AND COMBUSTION (8 hours)

Thermo-chemistry and Fuels - Combustion in IC Engines - Fuel molecular structure and properties - Combustion fundamentals - Combustion in IC Engines - Air Standard Cycles - Otto, Diesel and Dual - Combustion cycles - Engine performance parameters and their inter-relations

UNIT IV - EXHAUST EMISSIONS AND ALTERNATE FUELS (8 hours)

Emission from IC Engines - Emission regulations across the world - Drive Cycles across the world - Alternate Fuels - Various alternate fuels - Hybrid Power Train - Configurations of hybrid power train

UNIT V - TESTING AND PERFORMANCE OF ENGINES (8 hours)

Transmission Rationale - Drive Train - Manual transmission - Automatic Transmission, CVT - Tractive Effort and Design of Power Train - Tractive effort: rolling resistance, aerodynamic resistance - Selection of gear ratio - Engine-Transmission matching

TEXT BOOK

1. Alexander F. Andreev, Viachaslau I. Kabanau, and Vladimir V. "*Drive line system of ground vehicles"*, Vantsevich published by CRC press Taylor and Francis group.

REFERENCES

1. Heywood, John B., *"Internal Combustion Engine Fundamentals"*, McGraw-Hill, New York,1988.
2. Ferguson, Colin R., Kirkpatrick, Allan T., *"Internal Combustion Engine - Applied Thermoscience*", John Wiley, 2000.
3. Pulkrabek, Willard W., "*Engineering Fundamentals of the Internal Combustion Engine"*, Pearson, New Delhi, 2003.
4. Robert Bosch GmbH (editor), "*Automotive Handbook"*, 7th edition, Wiley, 2008.
5. Erjavec, Jack, *"Automotive Technology: A Systems Approach*", Thomson, 2006.
6. James E. Duffy, *"Modern Automotive Technology*", Goodheart Willcox, 2004.
7. Gisbert Lechner, *"Automotive Transmission, Fundamentals*, *Selection, Design and Application",* Springer, New York, 1999.

AE1102 – ENGINE AND DRIVELINE DESIGN												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	C	d	E	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1	1			1						
3.	Category	General (G)	Basic Sciences(B)			Engineering Sciences and Technical Art(E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		-	-			-				x		
5.	Approval	23rd meeting of Academic Council, May 2013										

AE1103	NEW PRODUCT DEVELOPMENT	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
1.	The objective of the course is to impart knowledge on the strategies, processes and methods used for new-product development.
2.	The techniques and tools for managing different stages of product development will also be dealt with.

INSTRUCTIONAL OBJECTIVES	
1.	To understand the principles involved in creativity, innovation and to form new product Development

INTRODUCTION

The process of technological innovation - factors contributing to successful technological innovation - the need for creativity and innovation - creativity and problem solving - brain storming - different techniques.

UNIT I - PROJECT SELECTION AND EVALUATION (9 hours)

Collection of ideas and purpose of project - Selection criteria - screening ideas for new products (evaluation techniques).

UNIT II - NEW PRODUCT DEVELOPMENT (9 hours)

Research and new product development - Patents - Patent search - Patent laws - International code for patents - Intellectual property rights (IPR).

UNIT III - NEW PRODUCT PLANNING (9 hours)

Design of prototype - testing - quality standards - marketing research - introducing new products.

UNIT IV - NEW PRODUCT DEVELOPMENT (9 hours)

Journeys in Product Development, Product Development Process Tools, Scoping Product Developments: Technical and Business Concerns.
Understanding Customer Needs, Establishing Product Function.

UNIT V - PRODUCT ARCHITECTURE (9 hours)

Product Teardown and Experimentation, Benchmarking and Establishing Engineering Specifications, Product Architecture.

TEXT BOOK

1. Barclay, Z. Dann, P. Holroyd, *"New Product development I, P*ublished by BH Butterworth-Heinemann a division of Reed Educational and professional publishing limited.

REFERENCES

1. Harry Nystrom, *"Creativity and innovation*", John Wiley & Sons, 1979.
2. Brain Twiss, *"Managing technological innovation"*, Pitman Publishing Ltd., 1992.

AE1103 - NEW PRODUCT DEVELOPMENT												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	C	d	E	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1	1			1						
3.	Category	General (G)		Basic Sciences(B)		Engineering Sciences and Technical Art(E)					Professional Subjects(P)	
											X	
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing					Engines and Management systems	
		-		-		x					-	
5.	Approval	23rd meeting of Academic Council, May 2013										

AE1104	**AUTOMOTIVE SYSTEM DESIGN**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This subject is intended to offer understanding on the multidisciplinary design aspects of engineering in automotive systems design.

INSTRUCTIONAL OBJECTIVES

1.	Students will have a comprehensive understanding of both the technical and non-technical competencies related to the effective and efficient design and development of technologies and applications for modern automotive systems.

UNIT I - STATISTICAL CONSIDERATION IN DESIGN AND OPTIMIZATION

(9 hours)

Ergonomics and Aesthetic Design, Statistics in design, design for natural tolerances, statistical analysis, and mechanical reliability. Introduction to design optimization of mechanical elements, adequate & optimum design, methods of optimization, Johnson's method of optimum design - Simple problems in optimum design like axially loaded members, shaft subjected to tensional and bending moments and other machine elements.

UNIT II - DESIGN OF CLUTCHES AND GEARBOX **(9 hours)**

Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, multi-plate clutch and centrifugal clutch

Selection of gear ratios & final drive ratio, Design of gears, shafts, splines and housing, selection of bearings.

UNIT III - DESIGN OF PROPELLER SHAFTS AND AXLES **(9 hours)**

Design of Propeller shafts for bending, torsion & rigidity, Design of universal joints and slip joints, final drive, Design of front & rear axles.

UNIT IV - BRAKE SYSTEMS **(9 hours)**

Design of Hydraulic Braking System, Internal Expanding Shoe Brake and Disc Brake Design of master cylinder, drum cylinder and piping design

UNIT V - DESIGN OF SUSPENSION AND STEERING SYSTEM **(9 hours)**

General design considerations of suspension system, Design of leaf springs for automobile suspension system, Design considerations of Belleville springs, Elastomeric springs, Air (Pneumatic) springs. Design considerations of Steering System and Vehicle Frame.

TEXT BOOK

1. Gian Carlo Genta, Lorenzo Iorello *"The Automotive Chassis system design"* published by Springer.

REFERENCES

1. Joseph E. Shigley & Larry D. Mitchell, *"Mechanical Engineering Design"*, 5th Edition, McGraw-Hill International Book Company, 2002.
2. Patil S.P., *"Mechanical System Design"*, 2nd edition, Jaico Publishers, 2005.
3. Spotts. M. F., Shoup. T. E., *"Design of Machine Elements"*, 7th Edition, Pearson Education, 1998.

4. Bhandari. V. B., *"Design of Machine Elements"*, Tata McGraw-Hill Publishing Company Ltd, 2010.
5. Julian Hapian Smith, *"An Introduction to Modern Vehicle Design"*, Society of Automotive Engineers Inc, 2002.

AE1104 – AUTOMOTIVE SYSTEM DESIGN												
Course Designed by		**Department of Automobile Engineering**										
1	Student Outcome	a	b	C	d	E	F	g	h	i	j	k
		X		X								
2	Mapping of instructional objectives with student outcome	1		1								
3	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
										X		
4	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
		X										
5	Approval	23rd meeting of Academic Council, May 2013										

AE1105	**COMPUTER AIDED VEHICLE DESIGN**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To make the students understand the basic principles involved in the computer aided vehicle design and apply the same for the optimum designing of the vehicle components.

INSTRUCTIONAL OBJECTIVES

1.	Computer-aided vehicle design (**CAD**) gives an understanding and expertise in the use of computer systems and tools to assist in the creation, modification, analysis, or optimization of a design of a vehicle.

UNIT I - VEHICLE FRAME AND SUSPENSION (9 hours)

Study of Loads-Moments and Stresses on Frame Members. Computer Aided Design of Frame for Passenger and Commercial Vehicles. Computer Aided Design of Leaf Springs-Coil Springs and Torsion Bar Springs.

UNIT II - FRONT AXLE AND STEERING SYSTEMS (9 hours)

Analysis of Loads-Moments and Stresses at different sections of Front Axle. Determination of Bearing Loads at Kingpin Bearings. Wheel Spindle Bearings. Choice of Bearings. Determination of Optimum Dimension and Proportions for Steering Linkages ensuring minimum error in Steering.

UNIT III - DRIVE LINE AND READ AXLE (9 hours)

Computer Aided Design of Propeller Shaft. Design of Final Drive Gearing. Design details of Full-floating., Semi-floating and Three Quarter Floating, Rear Axle Shafts and Rear Axle Housings.

UNIT IV - CLUTCH (9 hours)

Torque capacity of Clutch. Computer Aided Design of Clutch Components. Design details of Roller and Sprag Type of Clutches.

UNIT V - GEAR BOX (9 hours)

Computer Aided Design of Three Speed and Four Speed Gear Boxes.

Note: Use of Software Packages for Analysis and Design of Mechanical Systems may be used for Design Problem.

TEXT BOOKS

1. Dean Averns, *"Automobile Chassis Design Book"*, 2nd edition, Koteliansky Press, 2009.
2. Julian Happian-Smith, *"Introduction to Modern Vehicle Design"*, SAE International, 2004.

REFERENCES

1. Stokes. A, "*Manual Gearbox Design"*, Society of Automotive Engineers, 1992.
2. Alexandr F. Andreev, Viachaslau Kabanau, Vladimir Vantsevich, *"Driveline Systems of Ground Vehicles: Theory and Design"*, CRC Press, 2010.
3. Newton, Steeds & Garret, "*Motor Vehicle"*, Lliffe Books Ltd., London.
4. Heldt, P.M. "*Torque Converter"*, Chilton Book Co., New York.

AE1105 – COMPUTER AIDED VEHICLE DESIGN												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	C	d	E	F	g	h	i	j	k
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1		1		1						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
		-		-		-				X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
		X		-		-				-		
5.	Approval	23rd meeting of Academic Council, May 2013										

AE1106	FINITE ELEMENT ANALYSIS	L	T	P	C
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The aim is to provide the students with knowledge of the finite element analysis that will be of use in different automobile areas and to provide a foundation for further study.

INSTRUCTIONAL OBJECTIVES

1.	To equip students with fundamentals of finite element principles so as to enable them to understand the behavior of various finite elements.
2.	To be able to select appropriate elements to solve physical and engineering problems with emphasis as an automobile engineering applications.

UNIT I - BASIC CONCEPTS OF FEA **(9 hours)**

Introduction – Brief history of FEA - General Procedure for FEA – Discretization of a Structure –– Pros and Cons – Applications – Variational approach – Rayleigh Ritz Method – Method of Weighted Residuals – Point Collocation – Sub Domain Collocation – Least Square – Galerkin's Method - Solution of algebraic equations – Gaussian Elimination Method

UNIT II - ONE DIMENSIONAL PROBLEM (9 hours)

Co-ordinates – Global, Local and Natural – Shape Function – Potential energy approach – Generation of Stiffness Matrix – Assembly of Stiffness Matrix and Force Vector – Imposing of Boundary Conditions – Finite element equations – Applications to Spring, Bar, Beam and Truss Problems.

UNIT III - HIGHER ORDER FORMULATIONS (9 hours)

Plane Stress and Plane Strain – CST and LST elements – Basics of axis symmetric elements – Triangular element – Isoparametric elements – Four node Quadrilateral element – Jacobian matrices and transformations – Numerical Integration – Gaussian Quadrature

UNIT IV - STANDARD PACKAGES AND FEATURES (9 hours)

Introduction – Commercially available standard packages – Structure of a finite element analysis program – Pre and Post Processors – Desirable Features of FEA packages

UNIT V - APPLICATIONS (9 hours)

Modeling and Analysis of automobile components using ANSYS - Structural analysis of a Bicycle Spanner - Thermal analysis of Fin - Modal analysis of Frame – Vibrational analysis of a Automobile Suspension System – Analysis of a circular plate pushed down by a Piston Head using 2D Axis symmetric elements / Solid Brick and Shell elements – Analysis of Crank Shaft Torsional Vibrations - Vehicle Dynamics – Vehicle Model - Road Model – Computational Procedure – Experimental Verification.

TEXT BOOK

1. C S Krishnamoorthy, *"Finite Element Analysis Theory and Programming"*, 2nd edition published by Tata McGraw-Hill Company Limited.

REFERNCES

1. David V. Hutton, "*Fundamentals of Finite Element Analysis"*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2005.
2. Seshu P., "*Text Book of Finite Element Analysis"*, PHI Learning Private Limited, New Delhi, 2010.
3. Ramamurthy V., "*Finite Element Method in Machine Design"*, Narosa Publishing House, New Delhi, 2009.
4. Bhavikatti S.S., *"Finite Element Analysis"*, New Age International Publishers, New Delhi, 2008.

5. Erdogan Madenci, Ibrahim Guven, *"The Finite Element Method and Applications in Engineering using ANSYS"*, Springer (India) Private Limited, New Delhi, 2011.

AE1106 - FINITE ELEMENT ANALYSIS												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	C	d	E	F	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1,2	1,2			1						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
		-	-			-				X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		X	-			-				-		
5.	Approval	23rd meeting of Academic Council, May 2013										

AE1107	OPTIMIZATION FOR ENGINEERING DESIGN	L	T	P	C
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To study the principles of optimization and various techniques which can be used for Mechanical Engineering optimization along with applications.

INSTRUCTIONAL OBJECTIVES

1.	Principles of optimization and its need
2.	Various conventional optimization techniques
3.	Solving multivariable problems
4.	Solving problems using Unconventional optimization techniques

UNIT I - OPTIMUM DESIGN PRINCIPLES (9 hours)

Introduction to optimum design - General principles of optimization – Problem formulation & their classifications – Classical optimization techniques - Single variable and multivariable optimization.

UNIT II - UNCONSTRAINED OPTIMIZATION TECHNIQUES (9 hours)

Techniques of unconstrained optimization – Golden section, Random, pattern and gradient search methods – Interpolation methods.

UNIT III - CONSTRAINED OPTIMIZATION TECHNIQUES (9 hours)

Optimization with equality and inequality constraints - Direct methods – Indirect methods using penalty functions.

UNIT IV - UNCONVENTIONAL OPTIMIZATION TECHNIQUES (9 hours)

Genetic algorithms, Simulated Annealing and Ant Colony algorithm.

UNIT V - APPLICATIONS (9 hours)

Structural applications – Design of simple truss members - Design applications – Design of simple axial, transverse loaded members for minimum cost, weight – Design of shafts and torsionally loaded members – Design of springs.

TEXT BOOK

1. Kalyanmoy Deb *"Optimization for Engineering design*" Eastern Economy edition published by PHI publishers.

REFERENCES

1. Kalyanamoy Deb, "*Optimization for Engineering design algorithms and Examples"*, Prentice Hall of India Pvt. Ltd. 2006.
2. Rao, Singaresu S, *"Engineering Optimization – Theory & Practice*", New Age International (P) Limited, New Delhi, 2009.
3. Johnson Ray C, *"Optimum Design Of Mechanical Elements*", Wiley, John & Sons, Digitized 2007.
4. Goldberg D.E, *"Genetic algorithms in search, optimization and machine"*, Barnen, Addison Wesley, New York, 1989.
5. Fox. R. L, *"Optimization Methods for Engineering Design*", Addison Wesley Pub, Digitized 2007.
6. Garret N. Vanderplaats, "*Numerical optimization techniques for engineering design: with applications"*, McGraw-Hill Ryerson, Limited, Digitized 2007.

AE1107 – OPTIMIZATION FOR ENGINEERING DESIGN												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1,2, 3,4	1,2, 3,4			1,2, 3,4						

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Art (E)	Professional Subjects (P)
		-	-	-	X
4.	Broad Area	Design	Vehicle body and Engineering	Manufacturing	Engines and Management systems
		X	-	-	-
5.	Approval	23rd meeting of Academic Council, May 2013			

AE1108	**QUALITY CONTROL AND RELIABILITY ENGINEERING**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

Teach the essentiality of SQC, sampling and reliability engineering. Study on various types of control charts, six sigma and process capability to help the students understand various quality control techniques. Reliability engineering focuses on the dependability, failure mode analysis, reliability prediction and management of a system.

INSTRUCTIONAL OBJECTIVES

1.	Principles of optimization and its need
2.	Various conventional optimization techniques
3.	Solving multivariable problems
4.	Solving problems using Unconventional optimization techniques

UNIT I - STATISTICAL QUALITY CONTROL (9 hours)

Methods and Philosophy of Statistical Process Control - Control Charts for Variables and Attributes –Cumulative sum and Exponentially weighted moving average control charts -Other SPC Techniques – Process - Capability Analysis - Six sigma concept.

UNIT II - ACCEPTANCE SAMPLING (9 hours)

Acceptance Sampling Problem - Single sampling plans for attributes – double sampling -multiple sampling - sequential sampling - Military standards - The Dodge Roming sampling plans – Random sampling.

UNIT III - RELIABILITY ENGINEERING (9 hours)

Definition of reliability – Performance and reliability - Reliability requirements – System life cycle – Mean time between failures – Mean time to failure - Mortality Curve -Availability – Maintainability.

UNIT IV - FAILURE DATA ANALYSIS (9 hours)

Statistical failures of components – failure distributions – Bath tub curve – Negative exponential distribution – Normal distribution - log normal distribution – Gamma distribution - Weibull distribution Life distribution measurements – Accelerated life tests -Data requirements for reliability.

UNIT V - RELIABILITY PREDICTION AND MANAGEMENT (9 hours)

Failure rate estimates - Effect of environment and stress - Series and Parallel systems -RDB analysis – Standby Systems - Complex Systems - Reliability demonstration testing- Reliability growth testing - Duane curve - Risk assessment – FMEA and Fault tree analysis.

TEXT BOOKS

1. Khanna O.P, *"Statistical Quality Control"*, Dhanpat Rai Publications (P) Ltd., 2001.
2. Lewis E.E, *"Introduction to Reliability Engineering"*, John Wiley and Sons, 1987.

REFERENCES

1. Mohamed Zairi, *"Total Quality Management for Engineers",* Woodhead Publishing Limited 1991.
2. Harvid Noori and Russel, *"Production and Operations Management - Total Quality and Responsiveness",* McGraw-Hill Inc, 1995.
3. Douglus C. Montgomery, *"Introduction to Statistical Quality Control",* 2nd Edition, John Wiley and Sons, 1991.

AE1108 – QUALITY CONTROL AND RELIABILITY ENGINEERING												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	E	f	G	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1, 2, 3,4	1,2, 3,4			4						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
						X						
4.	Approval	23rd meeting of Academic Council, May 2013										

MANUFACTURING

AE1121	PRODUCT DEVELOPMENT AND COSTING	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To enable the student to understand the several aspects of the product development and to apply them in practice. Also to train the student in the concept of product costing

INSTRUCTIONAL OBJECTIVES

1. To provide knowledge stages of product development and also costing of a product

UNIT I - NEW PRODUCT DEVELOPMENT (9 hours)

Importance of manufacturing – manufacturing capability – mass production – product life cycle – concurrent engineering – Design for 'X' – Engineering problem solving process – Key factors to develop successful products – Strategy for new product development

UNIT II - PRODUCT DESIGN (9 hours)

Requirements of design – design process – design review – quality in designing – six sigma – poka-yoke-Material selection procedure – selection of process and design consideration – case studies

UNIT III - PRODUCT MODELING (9 hours)

Product modeling – definition of concept – types of product models – types of process chains-industrial demands- prototyping – principles – technologies – robust design-process

UNIT IV - PRODUCT COSTING (9 hours)

Bill of materials – outline process charts – cost estimating procedure – methods of costing – material cost – Labor cost – Overheads – Depreciation – Break even analysis - Problems

UNIT V - RECENT ADVANCES AND CONCEPTS IN PRODUCT DESIGN (9 hours)

Fundamentals of FEM – Significance to product design – Product life cycle management – Intelligent information system – Concept of knowledge based product and process design – Management information system – need – application – functions

TEXT BOOK

1. Karl T. Ulrich, Stephen D. Eppinger, *"Product Design and Development",* McGraw-Hill, 1995.

REFERENCES

1. George E. Dieter, *"Engineering Design – Materials and process approach",* Tata McGraw-Hill,1991
2. Donald. E. Carter, *"Concurrent Engineering",* Addison Wesley, 2004.
3. Anil Mital, Anoop Desai, Aashi mital, *"Product Development: A Structured Approach to Design and Manufacture",* Butterworth-Heinemann, 1st edition, 2008.

AE1121 - PRODUCT DEVELOPMENT AND COSTING													
Course Designed by		**Department of Automobile Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		X		X									
2.	Mapping of instructional objectives with student outcome	1		1									
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)			
										X			
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems			
						X							
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1122	**MODERN MANUFACTURING PROCESSES**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To develop the ability to understand the advanced manufacturing techniques evolved in manufacturing scenario.

INSTRUCTIONAL OBJECTIVES

At the end of this course the student should be able to understand

1.	Advanced techniques in casting
2.	Advanced forming and powder metallurgy

3.	Fabrication of microelectronic devices
4.	Manufacturing of composites
5.	Rapid prototyping

UNIT I - ADVANCES IN CASTING (9 hours)

Newer casting techniques - Expendable pattern casting - Plaster mold and ceramic mold casting – Vacuum casting - Squeeze casting - Rapid solidification for amorphous alloys – Casting techniques for single crystal components.

UNIT II - ADVANCED FORMING AND POWDER METALLURGY PROCESSES (9 hours)

High speed forging machines - Die materials - semisolid metal forming- Peen forming of sheet metals - Super plastic forming – Forming and shaping glass. Design consideration for Powder Metallurgy forming - Production of metal powders – Compaction – Sintering – Finishing of sintered parts – Secondary and finishing operations.

UNIT III - FABRICATION OF MICRO ELECTRONIC DEVICES (9 hours)

Semiconductors and silicon - Crystal growing and wafer preparation - Film deposition, Oxidation, Lithography, Etching, Diffusion and ion implantation, Metallization and testing - Bonding and packing.

UNIT IV - MANUFACTURING OF COMPOSITES (9 hours)

Introduction- Fibre reinforced, Metal matrix, Ceramics matrix composites, Nanocomposites - structure, Properties, manufacturing processes and applications.

UNIT V - RAPID PROTOTYPING (9 hours)

Rapid prototyping- overview, Techniques-Stereo lithography, Laminated object manufacturing, Selective laser sintering, fused deposition modeling, solid ground curing, 3D ink jet printing-Applications of rapid prototyping-Rapid tooling-Rapid manufacturing-Future development-Virtual prototyping.

TEXT BOOKS

1. Serope Kalpakjian, *"Manufacturing Engineering and Technology",* 3rd Edition, Addison-Wesley Publishing Co., Boston, 2009.
2. Madou M. J, *"Fundamentals of micro fabrication and nanotechnology",* 3rd edition, CRC Press, USA, 2011.

REFERENCES

1. Amstead B. H, Ostwald Phillips and Bageman R.L, *"Manufacturing Processes"*, John Wiley & Sons, New York, 1987.
2. Jaeger R.C, *"Introduction to microelectronic Fabrication",* Addision Wesley, Boston, 1988.
3. Chua C. K, *"Rapid Prototyping - Principles and Applications",* World Scientific Publishing Company, 2010.
4. Hilton P. D and *"Marcel Dekker"*, Rapid Tooling, New York, 2000.

AE1122 - MODERN MANUFACTURING PROCESSES													
Course Designed by		**Department of Automobile Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
				X		X				X			
2.	Mapping of instructional objectives with student outcome			1,2,3 ,4,5		1,2,3, 4,5				1,2,3, 4,5			
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)			
										X			
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems			
										X			
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1123	COMPUTER INTEGRATED MANUFACTURING	L	T	P	C
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

1.	To gain knowledge on how computers are integrated at various levels of planning and manufacturing.
2.	To understand the flexible manufacturing system and to handle the product data and various software used for manufacturing

INSTRUCTIONAL OBJECTIVES

1.	Its objectives are to expose the student to the different types of manufacturing available today such as the Special manufacturing System, the Manufacturing Cell, and the Flexible Manufacturing System (FMS).

2.	To learn the fundamentals of computer assisted numerical control programming and programming languages
3.	To learn the concepts of Computer Integrated Manufacturing and Management System and automated flow lines

UNIT I - INTRODUCTION TO CIM (9 hours)

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems. Manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

UNIT II - GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING (9 hours)

History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems- facility design using G.T. - benefits of G.T. - cellular manufacturing. Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning - variant approach and generative approaches - CAPP and CMPP process planning systems.

UNIT III - SHOP FLOOR CONTROL AND INTRODUCTION OF FMS (9 hours)

Shop floor control-phases -factory data collection system -automatic identification methods- Bar code technology-automated data collection system.
FMS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout -computer control systems-application and benefits.

UNIT IV - CIM IMPLEMENTATION AND DATA COMMUNICATION (9 hours)

CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture- Product data management-CIM implementation software. Communication fundamentals- local area networks -topology -LAN implementations - network management and installations.

UNIT V - OPEN SYSTEM AND DATABASE FOR CIM (9 hours)

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP) Development of databases - database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

TEXT BOOK

1. Mikell P.Groover, *"Automation, Production Systems and computer integrated manufacturing"*, Pearson Education, 2008.

REFERENCES

1. Yorem koren, *"Computer Integrated Manufacturing System"*, McGraw-Hill, 1987.
2. Ranky Paul G, *"Computer Integrated Manufacturing"*, Prentice Hall International, 1986.
3. David D Bedworth, Mark R.Hendersan, Phillip M.Wolfe, *"Computer Integrated Design and Manufacturing"*, McGraw-Hill Inc.
4. Roger Hanman, *"Computer Intergrated Manufacturing",* Addison – Wesley, 1997.
5. Mikell.P.Groover and Emory Zimmers Jr., *"CAD/CAM",* Prentice Hall of India Pvt. Ltd., New Delhi-1, 1998.
6. Kant Vajpayee S, *"Principles of Computer Integrated Manufacturing",* Prentice Hall India, 2003.
7. Radhakrishnan P, Subramanyan S and Raju V, *"CAD/CAM/CIM",* 2nd Edition New Age International (P) Ltd., New Delhi, 2000.

AE1123 - COMPUTER INTEGRATED MANUFACTURING												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1,2,3	1,2,3			3						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
						X						
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1124	ROBOTICS AND ROBOT APPLICATION	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To impart knowledge about the engineering aspects of Robots and their applications.

INSTRUCTIONAL OBJECTIVES

To familiarize the Basics of robots and Control system

1. End effectors and sensors
2. Robots cell design and programming
3. Industrial application of robot

UNIT I - INTRODUCTION TO ROBOT APPLICATION (9 hours)

Basic concepts - Robot anatomy - Manipulators - kinematics: Forward and inverse kinematics - Precision movement, robot specifications and Work volume, Types of Robot drives - Basic robot motions - Point to point control, continuous path control.-Robot control - unit control system concept - servo and non-servo control of robot joints, adaptive and optimal control.

UNIT II - END EFFECTORS AND SENSORS (9 hours)

End effectors - classification - mechanical, magnetic, vacuum and adhesive gripper - gripper force analysis and design.

Sensor devices, Types of sensors - contact, position and displacement sensors, Force and torque sensors - Proximity and range sensors - acoustic sensors - Robot vision systems - Sensing and digitizing - Image processing and analysis.

UNIT III - ROBOT CELL DESIGN (9 hours)

Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis.

UNIT IV - ROBOT PROGRAMMING (9 hours)

Robot language classification - programming methods - off and on line programming - Lead through method - Teach pendent method - VAL systems and language, simple program.

UNIT V - INDUSTRIAL APPLICATIONS (9 hours)

Application of robots - Material handling - Machine loading and unloading, Assembly, Inspection, Welding, Spray painting, Mobile robot, Microbots - Recent developments in robotics- safety considerations.

TEXT BOOKS

1. Deb S. R, *"Robotics technology and flexible automation",* Tata McGraw Hill publishing company limited, New Delhi, 2010.
2. Mikell P. Groover, *"Industrial Robotics Technology Programming and Applications"*, McGraw Hill Co., Singapore, 2008.

REFERENCES

1. Klafter, R. D, Chmielewski, T. A. and Noggins, *"Robot Engineering : An Integrated Approach*", Prentice Hall of India Pvt. Ltd., New Delhi, 2011
2. Fu, K. S., Gonzalez, R. C., & Lee, C.S.G., *"Robotics control, sensing, vision and intelligence*", McGraw Hill Book Co., Singapore, Digitized 2007.
3. Craig, J. J., *"Introduction to Robotics mechanics and control*", Addison-Wesley, London, 2008.

AE1124 - ROBOTICS AND ROBOT APPLICATION												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	l	j	k
		X	X			X						
2.	Mapping of instructional objectives with student outcome	1,2,3	1,2,3			3						
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		X										
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1125	**THEORY AND DESIGN OF JIGS AND FIXTURES**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This course aims to impart the knowledge on concepts and techniques of design of Jigs and Fixtures.

INSTRUCTIONAL OBJECTIVES

1.	To understand the principles, functions and design practices of Jigs, Fixtures and dies for press working

2.	To understand the Principles of jigs and fixtures design, locating principles, locating elements and clamping Devices.

UNIT I - JIGS AND FIXTURES (9 hours)

Definitions of Jigs and Fixtures - Principles of Jigs and Fixtures design - Preliminary analysis and planning of jigs and fixture parts and their materials - Basic steps in the design of jigs and fixtures - Advantages of Jigs & Fixtures.

UNIT II - LOCATION AND CLAMPING (9 hours)

Degrees of freedom - 3-2-1 location principle - Radial location and diamond pin location – Principle of pin location - location from plane surfaces - location from a profile - location from a cylinder - Circular location - Jamming and remedies – V location - Adjustable locators - Redundant locators - Fool proofing – Adjustable supports and centralizers Strap clamp – cam clamps - screw clamping - latch clamps - wedge clamps – pivoted clamps - eccentric operator clamp - power clamps quick acting clamps - equalizers.

UNIT III - LOADING AND UNLOADING PROBLEMS (9 hours)

Loading - Entering, locating and clamping symmetric consideration. Unloading - Bur clearance, ejectors, receivers, chip problems, relief and projection, shields and seals.

UNIT IV - CUTTER GUIDANCE (9 hours)

Various types of setting blocks - Press fit bushes - Renewable bushes – Slip bushes – Threaded bushes – Special bushes - Drills with attached bushing for small holes.

UNIT V - DESIGN OF JIGS AND FIXTURES (9 hours)

Three construction principles - Built up type, casting and weldment. Practicing the various types of jigs - Practicing the various types of milling fixtures - broaching fixtures – function of broaching fixtures - Internal and external broaching fixtures.

TEXT BOOK

1. Kempster. M.H.A., *"Introduction to jig and tool design",* Viva Books Private Limited, 2004.

REFERENCES

1. Joshi.P.H. "*Jigs and Fixtures"*, Tata McGraw-Hill Education, 2010.
2. Henriksen, Erik. K, "*Jigs and Fixtures, Design Manual"*, Industrial Press Inc., Madison Avenue, New York, 1983.

3. Donaldson.G.H., Lecain, Gould.V.V., "*Tool Design"*, TMH Edition, 1990.
4. ASTME, "*Fundamental of Tool design"*, Prentice Hall, 1989.

AE1125 – THEORY AND DESIGN OF JIGS AND FIXTURES													
Course Designed by		**Department of Automobile Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		X		X									
2.	Mapping of instructional objectives with student outcome	1,2		1,2									
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)			
										X			
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems			
						X							
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1126	**NON DESTRUCTIVE TESTING METHODS**	**L**	**T**	**P**	**C**
	Total contact hours 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to introduce analysis techniques used in science and industry to evaluate the properties of a material, component or system without causing damage. It is a highly valuable technique that can save both money and time in product evaluation, troubleshooting, and research.

INSTRUCTIONAL OBJECTIVES

1.	To expose the fundamentals in Non destructive Testing methods.
2.	To expose the knowledge of electrical and electromagnetic testing of materials.

INTRODUCTION

VISUAL METHODS: Optical aids, In-situ metallographic, Optical holographic methods, Dynamic inspection.

UNIT I - PENETRANT FLAW DETECTION (9 hours)

Principles: Process: Penetrant systems: Liquid penetrant materials: Emulsifiers: cleaners developers: sensitivity: Advantages: Limitations: Applications.

UNIT II - RADIOGRAPHIC METHODS (9 hours)

Limitations: Principles of radiography: sources of radiation, Ionising radiation - X-rays sources, gama-rays sources Recording of radiation: Radiographic sensitivity: Fluoroscopic methods: special techniques: Radiation safety.

UNIT III - ULTRASONIC TESTING OF MATERIALS AND MAGNETIC METHODS (9 hours)

Advantages, disadvantages, Applications, Generation of. Ultrasonic waves, general characteristics of ultrasonic waves: methods and instruments for ultrasonic materials testing: special techniques.

Advantages, Limitations, Methods of generating fields: magnetic particles and suspending liquids Magnetography, field sensitive probes: applications. Measurement of metal properties.

UNIT IV - ELECTRICAL METHODS AND ELECTROMAGNETIC TESTING (9 hours)

Eddy current methods: potential-drop methods, applications.Magnetism: Magnetic domains: Magnetization curves: Magnetic Hysteresis: Hysteresis-loop tests: comparator - bridge tests Absolute single-coil system: applications.

UNIT V – OTHER METHODS (9 hours)

Acoustic Emission methods, Acoustic methods: Leak detection: Thermal inspection.

TEXT BOOK

1. Halmshaw. P, "*Non-Destructive Testing",* Butterworth-Heinemann, 1991
2. Krishnadas Nair. C. G, "*Non – Destructive Test and Evaluation of Materials",* Tata McGraw Hill 2011.

REFERENCES

1. Metals Handbook Vol.17, *"Nondestructive evaluation and quality control",* ASM International, 1989.
2. Halmshaw. R, *"Introduction to the Non-destructive testing of Welded Joints",* Woodhead Publishing, 2nd edition, 1997.
3. Baldev Raj, Tammana Jayakumar, M. Thavasimuthu, *"Practical Non-destructive Testing*", Woodhead Publishing, 2002.

AE1126 - NON DESTRUCTIVE TESTING METHODS													
Course Designed by		Department of Automobile Engineering											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		X		X									
2.	Mapping of instructional objectives with student outcome	1,2		1,2									
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
											X		
4.	Broad Area	Design		Vehicle body and Engineering			Manufacturing				Engines and Management systems		
							X						
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1127	COMPOSITE MATERIALS AND STRUCTURES	L	T	P	C
	Total contact hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To study and understand the use of composite materials for different engineering applications.

INSTRUCTIONAL OBJECTIVES

1.	This subject introduces to the students the different types of composite materials, their properties and applications.
2	To give exposure to manufacturing procedures using composites.

UNIT I - INTRODUCTION TO COMPOSITES (9 hours)

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

UNIT II - POLYMER MATRIX COMPOSITES (9 hours)

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand layup processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding -

Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

UNIT III - METAL MATRIX COMPOSITES (9 hours)

Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process – diffusion bonding – stir casting – squeeze casting.

UNIT IV - CERAMIC MATRIX COMPOSITES (9 hours)

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

UNIT V - ADVANCES IN COMPOSITES (9 hours)

Carbon /carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for automotive/aerospace applications.

TEXT BOOKS

1. Mathews F.L. and Rawlings R.D., *"Composite materials: Engineering and Science",* Woodhead Publishing, 1999.
2. Krishan K. Chawla, *"Composite materials*", Springer, 2012.

REFERENCES

1. Clyne T.W. and Withers P.J., *"Introduction to Metal Matrix Composites,* Cambridge University Press, 1995.
2. Brent Strong A, *Fundamentals of Composite Manufacturing*", Society of Manufacturing Engineers, 2008.
3. Sharma S.C., *"Composite materials*", Narosa Publishing House, 2000.

AE1127 – COMPOSITE MATERIALS AND STRUCTURES												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	C	d	e	f	g	h	i	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1,2				1,2						

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Art (E)	Professional Subjects(P)
					X
4.	Broad Area	Design	Vehicle body and Engineering	Manufacturing	Engines and Management systems
				X	
5.	Approval	23rd meeting of the Academic Council , May 2013			

	CAD/CAM TECHNOLOGY IN AUTOMOTIVE ENGINEERING	L	T	P	C
AE1128	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To study how computer can be applied in mechanical engineering design.

INSTRUCTIONAL OBJECTIVES

To familiarize with

1.	Concepts of modeling in 2D and 3D
2.	Concepts of computer graphics in 2D
3.	CAD Packages and its features
4.	Theory of analysis
5.	Implementation in CAD/CAM

UNIT I - INTRODUCTION TO CAD/CAM (9 hours)

The design process Morphology of design, Product cycle Computer Aided Design, Benefits of CAD. Basic concepts of CAD - principles of computer graphics . CAD/CAM data base development and data base management systems. Programming and interface hardware – computer aided process monitoring - adaptive control, on-line search strategies.

UNIT II - CURVES & SURFACES AND 2D & 3D TRANSFORMATION (9 hours)

Analytic curves and surfaces, 2D homogenous transformations- translation, rotation, reflection, scaling, shearing and combined transformation 3D homogenous transformation - translation, rotation, reflection, scaling, shearing and combined transformation 3D viewing transformation – panning, rotation, reflection, shearing and zooming

UNIT III - COMPUTER AIDED DRAFTING AND SOLID MODELING (9 hours)

Graphic software: coordinate representation- graphic functions, software standards. Graphical Kernal system (GKS) - Initial graphics exchange system (IGES) - Graphic packages. Geometric Modeling - Wire frame, Surface and Solid models - CSG and B-REP Techniques - Features of Solid Modeling Packages

UNIT IV - COMPUTER AIDED MANUFACTURING (9 hours)

Manufacturing Planning and Control - CAD/CAM Integration - Principles of Computer Integrated Manufacturing - Hierarchical Network of Computers - Local Area Networks - Process Planning - Computer Aided Process Planning - Retrieval and Generative approaches.

UNIT V - COMPUTER AIDED PROCESS PLANNING AND SHOP FLOOR CONTROL (9 hours)

Computer Integrated Production Management System - Master Production Schedule - Material Requirement

Planning - Inventory Management - Manufacturing and Design Data Base - Capacity Planning - Shop Floor Control - Functions - Order release - Order Scheduling - Order progress - Factory data collection.

TEXT BOOK

1. Radhakrishnan. P, Subramanyan. S, Raju. V, CAD/CAM/CIM, New Age International Publishers(P) Ltd., 2006.

REFERENCES

1. Groover. M. P, *Automation, Production Systems and Computer Integrated Manufacturing*, Prentice Hall, 2007.
2. Mortenson, M, E, *"Geometric modeling"*, John Willey & Sons, 1985.
3. Roger. D. F and Adams. J. A, *"Mathematical elements of computer graphics"*, McGraw Hill, 1990.
4. Ibrahim Zeid, "*CAD/CAM Theory and practice"*, TATA McGraw hill corporation co.ltd,1988.
5. Hearn, Donald and Pauline Baker. M, "*Computer Graphics"*, Prentice Hall 1986.

AE 1128 – CAD/CAM TECHNOLOGY IN AUTOMOTIVE ENGINEERING												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	l	j	k
		X				X						
2.	Mapping of instructional objectives with student outcome	1,2 ,4,5	2,3,4	4,5		1,2				1	4	3,4,5
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
						X						
4.	Broad Area	Design	Vehicle body and Engineering			Manufacturing				Engines and Management systems		
		X										
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1129	WELDING AND JOINING TECHNOLOGIES	L	T	P	C
	Total contact hours 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To impart knowledge on various welding and joining technologies for different materials. Welding is a fabrication that joins materials, usually metals or thermoplastics, by causing coalescence.

INSTRUCTIONAL OBJECTIVES

1.	At the end of the course students will know the various types and properties of welding.

UNIT I - PROCESSES AND TYPES OF JOINTS (9 hours)

Classification of fusion welding processes, heat source intensity, heat input rates, shielding methods. Metallurgical effect of weld thermal cycle, residual stresses, formation and relieving. Types of weld joints, Edge preparation, cleaning of edges, tack welding.

UNIT II - ARC WELDING AND JOINING METHODS (9 hours)

Electrodes, types of covering, welding techniques for manual welding, power Sources, arc cutting, Carbon arc, submerged arc welding, gas tungsten arc (GTA) and gas metal arc (GMA) welding, electric slag welding, carbon dioxide (CO_2) welding and plasma arc welding.

Heat affected Zone and its significance in welding. Metallurgical aspects of welding pre and post heat treatment. Pre heating, vibratory stress relieving.
Soldering, brazing, welding, conventional welding processes, Gas, Arc, TIG, MIG, Termite, resistance, Friction, Electro slag etc. Special welding processes: LASER, Electron Beam, Submerged Arc welding etc.

UNIT III - THERMAL CUTTING OF METAL (9 hours)

Oxygen cutting, flame cut ability of metals, effect of cutting on structure and properties of steel, oxygen lancing machine cutting. Welding of different types of materials, like carbon and alloy steels, cast iron non-ferrous metals and alloys, aluminum.
Soldering and Brazing: Capillary and welding action, temperature range, filler metals and fluxes, processes and application, design and strength of joints.

UNIT IV - RESISTANCE WELDING (9 hours)

Spot welding, electrode, nugget size, resistance and force, current and time, types of equipment, rocker arm press type, multiple welding guns and portable welders, applications, seam welding, projection welding, flash and butt welding, applications.
Gas Welding: Gas welding ,fuel gases, flames, torches, filler metal, fluxes, backward and forward welding ,filler rod diameter, atomic hydrogen welding, termite welding.

UNIT V - SOLID PHASE WELDING (9 hours)

Cold pressure welding, weld formation, techniques for lap and butt welding, applications; diffusion joining; process variables, applications, forge welding, ultra sonic welding. Radiation Welding: Laser welding, electron beam welding types of electron gun, spot size beam power, operating voltage, pulse technique, deep penetration and applications.
Welding defects and remedies. Estimation of welding cost, Application of welding for aluminum & stainless steel.

TEXT BOOK

1. Nadkarni. S. V, "*Modern Arc Welding Technology"*, Ador Welding Ltd. Oxford and IBH Publishing, 2005.

REFEENCES

1. William A. Bowditch, Kevin E. Bowditch, Mark A. Bowditch, "*Welding Technology Fundamentals"*, Goodheart-Willcox Publisher, 2009.
2. Parmar. R. S, "*Welding Engineering And Technology"*, Khanna Publishers, 2004.
3. Richard L. Little, "*Welding and welding Technology"*, TATA McGraw Hill Publishing Company Ltd, 1973 (2008)

4. Lacaster. J. F, "*The Metallurgy of Welding, Soldering and Brazing"*, George Alien and Unwin Ltd., London.
5. *"Welding Handbooks"* – American Welding Society.

AE1129 – WELDING AND JOINING TECHNOLOGIES													
Course Designed by		Department of Automobile Engineering											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		X		X									
2.	Mapping of instructional objectives with student outcome	1		1									
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
											X		
4.	Broad Area	Design		Vehicle body and Engineering			Manufacturing				Engines and Management systems		
							X						
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1130	PRODUCT LIFE CYCLE MANAGEMENT	L	T	P	C
	Total contact hours 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course provides an understanding of the types of data generated and used in the product lifecycle, the current tools and methodologies in the management of that data, and system analysis and implementation techniques for using PDM as the backbone supporting a company's product development and implementation activities. Interaction between various enterprise systems is also discussed.

INSTRUCTIONAL OBJECTIVES

After this course students should be able to

1.	Explain the meaning of and the difference between the terms PDM and PLM
2.	Describe how a relational database is built and how it is used
3.	From an information model, create a database structure and populate it with relevant data
4.	Write simple SQL expressions for creating/retrieving relevant data in a relational database
5.	Explain the basic components and functionality of a PDM system

6.	From a given database structure, use and make small adjustments to a PDM system
7.	From a given activity model, use a PDM system to support and control a product realization process
8.	Given project, choose, configure, and adjust a PDM system to effectively support, follow up and control the project

UNIT I - INTRODUCTION TO PRODUCT LIFE CYCLE MANAGEMENT (PLM)
(9 hours)

Definition, PLM Lifecycle model, Threads of PLM, Need for PLM, Opportunities and benefits of PLM, Views, Components and Phases of PLM, PLM feasibility study, PLM visioning - **PLM Concepts, Processes and Workflow**: Characteristics of PLM, Environment driving PLM,PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM.

UNIT II - PRODUCT DATA MANAGEMENT (PDM) PROCESS AND WORKFLOW
(9 hours)

PDM systems and importance, reason for implementing a PDM system, financial justification of PDM implementation. Versioning, check-in and checkout, views, Metadata, Lifecycle, and workflow. Applied problems and solution on PDM processes and workflow.

Collaborative Product Development: Engineering vaulting, product reuse, smart parts, engineering change management, Bill of materials and process consistency, Digital mock-up and prototype development, design for environment, virtual testing and validation, marketing collateral.

UNIT III - TOOLS OF COMMUNICATION FOR COLLABORATIVE WORK (9 hours)

Creation of 3DXML and CAD drawing using CAD software. Creation of an animation for assembly instructions on 3D via composer, creation of an acrobat 3D document. Applied problems and solutions on tools of communication for collaborative work.

UNIT IV - KNOWLEDGE AND OPTIMIZATION OF DESIGN PRODUCTS (9 hours)

Know how, best practices, parameterization of design, Applied problems and Solution on optimization of products using power copy, publication, parameters, formula, rule, check, design table, configuration, reaction.

UNIT V - DIGITAL MANUFACTURING – PLM (9 hours)

Digital manufacturing, benefits manufacturing, manufacturing the first-one, Ramp up, virtual learning curve, manufacturing the rest, production planning.

Developing a PLM strategy and conducting a PLM assessment: Strategy, Impact of strategy, implementing a PLM strategy, PLM initiatives to support corporate objectives. Infrastructure assessment, assessment of current systems and applications**.**

TEXT BOOKS

1. Grieves, Michael. *"Product Lifecycle Management*", McGraw-Hill, 2006.
2. Burden, Rodger "*PDM: Product Data Management":*, Resource Pub, 2003.

REFERENCES

1. Fabio Guidice, Guido La Rosa, *"Product Design for the environment- A life cycle approach"*, Taylor and Francis 2006.
2. Robert J. Thomas, *"New product development: managing and forecasting for strategic success*", J. Wiley, 1993.
3. Gerd Hartmann, Ulrich Schmidt, "*Product life cycle management"* with SAP, Galileo Press, Incorporated, 2005.
4. Stark, John, "*Product Life Cycle Management: Paradigm"* for 21st Century Product Realization, Springer-Verlag, 2004.
5. Saaksvuori, Antti and Immpnen, Anselmi. *"Product Lifecycle Management",* Springer-Verlag, 2004.

<table>
<tr><th colspan="13">AE1130 – PRODUCT LIFE CYCLE MANAGEMENT</th></tr>
<tr><td colspan="2">Course Designed by</td><td colspan="11">Department of Automobile Engineering</td></tr>
<tr><td rowspan="2">1.</td><td rowspan="2">Student Outcome</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>K</td></tr>
<tr><td>X</td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Mapping of instructional objectives with student outcome</td><td>1,2,3,4, 5,6,7,8</td><td></td><td>1,2,3,4, 5,6,7,8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">3.</td><td rowspan="2">Category</td><td colspan="2">General (G)</td><td colspan="2">Basic Sciences (B)</td><td colspan="4">Engineering Sciences and Technical Art (E)</td><td colspan="3">Professional Subjects(P)</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="4"></td><td colspan="3">X</td></tr>
<tr><td rowspan="2">4.</td><td rowspan="2">Broad Area</td><td colspan="2">Design</td><td colspan="2">Vehicle body and Engineering</td><td colspan="4">Manufacturing</td><td colspan="3">Engines and Management systems</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="4">X</td><td colspan="3"></td></tr>
<tr><td>5.</td><td>Approval</td><td colspan="11">23rd meeting of the Academic Council , May 2013</td></tr>
</table>

VEHICLE TECHOLOGY

AE1142	COMPUTER SIMULATION OF I.C. ENGINE PROCESSES	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To expose the students to simulate various engine process using computers.

INSTRUCTIONAL OBJECTIVES

1. At the end of the course, the students will be able to understand the significance of various processes in I.C Engines and the use of computers to simulate them.

UNIT I - INTRODUCTION TO COMBUSTION (9 hours)

Introduction - Heat of reaction - Measurement of URP - Measurement of HRP - Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature - Isentropic changes of state.

UNIT II - SI ENGINE SIMULATION WITH AIR AS WORKING MEDIUM (9 hours)

Deviation between actual and ideal cycle - Problems, SI engine simulation with adiabatic combustion.temperature drop due to fuel vaporization, full throttle operation - efficiency calculation, part-throttle operation, super charged operation.

UNIT III - PROGRESSIVE COMBUSTION (9 hours)

SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process,' friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.

UNIT IV - SIMULATION OF 2-STROKE SI ENGINE (9 hours)

Simulate the performance, unbalanced forces on two stroke engine.

UNIT V - DIESEL ENGINE SIMULATION (9 hours)

Multi zone model for combustion, different heat transfer models, equilibrium calculations, simulation of engine performance, simulation for pollution estimation.

TEXT BOOK

1. Ganesan. V. *Computer Simulation of spark ignition engine process*, Universities Press (I) Ltd, Hyderbad, 1996.

REFERENCES

1. Ganesan.V, *Computer Simulation of Compression Ignition Engines*, Orient Longman, 2000.
2. Ramoss. A. L, "*Modelling of Internal Combustion Engines Processes"*, McGraw Hill Publishing Co., 1992.
3. Ashley Campbel, "*Thermodynamic Analysis of Combustion Engines"*, John Wiley & Sons, New York, 1986.
4. Benson. R. S, Whitehouse. N. D., *"Internal Combustion Engines*, Pergamon Press, Oxford, 1979.

AE1142 - COMPUTER SIMULATION OF I.C. ENGINE PROCESSES												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X		X						
2.	Mapping of instructional objectives with student outcome	1		1		1						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE 1143	**HYBRID, ELECTRIC AND FUEL CELL VEHICLES**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This course introduces the fundamental concepts, principles, analysis and design of hybrid, electric and fuel cell vehicles.

INSTRUCTIONAL OBJECTIVES

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

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

UNIT I - FUELCELL TECHNOLOGY (9 hours)

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

UNIT II - FUEL CELL BASED VEHICLES STRUCTURE (9 hours)

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

UNIT III - HYBRID ELECTRIC TECHNOLOGY AND ELECTRIC DRIVETRAINS (9 hours)

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

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

UNIT IV - HYBRID ELECTRIC VEHICLES (9 hours)

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

propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavy duty vehicles.

UNIT V - HYBRID VEHICLE TECHNOLOGY (9 hours)

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

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology",* Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and Aulice Scibioh, M., *"Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.
3. Hoogers, G., Edr. *"Fuel Cell Technology Handbook*", CRC Press, Washington D. C., 2003.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, "*Vehicular Electric Power Systems"*, Marcel Dekker, Inc., 2004.

AE1143 – HYBRID, ELECTRIC AND FUEL CELL VEHICLES												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X								
2.	Mapping of instructional objectives with student outcome	1,2		1,2								
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1145	ELECTRONIC ENGINE MANAGEMENT SYSTEMS	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To teach the students about the various sensors and engine management systems used in petrol and diesel engines

INSTRUCTIONAL OBJECTIVES

1.	To give an in-depth knowledge of various sensors used in engine management
2.	To give an overview of different types of fuel injection and ignition systems
3.	To know the latest technological advancements in vehicle power plant

UNIT I - ELECTRONICS (9 hours)

Semiconductors, Transistors, Amplifiers – Integrated circuits – Analog and Digital, Logic Gates, Microcontrollers –Analog Digital / Digital Analog Converters.

UNIT II - SENSORS (9 hours)

Sensors for Air flow, Pressure, Temperature, Speed, Exhaust Oxygen, Knock and Position in engine management systems – Principle of operation, construction and characteristics.

UNIT III - GASOLINE INJECTION SYSTEM (9 hours)

Open loop and closed loop systems, Mono point, Multi point, Direct injection systems and Air assisted systems – Principles and Features, examples of Bosch injection systems. Idle speed, lambda, knock and spark timing control. Three way catalytic converters, Lean NOx converters.

UNIT IV - DIESEL INJECTION SYSTEM (9 hours)

Heat release in the diesel engine and need for control of fuel injection. Inline injection pump - Rotary Pump and injector– Construction and principle of operation, Electronic control of these pumps. Common rail and unit injector system – Construction and principle of operation.

UNIT V - IGNITION SYSTEMS (9 hours)

Ignition fundamentals, solid state ignition systems, high energy ignition distributors, Electronic spark timing and control. Combined ignition and fuel management systems. Dwell angle calculation, Ignition timing calculation.

TEXT BOOKS

1. Robert N. Brady, *"Automotive Computers and Digital Instrumentation",* Prentice Hall, 1988.
2. Bosch Technical Instruction Booklets.
3. Tom Denton, "*Automotive Electrical and Electronic Systems"*, Edward Amold, 1995.

REFERENCES

1. Duffy Smith, *"Auto Fuel Systems*", The Good Heart Willcox Company Inc., Publishers, 1987.
2. *"Gasoline Engine Management",* Second Edition, Robert Bosch GmbH, 2004.
3. *"Engine Management"*, Second Edition, Robert Bosch GmbH, 1999.
4. Eric Chowaniety, *"Automobile Electronics*", SAE Publications 1995.
5. William B. Ribbews, *"Understanding Automotive Electronics*", Fifth Edition, SAE Publications 1998.

AE1145 – ELECTRONIC ENGINE MANAGEMENT SYSTEMS												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X		X	X							
2.	Mapping of instructional objectives with student outcome	1,2,3		1,2,3	1,2,3							
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1146	**AUTOMOTIVE NVH**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This course reviews the fundamental concepts of acoustics, noise propagation and vibrations. Focus is given to the theory and equipment pertaining to the measurement of automotive acoustics, sound quality and vibration.

INSTRUCTIONAL OBJECTIVES	
Upon completion of the course, the student should be able to:	
1.	Understand fundamental noise and vibration theory
2.	Understand measurement instrumentation, techniques and metrics used for automotive NVH
3.	Perform noise measurements and analyze sound for automotive applications
4.	Explain fundamental principles of sound quality and vibration modal analysis

INTRODUCTION TO NVH

Noise, Vibration and Harshness (NVH) and its role in automotive design and development. Physiological effects of noise and vibration, sources of vibration and noise in automobiles.

UNIT I - BASICS OF VIBRATION ANALYSIS (9 hours)

Basic concepts, mathematical models, formulating the equations of motion - linear and torsional system characteristics and response – damped and undamped single & two degree of freedom systems under harmonic force, coordinate coupling, generalized coordinates and modal analysis.

UNIT II - VIBRATION CONTROL TECHNIQUES (9 hours)

Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, Applications: isolation of the engine from vehicle structure and control of torsional oscillation amplitudes in engine crankshaft.

UNIT III - NOISE FUNDAMENTALS (9 hours)

Fundamentals of acoustics – general sound propagation – structure borne sound & air borne sound, Plane wave propagation - wave equation, specific acoustic impedance, acoustic intensity, Spherical wave propagation – acoustic near and far fields, Reference quantities, The decibel scale, relationship among sound power, sound intensity and sound pressure level, summation of pure tones, Decibel addition, subtraction and averaging, Effects of reflecting surfaces on sound propagation, octave band analysis, Anatomy of Human Ear, Mechanism of hearing, loudness, weighting networks, equivalent sound level.

UNIT IV - NVH MEASUREMENTS (9 hours)

Vibration and Noise Standards – Pass/Drive by noise, noise from stationary vehicles, interior noise in vehicles, NVH measurement tools and techniques,

Modal parameter (natural frequency, mode shape and damping) estimation techniques, signal and system analysis.

UNIT V-AUTOMOTIVE NOISE SOURCES AND CONTROL TECHNIQUES (9 hours)

Methods for control of engine noise, Transmission Noise, Intake and Exhaust Noise, Aerodynamic Noise, Tyre Noise, Brake noise. Noise control strategy, noise control at source – along the path – isolation, damping, balancing, resonators, absorption, barriers and enclosures.

TEXT BOOK

1. Matthew Harrison, "*Vehicle Refinement: Controlling Noise and Vibration in Road Vehicles",* Elsevier, 2004.

REFERENCES

1. Bell, L. H. and Bell, D. H., "*Industrial Noise Control – Fundamentals and Applications"*, Marcel Dekker Inc, New York, 1994.
2. Xu Wang, *"Vehicle Noise and Vibration Refinement*", CRC Press, 2010
3. Ambekar, A. G., "*Mechanical Vibrations and Noise Engineering"*, Prentice Hall of India, New Delhi, 2006.
4. Beranek, L. L. and Ver, I, L., "*Noise and Vibration Control Engineering – Principles and Application",* John Wiley & Sons, Inc, 1992.
5. Wilson, C. E., "*Noise Control – Measurement, Analysis, and Control of Sound and Vibration"*, Harper & Row Publishers, New York, 1989.
6. Thomson, W. T., *"Theory of Vibrations with Applications*", CBS Publishers Delhi

AE1146 – AUTOMOTIVE NVH												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X	X						
2.	Mapping of instructional objectives with student outcome	1,2, 3,4			3,4	3,4						
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1147	**HEAT, VENTILATION AND AIR-CONDITIONING (HVAC)**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE	
The purpose of this course is to familiarize students with the Heating, Ventilation, and Air Conditioning concepts of automobiles.	
INSTRUCTIONAL OBJECTIVES	
1.	The course is structured so as to acquire Fundamental and Practical oriented knowledge in HVAC.
2.	During the course, the students will be given various case studies, numerical to solve so as to enhance their technical confidence on the subject.

UNIT I - FUNDAMENTALS (9 hours)

HVAC Fundamentals - Basic terminologies in HVAC: TR, COP, EER, SEER, IPLV, Btu, etc - Concepts of Fluid Mechanics, Heat Transfer, Fluid Flow - Pressure fundamentals, System Pressures and resistance - Modes of heat transfer: Conduction, Convection and Radiation - Basic Refrigeration cycle - Equipment familiarization: Compressor, Condenser, Metering device and Evaporator - Analysis of VCC: Pressure – Enthalpy diagram - Introduction to Air Conditioning: Comfort and Process applications - Types of Air Conditioning Systems: All Air, All water, Air – Water and Direct refrigerant systems - Central and Compact air conditioning systems - Psychrometry: Psychrometric terms, Psychrometric processes, Use of Psychrometric chart.

UNIT II - CAR AIR CONDITIONING LOAD CALCULATIONS (9 hours)

Introduction to Car Air Conditioning - load calculations - Load Estimation methods: Carrier E20, Carrier HAP, ASHRAE RTSM - Load Components: Sensible and latent - Cabin Survey - Outdoor and Indoor Climatic conditions – Air Distribution to the interior – Power plant location – Front or Rear mounted AC system - Calculation of U factor for Walls, Glass, Roof, Partitions.

UNIT III - DUCT DESIGN (9 hours)

Industry practices in Duct design and estimation of flow quantities - Duct design: Manual calculations and by using software - Duct leakage testing.

UNIT IV - HVAC PERFORMANCE TESTING, ADJUSTING AND BALANCING (TAB) (9 hours)

Introduction to Testing, Adjusting and Balancing (TAB) - TAB Air system - Air Handling Unit: AHU types, Components, AHU testing and Evaluation of Reserve AHU capacity - Fan: Types, Fan laws, Fan and System curves, Fan testing - Measuring Instruments and Limitations - Measurement of Air flows: Pitot tube, Velocity matrix, Flow hood, Thermal Anemometer, Vane type Anemometer - TAB Air System: Procedures, Balancing single zone and multi zone systems - TAB Hydronic system - Pumps: Types, Pump laws, pump and System curves, Pump testing - Types of pumping system: Primary, Primary-Secondary, Primary-Secondary and Tertiary.

UNIT V - CLEANROOM PERFORMANCE TESTING (CPT) (9 hours)

Introduction to cleanrooms, types of cleanrooms and their applications - Understanding - User Requirement Specifications (URS) - Design Qualification (DQ) - Installation Qualification (IQ) - Operation Qualification (OQ) and Performance Qualification (PQ) - Understanding ISO 14644 Part 3 (Test Methods) - Cleanroom Performance Tests: Airflow and Air velocity, - Air Pressure Difference - Installed Filter Integrity test - Room Particle count test - Containment leak test - Light level and Uniformity test, Sound level test, etc.,

TEXT BOOK

1. *"Fundamentals of HVAC systems"* SI edition by Robert McDowall.

REFERENCES

1. Holman J.P., *"Heat Transfer"*, 8th edition, Mc Graw Hill Company, UK, 2001.
2. Steven Daly, "*Automotive Air-Conditioning and Climate Control Systems",* Butterworth-Heinemann, Elsevier, MA, 2006

AE1147 - HEAT, VENTILATION AND AIR-CONDITIONING (HVAC)												
Course Designed by		Department of Automobile Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X	X									
2.	Mapping of instructional objectives with student outcome	1,2	1,2									
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1148	TYRE TECHNOLOGY	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

To learn about design and fabrication of tyres.

INSTRUCTIONAL OBJECTIVES :

1.	To understand various components used and their function of tyres.
2.	To design and suitable compounding formulation for various tyre components
3.	To know the building & curing of tyres.

INTRODUCTION TO BASICS OF TYRES (5 hours)

Types of tyres, tyre components and its role, tread patterns, outline of production of tires, Requirements and function of tyres - Major departments of a Tyre Industry – An explanation of their function and relation to other departments. Factors influencing the performance of tyre: Compound design, degree of mixing: (open mill & internal mixing), parameters (temperature, time, speed), degree of vulcanization - Testing and despatch of mixes, Basic quality control and mill room control Laboratory.

UNIT I - FABRIC PREPARATION (8 hours)

Fabrics of the Tyre Industry: Cotton, Rayon, Nylon & steel cords – manufacture, construction – styles and presentations. Bonding methods – Fabric bonding necessities of stronger fabrics leading to bonding methods developments. Wet & dry bonding systems – dip and hot stretch process for Nylon. REL-VP latex systems – and parameters for dip & hot stretch process for Nylon. Modified surface treatment needed for polyesters & glass fabric - Metal coating for steel cord. Recent developments in Radical Tyre fabrics – Aromatic Nylon (Kevlar) and other special fabric reinforcement systems and their use - Testing of dipped fabrics 'U', 'H' and other tests. Dip pick up and the relation to adhesion etc.

UNIT II - CALENDERING (8 hours)

Calendering process: 3 and 4 roll calenders. Skimming & frictioning process preparation of bead wrapper and chaffer-on fabrics on 3 roll calenders. Topping process on calendar - Limitation of 3 roll calenders and advantages of 4 roll calenders-process control aspects – economics - Relation between ends per inch and calendering process. Inner, outer and breaker fabrics. Compound fabric ratios and compound design consideration for different styles of fabrics - Defects of calendered fabrics and their remedies. Parameters for scrap control in fabric

processes in the tyre industry requirement of total quality control involving fabric supplier's dipping, calendering and bias cutting operations. Economics of fabric usage.

UNIT III - THREAD EXTRUSION AND BEAD CONSTRUCTION (8 hours)

Basic concepts of Extrusion. Die swell & shrinkage phenomenon – effect of compounding parameters on these phenomenon. Die design and theoretical calculation of tread weight. Effect of viscosity & temperature on extrusion. Dimensions and weight control extusion operation parameters like feeding rate, screw speed, take off conveyor speed on tread extrusion. Extruded tread profile – critical dimensions. Duel extruder – Cap & base concept relation to tyre wear parameters like tread wear heat buildup etc.

Cross head extruder wire coating process - Bias cutting and pocket making: Bias angle specification and the significance Horizontal and vertical laying of coated wore. Apex preparation on extruder and profile calender Bead wrapping and flipping operations. Single and double bead concept and preliminary calculation of bead safety factors. Width and angle adjustments splicing and identification. Bias plies pocket 3-3-2 4-4-2 ply constructions Defects of pockets wrong identification over splicing wrinkles, parallel plies etc.

UNIT IV - TYRE BUILDING (8 hours)

Tyre building inputs: Inner liners, plies, beads, tread, side wall and gum strips – their inspection Drum inspection for drumset, drum circumference Significance of parameters for tyre building. Size making on finished tyre and the relation to building specifications. Tyre building specifications sequence of building. Intermitant consolidation use of various cements and gum strips. Importance of the state of the Art Technology. Appraisal of Tyre building as most crucial operation correlation of some of the cured tyre & service returned tyres to the lack of building skill. Green tyre inspection procedures weight tolerance techno-commercial importance of green tyre weight. Green tyre storage considerations.

UNIT V - GREEN TYRE PREPARATION & CURING (8 hours)

Internal and External painting – Awling – Bagging in case of Air bag cure Bag-o-matic and Air bag curing – mold lubrication- Bladder assembly bead curing rings – Dimension criticality Services to the Bag-o-matic presses Curing cycle – shaping – HPS, and hot water circulation. Dome steam cold water & vacuum cycles. Determination of optimum cure of tyres by thermocouple built tyres. Economics of curing post cure inflation of Nylon tyres cured tyre inspection. Defects of tyres – Tyre classification for defects – causes and

discussions - Examination of: (i) Returned tyres (ii) Tyres for retreading - Norm of tyre adjustments for fastwear, poor retreading Bead/casing failures. Hot and cold process retreading concept of total price/km run increasing competition and future trends in the industry and open house discussion.

TEXT BOOK

1. Tom French, Tyre technology, The University of Michigan, 1989.

REFERENCES

1. Blow. C. M, *Rubber Technology and Manufacture*, Butterworth- Heinemann, London, 1982.
2. Maurice Morton, *"Rubber Technology",* Springer, 3rd edition, 1987.
3. Claude Hepburn, "*Rubber Technology and Manufacture"*, Third Edition, 2005.
4. Kovac. F. J, *"Tyre Technology*", Good Year Tire & Rubber Company, 1973.
5. Different tyre manufacturer's websites.

AE1148 – TYRE TECHNOLOGY												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X	X						
2.	Mapping of instructional objectives with student outcome	1,2,3			1,2,3	2,3						
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)			Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering			Manufacturing			Engines and Management systems		
							X					
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1149	**AUXILIARY ENGINE SYSTEMS**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

Purpose of this course is to impart knowledge about Super charging & Turbocharging their mapping procedure and thermodynamic issues related to their operation.

INSTRUCTIONAL OBJECTIVES :	
To provide knowledge about,	
1.	Supercharging and compressor mapping
2.	Flow maps of supercharging systems
3.	Thermodynamic issues with Turbocharging
4.	Particular features of exhaust Turbocharging
5.	Modern design features of exhaust turbocharger features
6.	Engine thermal management

UNIT I - SUPER CHARGING & COMPRESSOR MAPPING (9 hours)

Definitions, Survey of Supercharging Methods, Petrol Engines, Diesel Engines, Exhaust Turbocharging. Fundamentals of Compressor matching, Compressor Power, air consumption, Types and Characteristics of Compressors. Relationship between air consumption and Power. Volumetric Efficiency of supercharged four stroke engines. Computations of gas exchange process.

UNIT II - FLOW MAPS OF SUPERCHARGING SYSTEMS (9 hours)

Two and Four stroke Engines, Interaction between turbocharger and engine. Mechanical supercharging, Exhaust turbo charging and operational differences. Equivalent nozzle area of turbine. Pulse turbocharging and diagram for determination of operating condition of a single stage turbocharger system. Examples of computed results.

UNIT III - THERMODYNAMIC ISSUES WITH TURBOCHARGING (9 hours)

Cylinder release temperature and mean exhaust temperature, theoretical aspects of complete extraction of work by expanding from release pressure to ambient pressure. Complete conversion into kinetic energy at ambient pressure. Compressor power in terms of mean piston pressure, difference in fuel consumption between mechanical and exhaust superchargers. Effect of cooling the charge air. Exhaust turbocharger as a means to increase efficiency.

UNIT IV - PARTICULAR FEATURES OF EXHAUST TURBOCHARGING (9 hours)

Exhaust manifold arrangements for various firing sequences of Engines. Advantages and disadvantages of Constant pressure Vs Pulse Turbocharging. Modified forms of Pulse turbocharging. Transient response. Torque characteristics of engines with exhaust turbochargers. Measures to improve acceleration and torque characteristics of exhaust turbocharged engines. Altitude de-rating. Effect of supercharging on exhaust emissions of Diesel and Petrol Engines as well as on Thermal and Mechanical loading.

UNIT V - MODERN DESIGN FEATURES OF EXHAUST TURBOCHARGER FEATURES AND ENGINE THERMAL MANAGEMENT (9 hours)

Charge Boosting, Exhaust pre-release, Turbo-cooling, Miller, Two Stage, Comprex, Hyperbar, Rotor designs, Types of impellers, Materials for impellers and turbines, Bearing arrangements, Types and Lubrication of Bearings. Examples of supercharged engines of Road Vehicles (cases)

Introduction to engine cooling systems, Engine Coolants, heat exchangers (Radiator, Charge Air Cooler/Intercooler, Oil cooler): Nomenclature, In-vehicle installation, performance curves. Pressurized engine cooling systems: Filling, De-aeration & Drawdown. Radiator caps & filler necks, coolant hoses. On-highway cooling system test code, Engine cooling systems Field test (Air-to-Boil), Heat exchanger thermal & Pressure cycle durability. Cooling Fans: Electric & Viscous Fan & Drives, Fan laws, Fan characteristics, and System resistance curve. Cooling flow measurement techniques. Cooling System Inspection, trouble diagnosis & Service. Radiator field failures. Introduction to EGR (exhaust gas recirculation) Coolers & its significance in reduction of vehicle emissions.

TEXT BOOK

1. Zinner, K, *"Auxillary Engine Systems by Supercharging of Internal Combustion Engines"*, Springer, 1978.

REFERENCES

1. N. Watson and M.S. Janota, *"Turbocharging the Internal Combustion Engines"*, Macmillan Press, London 1982.
2. BOSCH, *"Automotive Handbook"*, 8th Edition, Bentley Robert Incorporated, 2011.
3. Lilly, L.C.R, *"Diesel Engine Reference Book"*, Butterworths, London, 1984.
4. Benson, R.S, Whitehouse N.D, "*Internal Combustion Engines"*, Vol 1 and 2, Pergamon Press Ltd. Oxford UK.1980.
5. Tom Birch, *"Automotive Heating & Air Conditioning"*, 6th edition, Prentice Hall PTR, 2011.
6. Hermann Hiereth, Peter Prenninger, *"Charging the Internal Combustion Engine",* Springer, 2010.

AE1149 – AUXILIARY ENGINE SYSTEMS												
Course Designed by		Department of Automobile Engineering										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X			X							
2.	Mapping of instructional objectives with student outcome	1,2,3, 4,5,6			1,2,3, 4,5,6							

3.	Category	General (G)	Basic Sciences (B)	Engineering Sciences and Technical Art (E)	Professional Subjects(P)
					X
4.	Broad Area	Design	Vehicle body and Engineering	Manufacturing	Engines and Management systems
					X
5.	Approval	23rd meeting of the Academic Council , May 2013			

SERVICE & MANAGEMENT

AE 1151	**TROUBLE SHOOTING, SERVICING AND MAINTENANCE OF AUTOMOBILES**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To input knowledge on Vehicle Trouble shooting and maintenance.

INSTRUCTIONAL OBJECTIVES

1.	On completion of this course, the student will know about vehicle trouble shooting, maintenance of shop, its schedule and records. Maintenance, Repair and overhauling of engine, chassis vehicle body, electrical and electronic systems.
2.	Enabling students to operate and manage maintenance workshops.

INTRODUCTION AND TROUBLE SHOOTING

Check list on trouble shooting - Engine, clutch, gear box, rear axle, front axle, steering, electrical systems - Trouble shooting on engine management system - On board diagnosis using multi-scanner - Testing of SI engine using computerized engine analyzer

UNIT I - MAINTENANCE OF WORKSHOP, ITS SCHEDULE AND RECORDS

(9 hours)

Importance of maintenance - schedule and unscheduled maintenance - scope of maintenance - vehicle down time - vehicle inspection, reports, log books, trip sheet.

UNIT II - ENGINE REPAIR AND OVERHAULING (9 hours)

Dismantling of SI & CI engines and its components - Cleaning methods - inspection and checking - repair and reconditioning methods for all engine components - Maintenance of ignition system - fuel injection system - cooling system, lubrication system - Design trouble shooting chart for MPFI & CRDI Engines.

UNIT III - MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS (9 hours)

Maintenance - servicing and repair of clutch, fluid coupling, gear box, torque converter, propeller shaft - Maintenance of front axle, rear axle, brakes, steering systems, tyre.

UNIT IV - MAINTENANCE AND REPAIR OF VEHICLE BODY (9 hours)

Body panel tools for repairing - Tinkering and painting - Use of soldering, metalloid paste.

UNIT V - MAINTENANCE AND REPAIR OF ELECTRICAL SYSTEMS AND FLEET MAINTENANCE MANAGEMENT (9 hours)

Service, maintenance, testing and trouble shooting of battery, starter motor, alternator rectifier and transistorized regulator.

Fleet maintenance requirement - investment and costs, types of work shop layout, tools and equipment - spare parts and lubricants stocking, manpower, training, workshop management, warranty, replacement policy.

TEXT BOOK

1. Martin W. Stockel, Martin T. Stockel, Chris Johanson, "*Auto Service & Repair: Servicing, Troubleshooting, and Repairing Modern Automobiles: Applicable to All Makes and Models"*, Goodheart-Willcox Publisher, 1996.

REFERENCES

1. James D. Halderman, "Chase D. Mitchell, "*Automotive steering, suspension, and alignment"*, Prentice Hall, 2000.
2. Martin T. Stockel, Chris Johanson, "*Auto Diagnosis, Service, And Repair",* Goodheart-Willcox Publisher, 2003.
3. Vaughn D. Martin, *"Automotive Electrical Systems: Troubleshooting and Repair Basics"*, Prompt Publications, 1999
4. Crouse W., *"Everyday Automobile Repair"*, Intl. student edition, TMH, New Delhi, 1986.
5. BOSCH, "*Automotive Handbook"*, 8th Edition, BENTLEY ROBERT Incorporated, 2011.

6. John Doice, "*Fleet maintenance"*, Mcgraw Hill, New York, 1984.
7. Maleev V.L., *"Diesel Engine Operation and Maintenance*, McGraw Hill Book Co., New York, 1995.
8. Vehicle servicing manuals.

AE 1151 - TROUBLE SHOOTING, SERVICING AND MAINTENANCE OF AUTOMOBILES												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X							X		X	
2.	Mapping of instructional objectives with student outcome	1,2,							1,2		1,2	
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
						X						
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
										X		
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1154	TRANSPORT MANAGEMENT AND MOTOR INDUSTRY	L	T	P	C
	Total contact hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

Study & fill up the forms required as per Motor Vehicle Act. Prepare small project reports of bus / goods transport organization enabling him to work in different state transport organizations and private organization. Start SSI unit or may be able to work as service provider. Understand; prepare the different documents used in transport organization.

INSTRUCTIONAL OBJECTIVES

1.	To provide language training to the engineering students which will enable them to understand and acquire knowledge in technical subjects.
2.	Understand the purpose of research institutes in India, which are working on advancements of automobiles rather than adopting the idea of reverse engineering.

UNIT I - MOTOR VEHICLE ACT **(9 hours)**

Short titles & definitions- Laws governing to use of motor vehicle & vehicle transport- Licensing of drivers & conductors- Registration of vehicle- State & interstate permits- Traffic rules, Signals & controls- Accidents, Causes & analysis- Liabilities & preventive measures- Rules & regulations- Responsibility of driver- Public & public authorities- Offences, penalties & procedures- Different types of forms- Government administration structure- Personnel, Authorities & duties- Rules regarding construction of motor vehicles.

UNIT II - TAXATION **(9 hours)**

Objectives- Structure & methods of laving taxation- Onetime tax- Tax exemption & tax renewal.

UNIT III - INSURANCE **(9 hours)**

Insurance types & significance- Comprehensive- Third party insurance- Furnishing of particulars of vehicles involved in accident- MACT (Motor Accident Claims Tribunal) - Solatium Fund- Hit & Run case- Duty of driver in case of accident- Surveyor & Loss Assessor, Surveyor's report.

UNIT IV - PASSENGER TRANSPORT OPERATION **(9 hours)**

Structure of passenger transport organizations- Typical depot layouts- Requirements and Problems on fleet management- Fleet maintenance- Planning - Scheduling operation & control- Personal & training-training for drivers & conductors- Public relations, Propaganda, publicity and passenger amenities- Parcel traffic.- Theory of fares-Basic principles of fare charging- Differential rates for different types of services- Depreciation & debt charges- Operation cost and Revenues- Economics & records

UNIT V - GOODS TRANSPORT OPERATION **(9 hours)**

Structure of goods transport organizations- Scheduling of goods transport- Management Information System (MIS) in passenger / goods transport operation- Storage & transportation of petroleum products- **Advance Techniques in Traffic Management-** Traffic navigation- Global positioning system.

TEXT BOOKS

1. *"Motor Vehicle Act"* - Govt. of India Publications.
2. Shrivastava S.K *"Economics of Transport"*, S. Chand & Co. New Delhi. 1987.
3. Shrivastava. S. K, *"Transport Development in India"*, S. Chand & Co. Pvt. Ltd., New Delhi.

REFERENCES

1. Santosh Sharma, *"Productivity in Road Transport*", 2nd Edition, Association of State Road Transport Undertakings, New Delhi.
2. Patankar. P. G, "*Quality in Road Passenger Transport in India"*, CIRT, Pune, 1986.
3. Kulshrestha. D. K, *"Management of State Road Transports in India*", Mittal Publications, 1989.
4. Jegadish Gandhi. P, John Gunaseelan. G, "*Indian Transport System: An Appraisal of Nationalised Bus Services",* Mittal Publications, 1994.
5. Kulshrestha. D. K, "*Transport Management in India"*, Mittal Publications, 1989.

AE1154 TRANSPORT MANAGEMENT AND MOTOR INDUSTRY												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X									X	
2.	Mapping of instructional objectives with student outcome	1,2,									1,2	
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)					Professional Subjects(P)	
											X	
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing					Engines and Management systems	
				X								
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1155	**OFF ROAD VEHICLES**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

1. To provide knowledge about off road vehicles

INSTRUCTIONAL OBJECTIVES

At the end of the course students will be able to know

1. Classification and requirements of off road vehicles
2. Different types of equipment.
3. Tractors.

4.	Earth moving machines.
5.	Scrapers and graders.
6.	Shovels and Ditchers.
7.	Classification and requirements of off road vehicles

INTRODUCTION TO OFF ROAD VEHICLES (9 hours)

Land clearing machines Earth moving machines Scrapers and graders Shovels and ditchers Power plants, chassis and transmission, multiaxle vehicles.

UNIT I - DIFFERENT TYPES OF EQUIPMENT (9 hours)

Transport equipment: Powered equipment, Tractors and Trollies, Trailers, Platform lift trucks, Fork lift trucks, containers and Supports.

Hauling equipment: Types of dump trucks, On-high way vehicles, off high way vehicles.

Hoisting equipment: Jacks, truck mounted crane, Crawler crane, Outriggers.

UNIT II - TRACTORS (9 hours)

Tractors and tractors units; Tractors in earth moving ,applications of tractors, Rating of Tractors, Wheeled and Crawler tractor, Recent trends in tractor design, power shift transmission and final drive in caterpillar tractor. Motor grader, recent trends, control mechanism of a caterpillar motor grader.

UNIT III - EARTH MOVING MACHINES (9 hours)

Bulldozers, cable and hydraulic dozers. Crawler track, running and steering gears, scrapers, drag and self-Powered types - dump trucks and dumpers - loaders, single bucket, multi bucket and rotary types - power and Capacity of earth moving machines.

UNIT IV - SCARPER AND GRADERS (9 hours)

Scrapers, elevating graders, self-powered scrapers and graders. Shovels and Ditchers: Power shovel, revolving and stripper shovels - drag lines - ditchers - capacity of shovels. Land clearing machines: Bush cutter, stampers, tree dozer, rippers.

UNIT V - SHOVELS AND DITCHERS (9 hours)

Power shovel, revolving and stripper shovels - drag lines - ditchers - Capacity of shovels.

TEXT BOOK

1. Abrosimov. K. Bran Berg. A. and Katayer. K., *"Road making Machinery"*, MIR Publishers, Moscow, 1971.

REFERENCES

1. Wang. J. T., *"Theory of Grand vehicles"*, John Wiley & Sons, New York, 1987.
2. Mahesh Varma, *"Construction Equipment and its Planning and Applications*, Metropolitan Books Co., Delhi, 2004.
3. *"Off the Road Wheeled and Combined Traction Devices* - Ashgate Publishing Co. Ltd. 1998
4. Peurifoy. R. L, *Construction Planning Equipment and Methods*, McGraw Hill Publishers, 1956.

AE1155 – OFF ROAD VEHICLES												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X										
2.	Mapping of instructional objectives with student outcome	1,3,4, 5,6,7										
3.	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
										X		
4.	Broad Area	Design		Vehicle body and Engineering		Manufacturing				Engines and Management systems		
				X								
5.	Approval	23rd meeting of the Academic Council , May 2013										

AE1156	**VEHICLE MAINTENANCE**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				
PURPOSE					
To impart knowledge related to maintenance of vehicles.					
INSTRUCTIONAL OBJECTIVES					
At the end of the course, students will have knowledge of					
1.	Maintaining record of vehicle operation and maintenance, service schedules etc.				

2.	Vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.
3.	Repairing and overhauling procedure

UNIT I - MAINTENANCE OF RECORDS AND SCHEDULES (9 hours)

Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II - ENGINE MAINTENANCE – REPAIR AND OVERHAULING (9 hours)

Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III - CHASSIS MAINTENANCE - REPAIR AND OVERHAULING (9 hours)

Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV-ELECTRICAL SYSTEM MAINTENANCE – SERVICING AND REPAIRS (9 hours)

Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V - MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VECHICLE BODY (9 hours)

Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

TEXT BOOK

1. John Doke, *"Fleet Management",* McGraw Hill Co. 1984.

REFERENCES

1. James D Halderman, *"Advanced Engine Performance Diagnosis"*, PHI, 1998.
2. *Service Manuals from Different Vehicle Manufacturers.*

AE1156 – VEHICLE MAINTENANCE													
Course Designed by		**Department of Automobile Engineering**											
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k	
		X				X			X		X		
2.	Mapping of instructional objectives with student outcome	1,2,,3				1,2,3			1,2,3		1,2,3		
3.	Category	General (G)		Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)		
											X		
4.	Broad Area	Design		Vehicle body and Engineering			Manufacturing				Engines and Management systems		
				X									
5.	Approval	23rd meeting of the Academic Council , May 2013											

AE1157	**PROJECT MANAGEMENT**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

With increasing technological and scientific advances, the efficient and effective planning and implementation of major projects, especially in hi-tech sectors, is becoming increasingly complex and critical. This course is aimed at providing both basic and some advanced exposure to PM, so as to enable the manager of tomorrow to successfully complete sophisticated projects within the constraints of capital, time, and other resources.

INSTRUCTIONAL OBJECTIVES

The course aims at the following learning targets:

1.	To understand the concepts of project definition, life cycle, and systems approach;
2.	To develop competency in project planning, scheduling and related activities.

3.	To handle the complex tasks of time estimation and project scheduling, including PERT and CPM.
4.	To develop competencies in project costing, budgeting, and financial appraisal;
5.	To gain exposure to project control and management, using standard tools of cost and schedule variance analysis.

UNIT I - PROJECT MANAGEMENT CONCEPTS (9 hours)

Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

UNIT II - PROJECT ORGANIZATION & PROJECT CONTRACTS (9 hours)

Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

UNIT III - PROJECT APPRAISAL & COST ESTIMATION (9 hours)

Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

UNIT IV - PROJECT PLANNING & SCHEDULING (9 hours)

Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.

UNIT V - MODIFICATION & EXTENSIONS OF NETWORK MODELS (9 hours)

Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management- essential requirements of PM

software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.

TEXT BOOK

1. Nagarajan. K, *"Project "Management,* New Age International, 2012.

REFERENCES

1. Harvey Maylor, "*Project Management"*, Prentice Hall, 2010.
2. Erik W. Larson, *"Project Management*": The Managerial Process (Special Indian Edition), Tata McGraw-Hill Education, 2006

AE1157 – PROJECT MANAGEMENT												
Course Designed by		**Department of Automobile Engineering**										
1	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X					X	
2	Mapping of instructional objectives with student outcome	1, 2, 3,4,5				1,2, 3,4, 5					1,2, 3,4, 5	
3	Category	General (G)		Basic Sciences(B)			Engineering Sciences and Technical Art (E)				Professional Subjects(P)	
						X						
4	Approval	23rd meeting of Academic Council, May 2013										

AE1159	**MANAGEMENT INFORMATION SYSTEMS**	**L**	**T**	**P**	**C**
	Total contact hours – 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

This course introduces the various information and communications technologies. Students will research and practice using modern productivity applications. Students will examine how information systems are used to solve problems and make better business decisions and apply these concepts to analyze business cases.

INSTRUCTIONAL OBJECTIVES

At the end of this course, students should be able to:

1.	Integrate into business situations and analysis, and evaluate both theory and practice relevant to Management information systems
2.	Fully explain the relationship among and between information systems and management
3.	Analyze how technology can be used to synthesize complex data to make sound business decisions
4.	Prepare processes, in conjunction with technology personnel, to use MIS for competitive advantage
5.	Apply SAP techniques in plant maintenance and quality management.

UNIT I - MANAGEMENT INFORMATION SYSTEM (MIS) (9 hours)

Organisation and Information Systems. Changing Environment and its impact - The IT/IS and its influence - The Organisation: Structure, Managers and activities - Data, information and its attributes - the level of people and their information needs - Types of Decisions and information - Information System, categorisation of information on the basis of nature and characteristics.

UNIT II - KINDS OF INFORMATION SYSTEMS (9 hours)

Transaction Processing System (TPS) - Office Automation System (OAS) - Management Information system (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System (EIS or ESS).

UNIT III - SYSTEM ANALYSIS AND DEVELOPMENT AND MODELS (9 hours)

Need for System Analysis - Stages in System Analysis - Structured SAD and tools like DFD, Context Diagram Decision Table and Structured Diagram. System Development Models: Water Flow, Prototype, Spiral, RAD – Roles and responsibilities of System Analyst, Database Administrator and Database Designer.

UNIT IV - MANUFACTURING AND SERVICE SYSTEMS (9 hours)

Information systems for Manufacturing and Marketing functions - IS in Automotive industry.

UNIT V - ENTERPRISE SYSTEM AND SAP-ERP SYSTEMS (9 hours)

Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship management (CRM): Phases. Knowledge Management and e-governance

SAP – Introduction, Applications, Master data, Schedule line, Bill of material, Production planning, Batch management, Plant maintenance, Quality management

TEXT BOOKS

1. Kenneth J Laudon, Jane P. Laudon, *"Management Information Systems",* Pearson/PHI, 10th edition, 2007
2. Jawadekar. W. S, *"Management Information System",* Tata McGraw Hill Edition, 3rd edition, 2004
3. *Ralph Stair*, MIS

REFERENCES

1. James A. O' Brien, *"Introduction to Information System*", Tata McGraw Hill, 12th Edtion.
2. Sadagopan. S, *"Management Information Systems*", PHI, 1/e, 2005.
3. Effy Oz, *"Management Information Systems*", Thomson Course Technology, 3rd edition, 2003.
4. Lynda M AppleGate, Robert D Austin et al, *"Corporate Information Strategy and Management* , Tata McGraw Hill, 7th Edition.

AE1159 – MANAGEMENT INFORMATION SYSTEMS												
Course Designed by		**Department of Automobile Engineering**										
1.	Student Outcome	a	b	c	d	e	f	g	h	i	j	k
		X				X					X	
2.	Mapping of instructional objectives with student outcome	1, 2, 3,4,5				1,2,3 ,4,5					1,2,3, 4,5	
3.	Category	General (G)	Basic Sciences (B)			Engineering Sciences and Technical Art (E)				Professional Subjects (P)		
						X						
4.	Approval	23rd meeting of Academic Council, May 2013										