DEPARTMENT OF AUTOMOBILE ENGINEERING

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

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

Chaitanya Knowledge City, Rajanagaram, Rajamahendravaram – 533294. E.G.Dt. - AP.

GR-17

DEPARTMENT OF AUTOMOBILE ENGINEERING

4 YEARS B.Tech. COURSE STRUCTURE & SYLLABUS

With Effective from 2017-18 Batch

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

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DEPARTMENT OF AUTOMOBILE ENGINEERING

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

I YEAR **I SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
	Name	Code	L	T	P/ D		Internal	External	Total
1	English – I	17198101	3	1	-	3	40	60	100
2	Mathematics - I	17198102	3	1	-	3	40	60	100
3	Engineering Physics	17198104	3	1	-	3	40	60	100
4	Computer Programming	17195103	3	1	-	3	40	60	100
5	Engineering Drawing	17193175	1	-	3	3	40	60	100
6	Environmental Studies	17198106	3	1	-	3	40	60	100
7	English Communication Skills Lab-1	17198111	-	-	3	2	50	50	100
8	Engineering Physics Lab	17198112	-	-	3	2	50	50	100
9	Computer Programming Lab	17195113	-	-	3	2	50	50	100
	Total		**16**	**5**	**12**	**24**	**390**	**510**	**900**

I YEAR **II SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
	Name	Code	L	T	P/ D		Internal	External	Total
1	English – II	17198201	3	1	-	3	40	60	100
2	Mathematics – II (Mathematical Methods)	17198202	3	1	-	3	40	60	100
3	Mathematics – III	17198203	3	1	-	3	40	60	100
4	Engineering Chemistry	17198204	3	1	-	3	40	60	100
5	Engineering Mechanics	17193205	3	1	-	3	40	60	100
6	Professional Ethics and Human Values*	17198206	1	2	-	1	40	60	100
7	English Communication Skills Lab – 2	17198211	-	-	3	2	50	50	100
8	Engineering Chemistry Lab	17198212	-	-	3	2	50	50	100
9	Engineering Workshop & IT Workshop	17198213	-	-	3	2	50	50	100
	Total		**16**	**7**	**9**	**22**	390	510	**900**

T : Theory **P: Practical** **D: Drawing** **C: Credits**

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DEPARTMENT OF AUTOMOBILE ENGINEERING

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

II YEAR **I SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
	Name	Code	L	T	P/D		Internal	External	Total
1	Basic Automobile Engineering	17170301	3	1	-	3	40	60	100
2	Metallurgy & Materials Science	17170302	3	1	-	3	40	60	100
3	Mechanics of Solids	17170303	3	1	-	3	40	60	100
4	Thermodynamics	17170304	3	1	-	3	40	60	100
5	Industrial Engineering & Management	17170305	3	1	-	3	40	60	100
6	Computer Aided Engineering Drawing Practice	17170376	-	-	6	2	40	60	100
7	Automobile Chassis Components Lab	17170311	-	-	3	2	50	50	100
8	Mechanics of Solids & Fluid Mechanics lab	17170312	-	-	3	2	50	50	100
	Total		**15**	**5**	**12**	**21**	340	460	**800**

II YEAR **II SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
	Name	Code	L	T	P/D		Internal	External	Total
1	Kinematics of Machinery	17170401	3	1	-	3	40	60	100
2	Automotive Engines	17170402	3	1	-	3	40	60	100
3	Basic Electrical & Electronics Engineering	17170403	3	1	-	3	40	60	100
4	Fluid Mechanics & Hydraulic Machinery	17170404	3	1	-	3	40	60	100
5	Manufacturing Processes	17170405	3	1	-	3	40	60	100
6	**Soft Skills -1**	17179406	1	2	-	1	40	60	100
7	Machine Drawing	17170477	-	-	3	3	40	60	100
8	Engine Components & Testing Lab	17170411	-	-	3	2	50	50	100
9	Basic Electrical & Electronics Engineering Lab	17170412	-	-	3	2	50	50	100
	Total		**16**	**7**	**9**	**23**	**380**	**520**	**900**

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

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DEPARTMENT OF AUTOMOBILE ENGINEERING

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

III YEAR **I SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
	Name	Code	L	T	P/D		Internal	External	Total
1	Dynamics of Machinery	17170501	3	1	-	3	40	60	100
2	Automotive Electrical & Autotronics	17170502	3	1	-	3	40	60	100
3	Design of Automobile Components	17170503	3	1	-	3	40	60	100
4	Vehicle Transport Management	17170504	3	1	-	3	40	60	100
5	Heat Transfer	17170505	3	1	-	3	40	60	100
6	Vehicle Performance & Testing	17170506	3	1	-	3	40	60	100
7	Heat Transfer Lab	17170511	-	-	3	2	50	50	100
8	Basic Automobile Components Manufacturing Lab	17170512	-	-	3	2	50	50	100
9	**Mini Project-1 ***	17170521	-	-	-	2	100	-	100
	Total		**18**	**6**	**6**	**24**	**440**	**460**	**900**

III YEAR **II SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
	Name	Code	L	T	P/D		Internal	External	Total
1	Managerial Economics & Financial Analysis	17179601	3	1	-	3	40	60	100
2	Machine Tools & Metrology	17170602	3	1	-	3	40	60	100
3	CAD / CAM	17170603	3	1	-	3	40	60	100
4	Alternative Energy Sources for Automobiles	17170604	3	1	-	3	40	60	100
5	DepartmentalElectiveI	(See List)	3	1	-	3	40	60	100
6	Automation in Automotive Manufacturing	17170606	3	1	-	3	40	60	100
7	**Soft Skills – 2***	17179607	1	2	3	1	40	60	100
8	Machine Tools & Metrology Lab	17170611	-	-	3	2	50	50	100
9	CAD / CAM LAB	17170612	-	-	3	2	50	50	100
	Total		**19**	**8**	**6**	**23**	**380**	**520**	**900**

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

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DEPARTMENT OF AUTOMOBILE ENGINEERING

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

IV YEAR **I SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P/D		Internal	External	Total
1	Departmental Elective – II	(See List)	3	1	-	3	40	60	100
2	Vehicle Dynamics	17170702	3	1	-	3	40	60	100
3	Instrumentation & Control Systems	17170703	3	1	-	3	40	60	100
4	Finite Element Methods	17170704	3	1	-	3	40	60	100
5	**Open Elective**	(See List)	3	1	-	3	40	60	100
6	Automotive pollution & Control	17170706	3	1	-	3	40	60	100
7	Servicing and Maintenance of Automobiles &Instrumentation Lab	17170711	-	-	3	2	50	50	100
8	Tuning of Automobiles through Real time workshop interaction Lab	17170712	-	-	3	2	50	50	100
9	**Mini Project-2***	17170731	-	-	-	2	100	-	100
	Total		**18**	**6**	**6**	**24**	**440**	**460**	**900**

. **IV YEAR** **II SEMESTER**

S. No.	Subject		Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P/D		Internal	External	Total
1	Hybrid, Electric & Fuel Cell Vehicles	17170801	3	1	-	3	40	60	100
2	Departmental Elective – III	(See List)	3	1	-	3	40	60	100
3	Departmental Elective – IV	(See List)	3	1	-	3	40	60	100
4	**Project Work**	17170841	-	-	-	9	60	140	200
5	**IPR& PATENTS**	17179895	1	2	-	1	40	60	100
	Total		**10**	**5**	**-**	**19**	**220**	**380**	**600**

T : Theory P: Practical D: Drawing C: Credits

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ELECTIVES

OPEN ELECTIVE (17170765)

1. Environment Pollution & Control - 17170765a
2. Building Technology - 17170765b
3. Social Networks - 17170765c
4. Renewable Energy Sources & Systems - 17170765d
5. Internet of Things - 17170765e
6. Hybrid Vehicles (Not for AME students) - 17170765f
7. Robotics - 17170765g
8. Principles of Management - 17170765h

	Elective-1 (17170665)	**Elective-2 (17170761)**	**Elective-3 (17170863)**	**Elective-4 (17170864)**
Stream-1	Two & Three wheelers	Special Purpose Vehicles	Vehicle Maintenance	Off Road Vehicles
Stream-2	Automotive chassis Components Design	Modern Vehicle Design	Automotive Aerodynamics	Modern Vehicle Technology
Stream-3	Unconventiona l Machining Process	Product Design & Assembly Automation	Design for Manufacture	Rapid Prototyping
Stream-4	Disaster Management	Management Science	Operations Research	Principles of Entrepreneurship
Stream-5	Non Destructive Testing	Computational Fluid Dynamics	Micro Electro Mechanical Systems	Nano Technology
Stream-6	Trouble Shooting Servicing& Maintenance of Automobiles	Vehicle Body Engineering &Safety	Automotive Chasis & Suspension	Simulation of SI & CI Engines

Description	SUBJECT	L	T	P	C
Course Code	ENGLISH -I (17198101)	3	1	0	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading,Writing,Listening and Speaking				

Course Objectives:

- Improve the exposure to universal happenings
- Communicate the necessity to exercise humor in the daily life
- Take inspiration by reading autobiographical issues
- Achieve high quality of life, strength and sovereignty of a developed nation

Unit-I

Objective: To develop human resources to serve the society in different ways
From English for Engineers and Technologists.
Detailed Text: 'Human Resources': from English for Engineers and Technologists (C.O.1)

Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Non-Detailed Text: 'An Ideal Family' by Katherine Mansfield

Unit-II

Objective: To highlight road safety measures whatever be the mode of transport.
Detailed Text: Transport: Problems and Solutions' (C.O.1)

Objective: To develop extensive reading skill and comprehension for pleasure and profit
Non-Detailed Text: ''War' by Luigi Pirandello from 'Panorama: A Course on Reading''

Unit-III

Objective: To highlight the advantages and disadvantages of technology.
Detailed Text: 'Evaluating Technology' from English for Engineers and Technologists. (C.O.2)

Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Non-Detailed Text: 'The Verger' by Somerset Maugham from Panorama: A Course on Reading'

Unit–IV

Objective: To bring into focus different sources of energy as alternatives to the depleting sources.
Detailed Text: 'Alternative Sources of Energy' from English for Engineers and Technologists. (C.O.3)

Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Poetry: ' The Scarecrow' by Satyajit Ray from Panorama: A Course on Reading Frost

Unit – V

Objective: To highlight the fact that animals must be preserved because animal life is precious **Detailed Text: 'Our Living Environment' from English for Engineers and Technologists.** (C.O.4)

Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Non-Detailed Text: 'A Village Host to Nation' from Panorama: A Course on Reading

Detailed textbook:
ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by Orient Blackswan Pvt Ltd
Non-detailed textbook:
PANORAMA: A COURSE ON READING, Published by Oxford University Press India

Description	SUBJECT	L	T	P	C
Course Code	MATHEMATICS-I (17198102)	4	0	0	3
Teaching	Total contact hours 65				
Prerequisite (s)	Basic knowledge of algebra, trignometry, differentiation and integration.				

Course Objective(s):

1. To apply Laplace Transforms to solve Initial Value Problems and evaluate Infinite Integrals.
2. To solve first and higher order ordinary differential equations (ODE) with applications by various techniques.
3. To apply Partial Differentiation to solve Inequalities and to find Maxima and Minima.
4. To solve First and Higher order PDE with their applications to Heat equation, Wave equation, Laplace equation

UNIT I: Laplace transform

Objective: Application of Laplace Transform to Solution of IVP and Evaluation of Integrals

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem
(with out proof).

Applications: Solutions of ordinary differential equations using Laplace transforms.(CO1)

UNIT II: Differential equations of first order and first degree

Objective: Solution of First order and First degree ODE with applications

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-orthogonal trajectories. (CO2)

UNIT III: Linear differential equations of higher order

Objective: Solution of Higher order Linear ODE with applications.

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e *ax* , Sin ax, cos ax, polynomials in x, e *ax* V(x), xV(x).

Applications: LCR circuit, Simple Harmonic motion. (CO2)

UNIT IV: Partial differentiation

Objective: Mean Value Theorems and their applications and to find Maxima and Minima

Introduction- Total derivative-Chain rule-Generalized Mean Value theorem for single variable (without proof)-Taylors and Mc Laurent's series for two variables– Functional dependence-Jacobian.

Applications: Maxima and Minima of functions of two variables with constraints and without constraints.
(CO3)

UNIT V: First order & Higher order Partial differential equations

Objective: Formation, Solution& application of First & Higher order PDE

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations.

Classification of II order PDE- Method of separation of Variables

Applications: One- dimensional Wave, Heat equations - two-dimensional Laplace Equation.(CO4)

Text Books:

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

Reference Books:

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

Weblinks : WWW.NPTEL.COM

Description	SUBJECT	L	T	P	C
Course Code	ENGINEERING PHYSICS (17198104)	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 level. Application of Physics theory and calculations to required course.				

Unit-I

Course Objectives:

Physics curriculum which is re-oriented to the needs of all branches of graduate engineering courses that serves as a transit to understand the specific advanced topics.
The course is designed to:

1. Impart Knowledge of Physical Optics phenomena like Interference, Diffraction involving to design instruments with higher resolution.
2. Analyze the concept of Polarization, Coherent sources, its realization and utility in optical instrumentation.
3. Study the concepts regarding the bulk response of Magnetic materials and their analytical properties.
4. Taps the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.
5. Study the Structure-property relationship exhibited by solid crystal materials and impart the concepts of EM fields to find velocity of light.
6. Understands quantum picture of sub-atomic world dominated by electron and its presence.
7. Apply the knowledge of physics of electronic transport at underlying mechanism for

Objective: To introduce basic concepts of Optical Interference and Diffraction to design instruments with higher resolution and apply the concepts of coherent sources, its realization and utility optical instrumentation. **(CO1, CO2)**

INTERFERENCE: Principle of Superposition – Coherence – Interference in thin films (reflection geometry) – Newton's rings - Applications (wavelength, refractive index of the material.

DIFFRACTION: Fraunhofer diffraction double slit, N-slits -(Qualitative treatment only)-Grating spectrum –Rayleigh's criterion, Resolving power of a grating.

Unit-II

Objective: To knowledge the basical physics of polarization and lasers that are trusted Non-linear coherent sources establishing for the fitness of Instrumentation, establishing a structure property relationship for materials. **(CO2)**

POLARIZATION: Types of Polarization – Malu's law- Brewester's law- double refraction - Nicol Prism.

LASERS: Properties of lasers - absorption, spontaneous and stimulated emissions- Einsteins coeffecients, Population inversion - Solid state laser: Ruby laser, Gas laser: He-Ne laser, Applications of Lasers

Unit-III

Objective:. To knowledge the designing of Electrical and Magnetic response of naturally abundant and artificially made materials, and pervading SHM and its consequences onto the detailed studies of Acoustics of Buildings, **(CO3, CO4)**

MAGNETIC PROPERTIES

Basic definitions, B,H,I relation-Classification of magnetic materials – origin of magnetic moment – Weiss theory of Ferromagnetism - Hysteresis- Soft and Hard magnetic materials.

ACOUSTICS: Reverberation time - Sabine's formula- Measurement of absorption coefficient – Factors affecting the acoustically good hall and their remedies.

Unit-IV

Objective: Convening the physics knowledge base in establishing a structure property relationship for materials and to deeper understanding vectorial concepts of EM fields paves the student to gear – up for a deeper understanding. **(CO3, CO5)**

CRYSTALLOGRAPHY & X-RAY DIFFRACTION: Basis and lattice – Bravais systems- Symmetry elements- Unit cell- packing fraction – coordination number- Miller indices – Separation between successive (hkl) planes – Bragg's law.

ELECTROMAGNETIC FIELDS: Introduction-Gauss and Stokes theorems(qualitative) – Fundamental laws of electromagnetism-Maxwell's equations of EM wave.

Unit–V

Objective: To Gain knowledge about structure of solids and crystal lattices of semiconductors. To Compare the energies of the conduction bands and valence bands in metals, insulators, and semiconductors in understanding the physics of electronic transport as underlying mechanism for appliances. **(CO5, CO6, CO7)**

BAND THEORY OF SOLIDS: Bloch's theorem (qualitative)–Kronig Penney model(qualitative) – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

SEMICONDUCTOR PHYSICS: Introduction- Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors.

Text books:

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

Reference Books:

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

Web links: 1. www.physics org.com, 2.www. Optics.net, 3. www.nptel.com,

4. Free online courses and education.

Description	SUBJECT	L	T	P	C
Course/ Code	**COMPUTER PROGRAMMING** **Common to (CE, EEE, ME, ECE, CSE, AME, MIN)(17195103)**	3	1	0	3
Teaching	**Total contact hours - 50**				
Prerequisite (s)	Basic knowledge about Computer, Algorithm and Flowchart.				

Course Objective(s):

- To impact adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basics of C language.
- To enable effective usage of arrays,strings,functions,pointers.
- To teach the basics of pre-processors available with C Compiler.

Unit-1: Introduction to Programming

Objective: Toidentify the basic operation of CPU by using different number system, notion of algorithm, flowchart, program, and different languages in computer programming. (CO1, CO2)

Introduction to Computers: Introduction to computer programming,Algorithm,flow chart,Program development steps.

Computer languages: Machine level, Assembly level and High-level language.

Number System:conversions- decimal, binary, octal, hexadecimal.

'C' Fundamentals: Structure of a C-program,C-character set, C Tokens- variables, constants, identifiers, data types and sizes, operators.

Unit-2:Control Structures

Objective:To Understanding the concept of various control structures, branchingand different decision making techniques. (CO3)

I/O Functions: Header files, Standard I/O library functions-formatted I/O functions.

Decision making statements: simple if, if-else, nested if-else, else-if ladder, switch-case statements and sample programs.

Iterative Statements: for, while, do-while. Jump Statements-break, continue, goto

Unit-3: Introduction toArray, Structure and Pointer

Objective:Toidentify the concept of array, structure and use of pointers for accessing the values of memory allocation in the program.(CO4)

Arrays- declaration, initialization, storing and accessing elements of 1-D, 2-D and multi-dimensional arrays. **Array Applications**- addition, multiplication, transpose, symmetry of a matrix.

Structure: Declaration, initialization, storing and accessing elements by using structure and union.

Pointers: Introduction to pointers, defining a pointer variable, Pointer to Pointer, Examples of pointers, using pointers in expressions, pointers and arrays.

Unit-4: Strings

Objective:To understanding the data representation by using String.(CO4)

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

Unit-5: Functions & Preprocessors

Objective:To understanding the concept of Modularprogrammingand use of Pre-Processors in program.(CO5)

Functions- declaration, definition, prototype, function call, return statement, types of functions, parameter passing methods, and function recursion.

Preprocessor: #define, #include Statement, #ifdef, #endif, and storage classes.

Course Outcomes:

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

CO-1. To obtain the knowledge about different languages used in computer programming and also about the number systems which will be very useful for bitwise operations and basic terminology used in the computer programming.

CO-2. To obtain knowledge about algorithm, flow chart, and structure of C program and different C tokens used inside C program.

CO-3. To develop program by using Control structure,different looping and Jump statement.

CO-4. To obtain knowledge about the application and implementation of 2-dimentionalArray and string inside the program.

CO-5. To obtain knowledge about different functionalities of Preprocessors and also to develop the program by using different type of function calls.

Text Books

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

Reference Books

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

Course Code : Computer Programming-1 (16199205)													
Course designed By:Department of Computer Science and Engineering													
	Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course Outcomes	CO1	✓											
	CO2			✓									
	CO3					✓							
	CO4					✓							
	CO5	✓		✓		✓							
Category		General Humanities			Basic Sciences		Engineering Sciences and Technical			Professional Subjects			
							✓						
Mode of Evaluation:Quiz, Assignment, Seminar, Written Examination.													

Description	SUBJECT	L	T	P	C
Course/ Code	**Engineering Drawing (17193175)**	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Aptitude to learn				

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

UNIT I

Introduction to drawing Instruments and uses. Lettering.

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

UNIT II

Scales : Vernier and Diagonal scales.

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

UNIT III

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

UNIT IV

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

UNIT V

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

Course Outcomes:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Description	SUBJECT	L	T	P	C
Course Code	ENVIRONMENTAL STUDIES (17198106)	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge to conserve Natural Resourses and to control Environmental Pollution.				

Course Ojectives:

1. Understand fundamental physical and biological principles that govern natural processes.
2. Demonstrate an integrative approach to environmental issues with a focus on sustainability of Natural resource utilization.
3. Basic understanding of the ecosystem diversity and its conservation.
4. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
5. Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.
6. Provide students with technical and analytical skills that enable them to find employment in federal and state resource agencies, consulting firms, community-based education, and industrial firms tasked with environmental compliance.

Unit-I

Objective: Understand fundamental physical and biological principles that govern natural processes and ecosystem.(CO1, CO3,CO4)

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Stockholm and Rio Summit–Global Environmental Challenges**:** Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, Consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

Unit-II

Objective: Demonstrate an integrative approach to environmental issues with a focus on sustainability of Natural resource utilisation.(CO2)

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Natural Resources: Natural resources and associated problems Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources**:** Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources**:** World food problems, changes caused by non-agriculture activities-effects of Modern agriculture, fertilizer-pesticide problems, water logging, salinity
Energy resources**:** Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources**:** Land as a resource, land degradation, Wasteland reclamation, man induced Landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit-III

Objective: Basic understanding of the ecosystem diversity and its conservation. **(CO3)**

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

.
Unit-IV
Objective: Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. (CO4)

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution. Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.
Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

Unit- V
Objective: Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems. Provide students with technical and analytical skills that enable them to find employment in federal and state resource agencies, consulting firms, community-based education, and industrial firms tasked with environmental compliance. (CO5,CO6)

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns.
Environmental ethics: Issues and possible solutions. Environmental Protection Act - Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.
Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism The student should submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

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

Reference Books:

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

Web Links:

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

Description	SUBJECT	L	T	P	C
Course Code	ENGLISH - COMMUNICATION SKILLS LAB- I (17198111)	0	0	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading,Writing,Listening and Speaking				

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

UNIT 1:

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

UNIT 2:

1. Responding to Requests and asking for
Directions Practice work.

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

UNIT 4:
1. Letters and Sounds
   Practice work.

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

UNIT 6:
Movie Reviews

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. A Practical Course in effective english speaking skills, PHI
5. Word power made handy, Dr shalini verma, Schand Company
6. Professional Communication, Aruna Koneru, Mc Grawhill Education

Description	SUBJECT	L	T	P	C
Course Code	ENGINEERING PHYSICS LAB (17198112)	0	0	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)					

GODAVARI INSTITUTE OF ENGINEERING& TECHNOLOGY (A)

NH- 16, CHAITANYA NAGAR, RAJAHMUNDRY -533296

Engineering Physics Lab
List of Experiments

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

Virtual Lab: www.vlab.co.in

Description	SUBJECT	L	T	P	C
Course/ Code	**COMPUTER PROGRAMMING LAB** **Common to (CE, EEE, ME, ECE, CSE, AME, MIN)(17195113)**	0	0	3	3
Teaching	**Total contact hours - 50**				
Prerequisite (s)	Basic knowledge about Computer, Algorithm and Flowchart.				

Course Objective(s):

- To impact adequate programming skills to solve mathematical problems
- To develop programming skills using the fundamentals and basics of C language.
- To enable effective usage of arrays, strings, functions, pointers and files.

1. Write a C Program to
   a) Calculate the area of triangle using the formula
   Area = (s (s-a) (s-b) (s-c)) 1/2, where s= (a+b+c)/2
   b) To find the largest of three numbers using ternary operator.
   c) To swap two numbers without using a temporary variable.
2. Write a C program that uses functions to perform the following operations using Structure:
   a) Reading a complex number
   b) Writing a complex number
   c) Addition of two complex numbers
3. Write a C program to
   a) 2"s complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2"s complement of 11100 is 00100. Write a C program to find the 2"s complement of a binary number.
   b) Find the roots of a quadratic equation.
   c) Take two integer operands and one operator form the user,
   Performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
4. Write a C Program to
   a) Check whether the given number is Armstrong number or not.
   b) Check whether the given number is palindrome or not.
5. Write a C program to
   a) Find the sum of individual digits of a positive integer and find the reverse of the given number.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
   c) Generate all the prime numbers between 1 and n, where n is a value supplied by the user.
6. Write a C Program to
   a) Print the multiplication table of a given number n up to a given value, where n is entered by the user.
   b) Enter a decimal number, and calculate and display the binary equivalent of that number.
   c) Enter a binary number, and calculate the decimalequivalent of that number.
7. Write a C program to
   a) Interchange the largest and smallest numbers in the array.
   b) Implement a liner search.
   c) Implement binary search.
8. Write a C program to
   a) Examples which explore the use of structures, union and other user defined variables.

b) Declare a structure for calculating the percentage achieved by 3 students, by considering the structure elements as name, pin no, mark1, mark2, mark3.

9. Write C Programs
   a) For the following string operations without using the built in functions
      i. to reversea strings
      ii. to append a string to another string
      iii. to compare two strings.
   b) Write C Programs for the following string operations without using the built in functions
      i. to find the length of a string
      ii. To find whether the given string "MADAM" is palindrome or not.
10. Write a C program
   a) Use functions to perform the following operations:
      i. To insert a sub-string in to given main string from a given position.
      ii. To delete n Characters from a given position in a given string.
   b) To replace a character of string either from beginning or ending or at a specified location
11. Write C Programs for the following string operations with and without using the built in functions
   a) Write C Program to reverse a string using pointers.
   b) Write a C program to concatenate two strings by using pointer.
12. Write C programs that use both recursive and non-recursive functions for the following
   a) To find the factorial of a given integer.
   b) To find the GCD of two given integers.
   c) To find Fibonacci sequence.
13. Write C programs to
   a) Find the area of triangle by using call by value and call by reference concepts.
   b) Pointer based function to exchange value of two integers using passing by address.
   c) Compare two strings by using call by address.
   d) Separate the even and odd elements of an array into two different arrays by using call by value.

Course Outcomes:

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

CO-6. To know the structure and syntax of a programming language.
CO-7. To develop code for simple mathematical problems.
CO-8. To write the programs using arrays, structures and pointers

Course Code : Computer Programming Lab													
Course designed By: Department of Computer Science and Engineering													
	Program Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
Course Outcomes	**CO1**	✓											
	CO2			✓									
	CO3					✓							
	CO4					✓							
	CO5	✓		✓		✓							

Category	**General Humanities**	**Basic Sciences**	**Engineering Sciences and Technical**	**Professional Subjects**
			✓	

Mode of Evaluation: Quiz, Assignment, Seminar, Written Examination.

Description	SUBJECT	L	T	P	C
Course Code	ENGLISH -II (17198201)	3	1	0	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Learner should possess the primary communicative abilities suitable for global exposure				

Course Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
- To develop the communication skills of the students in both formal and informal situations.

UNIT 1:

Objective: Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts where intuitive experience inspires learning
Detailed Text:' The Greatest Resource- Education' from English Encounters

Objective: The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received
Non-Detailed Text: ' A P J Abdul Kalam' from The Great Indian Scientists.

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UNIT 2:

Objective: The lesson centres on the pros and cons of the development of science and technology
Detailed Text:' A Dilemma' from English Encounters
Objective: The lesson highlights the dedicated research work of C V Raman and his achievements in Physics
Non-Detailed Text: 'C V Raman' from The Great Indian Scientists.

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UNIT 3:

Objective: The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences
Detailed Text: 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.
Objective: The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear program me as architect.
Non-Detailed Text: 'Homi Jehangir Bhabha' from The Great Indian Scientists.

UNIT 4:

Objective: The lesson highlights insightful commentary on cultural traditions.
Detailed Text: 'The Lottery' from English Encounters.

Objective: The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

Non-Detailed Text: 'Jagadish Chandra Bose' from The Great Indian Scientists.

UNIT 5:

Objective: The essay presents several health disorders that spring out due to environmental changes Generations.

Detailed Text :' The Health Threats of Climate Change' from English Encounters.

Objective: The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray

Non-Detailed Text: ' Prafulla Chandra Ray' from The Great Indian Scientists.

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DETAILED TEXTBOOK: English Encounters Published by **Maruthi Publishers**.
DETAILED NON-DETAIL: The Great Indian Scientists Published by **Cenguage learning**

Description	SUBJECT	L	T	P	C
Course Code	**MATHEMATICS-II (17198202)**	4	0	0	3
Teaching	**Total contact hours 65**				
Prerequisite (s)	Basic knowledge of Algebra,Trigonometry,Differentiation, Integration and Complex numbers				

Course Objective(s):

1. To apply Numerical Techniques to solve Algebraic and Transcendental Equations and also Initial Value Problems and ODE.
2. To interpolate the tabulated data at the given values using various interpolation techniques
3. To solve the IVPs in ODE using numerical techniques.
4. To learn and apply C-R equations.
5. Express a given function satisfying certain conditions in Fourier series and Use finite and infinite Fourier Integral Transforms to solve BVPs.

UNIT I: Solution of Algebraic and Transcendental Equations
Objective: To enable the student to solve Algebraic and Transcendental equations by Numerical Methods.
Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method.(CO1)

UNIT II: Interpolation
Objective: To enable the student to use Interpolation Techniques for a given tabulated data
Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton‟s formulae for interpolation – Interpolation with unevenly
spaced points - Lagrange‟s Interpolation formula.(CO2)

UNIT III: Numerical solution of Ordinary Differential equations
Objective: To enable the student to use Numerical Techniques to solve IVPs in ODE
Solution by Taylor‟s series-Picard‟s Method of successive Approximations-Euler‟s Method-
Runge-Kutta Methods.(CO3)

Unit-I V: Functions of a complex variable
Complex function , Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function**,** $C-R$ equations in polar form, Harmonic functions, Milne-Thomson method. (CO4)

UNIT V: Fourier Series & Transforms
Objective: To enable the student to expand a function in Fourier Series& to use Fourier Integral Theorem and Transforms to solve BVPs.
Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series
application: Amplitude, spectrum of a periodic function
Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine

transforms – properties – inverse transforms – Finite Fourier transforms.(CO4,CO5)

Text Books:

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

Reference books:

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

Weblinks: WWW.NPTEL.COM

Description	SUBJECT	L	T	P	C
Course Code	**MATHEMATICS-III (17198203)**	4	0	0	3
Teaching	Total contact hours 65				
Prerequisite (s)	Basic knowledge of Algebra, Trigonometry,Differentiation, Integration, Vectors, co ordinate geometry and matrices.				

Course Objective(s):

1. To use matrix theory to solve linear system of equations
2. To find eigen values and Eigen vectors and use Clayey Hamilton theorem to find Inverse and Powers of a Matrix and also reduce a given Quadratic form to Canonical form.
3. To learn applications of Integration and evaluation of Multiple Integrals.
4. To use Beta, Gamma functions to evaluate Improper Integrals.
5. To use vector differentiation and integration with vector integral theorems

UNIT I: Linear systems of equations

Objective: To enable the student to use Matrix theory to solve linear system of equations**.**
Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- Gauss Elimination - Gauss Jordon and Gauss Seidal Methods.
Application: Finding the current in a electrical circuit. (CO1)

UNIT II: Eigen values - Eigen vectors and Quadratic forms

Objective: To enable the student to find Eigen values and Eigen vectors of a matrix and apply Cayley Hamilton theorem.
Eigen values - Eigen vectors– Properties – Cayley-Hamilton Theorem – **without proof** Inverse and powers of aMatrix by using Cayley-Hamilton theorem- Quadratic forms- Reduction of quadratic form to Canonical form – Rank - Positive, negative definite - semi definite - index – signature.Application: Free vibration of a two-mass system.(CO2)

UNIT III: Multiple integrals

Objective*:* To enable the student to apply integration to find length, volume and surface areas. Also the student will learn evaluations of multiple integrals.
Review concepts of Curve tracing (Cartesian - Polar and Parametric curves)- **No question from this part**
Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple integrals - double and triple integrals – change of variables – Change of order of Integration Application: Moments of inertia.(CO3)

UNIT IV: Special functions

Objective: To enable the student to evaluate improper integrals using Beta, Gamma functions**.**
Beta and Gamma functions- Properties - Relation between Beta and Gamma functions-Evaluation of improper integrals
Application: Evaluation of integrals.(CO4)

UNIT V: Vector Differentiation & Integration

Objective: To enable the student to apply vector differentiation & Integration to physical and engineering situations**.**

Gradient- Divergence-Curl - Laplacian and second order operators -Vector identities (without proof) Application: Equation of continuity, potential surfaces

Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems .application: work done, Force.(CO5)

Text Books:

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

Reference books:

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

Weblinks : WWW.NPTEL.COM

Course Ojectives:

7. For prospective engineers knowledge about water used in industries (boilers etc.) and for drinking purposes is useful; hence chemistry of water of hard water, boiler troubles and modern methods of softening hard water is introduced.
8. Knowledge of galvanic cells, electrode potentials is necessary for engineers to understand corrosion problem and its control. The problems associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them.
9. Plastics are materials used very widely engineering materials. An understanding of properties particularly physical and mechanical properties of polymers / plastics / elastromers helps in selecting suitable materials for different purpose.
10. A board understanding of the more important fuels employed on a large scale is necessary for all engineer to understand energy – related problems and solve them.
11. With the knowledge available now, future engineers should know at least some of the advanced materials that are becoming available. Hence some of them are introduced here.

Description	SUBJECT	L	T	P	C
Course Code	ENGINEERING CHEMISTRY (17198204)	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of theoretical and experimental from +2 level, Application of Chemistry theory and calculations to required course.				

Unit-I

Objective: "For prospective engineers knowledge about water used in industries (boilers etc.) and for drinking purposes is useful; hence chemistry of water of hard water, boiler troubles and modern methods of softening hard water is introduced." (CO1)

Water technology

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

Unit-II

Objective: "Knowledge of galvanic cells, electrode potentials is necessary for engineers to understand corrosion problem and its control, the problems associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them". (CO2)

Electrochemistry & Corrosion

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

Unit-III

Objective: "Plastics are materials used very widely engineering materials. An understanding of properties particularly physical and mechanical properties of polymers / plastics / elastromers helps in selecting suitable materials for different purpose ". (CO3)

High polymers

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

Unit-IV

Objective: "A board understanding of the more important fuels employed on a large scale is necessary for all engineer to understand energy – related problems and solve them". (CO4)

Fuels

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

Unit-V

Objective: "With the knowledge available now, future engineers should know at least some of the advanced materials that are becoming available"(CO5)

Chemistry of advanced materials

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

Text Books:

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

Reference Books:

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

Weblink:

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

Description	SUBJECT	L	T	P	C
Course/ Code	**Engineering Mechanics (17193205)**	**3**	1	-	3
Teaching	**Total contact hours - 64**				
Prerequisite (s)	Engineering Physics				

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

UNIT – I

Introduction to Engg. Mechanics – Basic Concepts.

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

UNIT II

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

UNIT – III

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

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

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

UNIT –I V

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

UNIT – V

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

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

Course Outcomes:

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

TEXT BOOKS:

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

REFERENCES:

1. Engineering Mechanics: statics and dynamics – I.H.Shames, – Pearson Publ.
2. Mechanics For Engineers, dynamics: - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
3. Engineering Mechanics: Fedinand . L. Singer , Harper – Collins

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Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Description	SUBJECT	L	T	P	C
Course Code	**Professional Ethics and Human Values (17198206)**	**3**	**1**	**0**	
Teaching	**Total Contact hours – 65**				
Prerequisite(s)	Knowledge of Economics, Demand analysis, Production Analysis, Fundamentals of Accounting and Ratio analysis.				

Course Objectives:

1. The aim of this subject is to equip the students with moral values which help them in engineering profession.
2. It help them to discover set of justified moral principles and ideals to be endorsed by the engineers
3. To develop reasoning and analytical skills among engineering students.
4. To make the engineering students aware of the safety measures, risk factors and risk analysis.
5. To make the students to identify issues in engineering and management areas

UNIT I:

(To understand the moral values that ought to guide the Engineering profession. It is intended to developed a set of beliefs, attitudes, and habits that engineers should display concerning morality.)

Human values

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

UNIT II:

(Important goal of engineering ethics is the discovery of the set of justified moral principles of obligation, rights and ideals that ought to be endorsed by the engineers and apply them to concrete situations.)

Engineering ethics:

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

UNIT III:

(To impart reasoning and analytical skills need to apply ethical concept to engineering decisions and to Provide an understanding of interface between social technological and natural environments on global issues)

Engineering as social experimentation:

Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics-computers as the Instrument of Unethical behaviour-computers as the object of Unethical Acts-autonomous Computers-computer codes of Ethics-Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

UNIT IV:

(To make the students aware of the safety concepts, risk factors and risk benefit analysis)

Engineers' responsibility for safety and risk:

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

UNIT V:

(To identify the moral issues involved in both management and engineering areas, An understanding of the Engineer's Rights such as collegiality, Conflict of interest, Collective Bargaining.)

Engineer's responsibilities and rights:

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

TEXT BOOKS

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

Reference:

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

Description	SUBJECT	L	T	P	C
Course Code	ENGLISH - COMMUNICATION SKILLS LAB- II (17198211)	0	0	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading,Writing,Listening and Speaking				

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

UNIT 1:
1. Debating
   Practice work

UNIT 2:
1. Group Discussions
   Practice work

UNIT 3:
1. Presentation Skills
   Practice work

UNIT 4:
1. Interview Skills
   Practice work

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

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

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd.

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

Description	SUBJECT	L	T	P	C
Course Code	ENGINEERING CHEMISTRY LAB (17198212)	0	0	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)					

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Effective from 2017-2018 batch

ENGINEERING CHEMISTRY LABORATORY

List of Experiments:

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

Description	SUBJECT	L	T	P	C
Course/ Code	ENGINEERING WORKSHOP(17198213)			3	2
Teaching	Total contact hours - 24				
Prerequisite (s)	Aptitude to learn				

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

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

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

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

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

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

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

Description	SUBJECT	L	T	P	C

Course/ Code	IT WORKSHOP LAB (17198213) Common to (CE, EEE, ME, ECE, CSE, AME, MIN)	0	0	3	3
Teaching	Total contact hours - 50				
Prerequisite (s)	Basic knowledge about Computer				

Course Objective(s):

- To impact the knowledge of various hardware components of a computer
- To provide the skill of assembling the computer.
- To impact the knowledge and usage of various Microsoft tools such as Power Point ,Word and Excel

1. Identify the components of a computer, components in a CPU and its functions. Every student must draw block diagram of the CPU along with the configuration of each peripheral.
2. Every student should disassemble and assemble the PC back to working condition.
3. Every student should individually install windows 7 (professional) on the personal computer. He/She must install the device driver's software, and basic application software's viz., adobe reader, ms-office etc.
4. Each student must able to configure the basic computer management settings of windows components. Each student must familiar to work with MS-DOS command prompt and basic DOS commands.
5. Every student should install Linux on the computer. This computer should have windows installed .The system should be configured as dual boot with both windows and Linux.
6. Several mini tasks would be that covers basic commands in Linux and basic system administration in Linux which includes: Basic Linux commands in Bash, Create hard and symbolic links .Text processing, using wildcards.
7. Web Browsers and Surfing the web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-in like Macromedia Flash and JRE for Applets should be configured.
8. Search Engines and Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.
9. Cyber Hygiene: Students would be exposed to the various threats on internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block popup, block activeX downloads to avoid virus and/or worms.
10. Each student will familiar with Microsoft word and different templates of it for design a RESUME. Creating Project Abstract features to be covered: Formatting styles, inserting table, bullets and numbering, changing text direction, cell alignment.
11. Excel orientation: The student must know the importance of Ms-Excel as a spreadsheet tool, give the details of the four tasks and features that would be covered in each using Excel-Accessing, Overview of toolbars, saving Excel files, using help and resources.
12. Students will be working on basic power point utilities and tools which help them create a basic power point presentation.

Course Outcomes:

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

CO-9. Identify various hardware components of a system
CO-10. Assemble the computer.
CO-11. Use various Microsoft tools.

Course Code : IT Workshop													
Course designed By: Department of Computer Science and Engineering													
	Program Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course Outcomes	CO1	✓											
	CO2			✓									
	CO3					✓							

	CO4					✓							
	CO5	✓		✓		✓							

Category	**General Humanities**	**Basic Sciences**	**Engineering Sciences and Technical**	**Professional Subjects**
			✓	

Mode of Evaluation: Quiz, Assignment, Seminar, Written Examination.

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	BASIC AUTOMOBILE ENGINEERING (17170301)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Not required				

COURSE OBJECTIVES:

To make the student able to

1. Compare different types of automobiles and their components.
2. Differentiate working principles of different types of automobile engines.
3. Illustrate working of different transmission elements and control systems.
4. Distinguish the functions of auxiliary systems.
5. Implement different types of safety systems.
6. Judge effective pollution reduction methods.

UNIT-I

Introduction to Automobiles & Engines: Functions and characteristics of different types of automobiles and their power sources. Specifications, Performance Parameters, Quality standards, Trends in automobile design. Engine Specifications with regard to power, speed, torque, no.of cylinders and arrangement, lubrication and cooling etc. Reciprocating Engines, Rotary Engines.
Engine Lubrication systems, splash and pressure lubrication systems, oil filters, oil pumps, Engine cooling system, Engine fuel systems, Engine intake & exhaust systems.

UNIT-II

Transmission Systems: Clutches, principle of operations, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel-gear boxes, types, sliding mesh, constant mesh, synchro- mesh gear boxes, over drive, torque converter. propeller shaft, Torque tube drive, universal joint & slip joint, Hotch-kiss drive , differential rear axles-types-wheels and tyres.

UNIT-III

Steering, Braking and Suspension Systems: Steering geometry-camber, castor, king pin rake, combined angle toe-in, center point steering. types of steering mechanism-Ackerman steering mechanism, steering gears-types, steering linkages. Mechanical, hydraulic, pneumatic & vacuum brakes-brief description, anti lock brake system (ABS) and electromagnetic retarder. Telescopic suspension, Rigid axle suspension and independent suspension, Shock absorbers, Torsion bar, Stabilizer, Different types of springs used in automobile suspension.

UNIT-IV

Auxiliary Systems: Electrical and electronic systems, voltage regulators, bendix drive mechanism solenoid switch, lighting system, horn, wiper, fuel gauge, Heating, Ventilation, and Air Conditioning (HVAC) systems, Vehicle Thermal Management System and Vehicle body design features, Tipping Systems(lifting).

UNIT-V

Vehicle Safety Systems & Eco Friendly Systems: Safety: Introduction to safety systems, seat belt, air bags, bumper, wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.

Different pollutants from automobiles and their sources, formation, Effects of pollution on environment, human. Regulations, Emission standards. Pollution control methods.

COURSE OUTCOMES

After successful completion of the course, a successful student will be able to-

CO1: Compare different types of automobiles and their components.
CO2: Differentiate working principles of different types of automobile engines.
CO3: Implement different types of safety systems.
CO4: Judge effective pollution reduction methods.

TEXT BOOKS:

1. Automotive Mechanics, William H Crouse and Donald L Anglin, Tata McGraw – Hill Publishing Co. Ltd. 2004, 10th Edition.
2. Automobile Engineering – R.B. Gupta.
3. Automobile Engineering (Vol. 1) – Dr. Kirpal Singh
4. Automobile Engineering (Vol. 2) – Dr. Kirpal Singh

REFERENCES:

1. Automobile Engineering --- G.B.S. Narang.
2. IC Engines – V.Ganeshan/TMH
3. IC Engines – ML Mathur & RP Shrma
4. IC Engines – Domkundvar
5. BP Obert IC Engines & Air Pollution – Harper & Row pub.
6. Bosch Gasoline Engines Management – Bosch Pub.
7. Bosch Diesel Engine Management – Bosch Pub.

Course Code :		BASIC AUTOMOBILE ENGINEERING											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓									
	CO 2		✓	✓									
	CO 3				✓								
	CO 4							✓					
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical			Professional Subjects				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	METALLURGY & MATERIALS SCIENCE (17170302)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Physics, Engineering Chemistry				

COURSE OBJECTIVES:

To make the student able to

1. Adapt the science and fundamentals of materials
2. Select the material for requirement
3. synthesize the regions of stability of phases that occur in the systems
4. Create the materials by alloying, heat treatment

UNIT – I

Structure of Metals and Constitution of alloys: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT –II

Equilibrium Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cus-Sn and Fe-Fe3C.

UNIT –III

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

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

UNIT – IV

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

Introduction to powder metallurgy – Basic Principles.

UNIT – V

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

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

COURSE OUTCOMES:

After successful completion of the course, a successful student will be able to-

CO1: Enhance students' ability to understand the science and fundamentals of materials
CO2: Select the material for requirement
CO3: Synthesize the regions of stability of phases that occur in the systems
CO4: Vary the properties of a material depends on requrement

TEXT BOOKS:

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

REFERENCES:

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

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Course Code :		**Metallurgy & Material Science**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓		✓									
	CO 2		✓										
	CO 3		✓										
	CO 4									✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MECHANICS OF SOLIDS (17170303)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Mechanics				

COURSE OBJECTIVES:

To make the student able to

1. Analyze the solids and structure to find the stress and strain
2. Determine the mechanical properties of a material
3. Apply principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition in linear solids and structures
4. Analyze determinate and indeterminate axial members, torsional members, and beams to determine axial forces, torque, shear forces, and bending moments

UNIT – I

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

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

UNIT – II

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

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

UNIT – III

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

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

UNIT – IV

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

Thick Cylinders: Stresses in a thick cylindrical shell, lame's equation – cylinders subjected to inside & outside pressures – stresses in compound thick cylinders.

UNIT – V

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

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

COURSE OUTCOMES:

After successful completion of the course, a successful student will be able -

1. Analyze the solids and structure to find the stress and strain
2. Determine the mechanical properties of a material
3. Apply principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition in linear solids and structures
4. Analyze determinate and indeterminate axial members, Torsional members, and beams to determine axial forces, torque, shear forces, and bending moments

TEXT BOOKS:

1. Strength of materials by R.K.Bansal , Laxmi Publications .
2. Strength of materials by Bhavikatti, Lakshmi publications.
3. Strength of materials by RK Rajput, S Chand publications.
3. Solid Mechanics, Schaum's Outline series

REFERENCES:

1. Analysis of structures by Vazirani and Ratwani.
2. Strength of Materials by S.Timshenko
3. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

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Course Code :		**MECHANICS OF SOLIDS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓	✓										
	CO 2		✓										
	CO 3	✓											
	CO 4	✓								✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	THERMODYNAMICS (17170304)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Chemistry				

COURSE OBJECTIVES:

To make the student to

1. Apply the basic concepts of thermal sciences and their application to in formulating the thermal engineering problems.
2. Have a good understanding of first and second laws of thermodynamics and will be in
3. A position to fully understand the analysis to be taught at the higher levels.
4. Be in a position to check the feasibility of proposed processes and cycles using the ideas of second law of thermodynamics and entropy.

UNIT – I

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

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

UNIT – II

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

UNIT – III

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

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

UNIT-IV

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

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

UNIT V

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

COURSE OUTCOMES:

After successful completion of the course, a successful student will be able -

1. Be able to have the basic concepts of thermal sciences and their application to in formulating the thermal engineering problems.
2. Have a good understanding of first and second laws of thermodynamics and will be in
3. A position to fully understand the analysis to be taught at the higher levels.
4. Be in a position to check the feasibility of proposed processes and cycles using the ideas of second law of thermodynamics and entropy.

TEXT BOOKS :

1. Engineering Thermodynamics , PK Nag 4th Edn , TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles , 7th Edn - McGrawHill

REFERENCES :

1. Engineering Thermodynamics – Jones & Dugan PHI
2. Thermodynamics – J.P.Holman , McGrawHill
3. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.
4. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.

Useful Web-links: http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

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Course Code :		**THERMODYNAMICS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓					✓						
	CO 2	✓					✓						
	CO 3		✓										
	CO 4						✓						
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	INDUSTRIAL ENGINEERING & MANAGEMENT (17170305)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not required				

COURSE OBJECTIVES:

To make the student able to-

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

UNIT – I

Introduction:

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

UNIT – II

Plant - Facility Location & Lay-out

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

UNIT – III

Production & Work Study

Production –Types of Production- Advantages and disadvantages - Aggregate Production Planning.

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

UNIT – IV

Quality Management:

Quality – DMAIC Cycle – Life cycle approach - Quality costs- Inspection - Control Charts – Numerical Examples on X Bar – R Charts, C Charts and P Charts - Seven QC tools. TQM basic

Concepts -Zero Defects – Quality Circles – ISO Quality Systems, 5S, Six Sigma, Quality Function Deployment, Kaizen.

Innovative Industrial Engineering Techniques

Materials Management - Inventory Management – Selective Inventory Control techniques –ABC-VED-FSN- Surplus Disposal. MRP1 and MRPII, Supply Chain Management, ERP, Value Engineering – Value Analysis

UNIT – V

Project Management

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

COURSE OUTCOMES:

After successful completion of the course, successful student will be able to

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

TEXT BOOKS:

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

REFERENCES:

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

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

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Course Code :		**INDUSTRIAL ENGINEERING & MANAGEMENT**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓										
	CO 2			✓									
	CO 3					✓							
	CO 4											✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	COMPUTER AIDED ENGINEERING DRAWING PRACTICE (17170376)	-	-	6	2
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Drawing				

COURSE OBJECTIVES :

To make student able

1. To understand and appreciate the importance of Engineering Graphics.
2. To understand the basic principles of Technical/Engineering Drawing.
3. To understand the different steps in producing drawings according to BIS.
4. To learn basic engineering drawing formats.

UNIT-I:

Projections Of Planes & Solids : Projections of Regular Solids inclined to both planes – Auxiliary Views. Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

Development And Interpenetration Of Solids: Development of Surfaces of Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.

Interpenetration of Right Regular Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT-II:

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

Transformation of Projections: Conversion of Isometric Views to Orthographic Views – Conventions.

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

In part B computer aided drafting is to be introduced.

UNIT III:

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

UNIT IV:

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

UNIT V:

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

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COURSE OUTCOMES:

After successful completion of the course, successful student will be able to

1. Develop Engineering Graphics.
2. Use modern engineering software tools
3. Use and follow the ISO and BIS standards
4. Design various components of an automobile

TEXT BOOKS :

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

REFERENCES:

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Course Code :		**COMPUTER AIDED ENGINEERING DRAWING PRACTICE**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1						✓						
	CO 2					✓							
	CO 3	✓											
	CO 4			✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOBILE CHASSIS COMPONENTS LAB (17170311)	-	-	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)	Lubrication principles, Simple machines, Classical mechanics, Engineering Drawing.				

COURSE OBJECTIVES:

1. To differentiate different types of automobiles.
2. To demonstrate different types of chassis and bodies.
3. To analyze different power transmission elements
4. To classify and contrast different vehicle control systems.

LIST OF EXPERIMENTS:

1. Identification, location, study and preparation of schematic layout of automobile vehicle and its components.
2. Study of types of Clutches.
3. Study of types of Gear Boxes.
4. Study of types of Propeller Shafts & Differentials.
5. Study of types of Steering Gear Boxes.
6. Study of Suspension Systems.
7. Study of types of Brakes.
8. Study of types of Front Axle & Rear Axle.
9. Study of types of Tyres.
10. Study of types of Frames.

COURSE OUTCOMES:

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

1. Differentiate different types of automobiles.
2. Demonstrate different types of chassis and bodies.
3. Analyze different power transmission elements
4. Classify and contrast different vehicle control systems.

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Course Code :		**AUTOMOBILE CHASSIS COMPONENTS LAB**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓										
	CO 2											✓	✓
	CO 3		✓										
	CO 4												✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, I Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MECHANICS OF SOLIDS & FLUID MECHANICS LAB (17170312)	-	-	3	2
Teaching	Total contact hours - 42				
Prerequisite(s)	Engineering Mechanics, Fluid properties and principles				

COURSE OBJECTIVES:

1. To make the student able to determine the strength of the materials
2. To make the student able to analyse the failure.
3. To make the student able to analyse the behaviour of the fluid in flow conditions
4. To make the student able to analyse the performance of hydraulic machines.

(A) MECHNICS OF SOLIDS LAB:

1. Direct tension test
2. Bending test on

a) Simple supported

b) Cantilever beam

3. Torsion test
4. Hardness test

a) Brinells hardness test

b) Rockwell hardness test

5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

(B) FLUID MECHANICS LAB

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

1. Impact of jets on Vanes.
2. Performance Test on Single Stage Centrifugal Pump.
3. Performance Test on Reciprocating Pump.
4. Calibration of Venturimeter.
5. Calibration of Orifice meter.
6. Determination of friction factor for a given pipe line.

7. Determination of loss of head due to sudden contraction in a pipeline.
8. Turbine flow meter.

Note : Any 6 of the above 8 experiments are to be conducted

COURSE OUTCOMES:
After successful completion of this course, successful student able to

1. To make the student able to determine the strength of the materials
2. To make the student able to analyse the failure.
3. To make the student able to analyse the behaviour of the fluid in flow conditions
4. To make the student able to analyse the performance of hydraulic machines

Course Code :		**MECHANICS OF SOLIDS & FLUID MECHANICS LAB**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓										
	CO 2											✓	✓
	CO 3		✓										
	CO 4												✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	KINEMATICS OF MACHINERY (17170401)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Mechanics, Strength of Materials, Engineering Drawing.				

COURSE OBJECTIVES:

To make the student able to

1. Create the motion of the component and design the basic geometry of the mechanisms.
2. Determine the velocities and acceleration of the machine members.
3. Design and develop the mechanism
4. Determine the degrees of freedom for a particular combination of linkages

UNIT – I

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

UNIT – II

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

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

UNIT – III

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

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

UNIT – IV

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

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

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UNIT – V

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

Gear Trains :

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

COURSE OUTCOMES:

After successful completion of this course, successful student able to-

1. Create the motion of the component and design the basic geometry of the mechanisms.
2. Determine the velocities and acceleration of the machine members.
3. Design and develop the mechanism
4. Determine the degrees of freedom for a particular combination of linkages

TEXT BOOKS:

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

REFERENCES:

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

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Course Code :		**KINEMATICS OF MACHINERY**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓						✓			
	CO 2		✓				✓						
	CO 3			✓									
	CO 4		✓										
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOTIVE ENGINES (17170402)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Chemistry of combustion, Modes of heat transfer, Fluid Mechanics, Engineering Materials, Lubrication principles.				

COURSE OBJECTIVES:

To make the student able to

1. Get knowledge in automotive engine in detail, understand the terminology, construction and principle of operation of various engine components.
2. Understand working of various engine systems such as cooling and lubrication systems
3. Understand combustion principles and fuel supply systems
4. Get awareness regarding pollution caused by automobiles and their controlling methods.

UNIT-1

Objectives: To make the students understand the development in internal combustion engines, classification and constructional details,

Introduction: Historical development of Automobiles, Different Types of Automotive Power plants, principles of I.C engines, supercharging and turbo charging.

Two stroke and four stroke engines: different types of scavenging systems, scavenging efficiency. Valve and Port timing diagrams, Special types of I.C engines like Stirling, Wankle rotary, Variable compression ratio engines and Variable valve timing engines.

Automobile engine components: Classification, Function, Materials, Constructional details and Manufacturing process of various engine components.

UNIT-2

Objectives: To understand the importance of lubrication systems and cooling system for effective functioning of IC engines.

Lubrication systems: Characteristics of lube oils, Functions of the lubrication system, classification of lubricating oils, lubricating systems- wet sump lubrication- dry sump lubrication, oil filters, oil pumps, crankcase ventilation, oil additives.

Cooling systems: Air and water cooling systems, thermo siphon and forced water cooling systems. Types of fans- Viscous fan / EMFC, Characteristics of coolant oil.

UNIT-3

Objectives: To make the students understand the fuel admission in S.I engines and related systems.

SI engine fuel systems: Mixture requirements in S.I engines, fundamental of carburetion flow characteristics of carburetion, Methods of mixture correction, calculation of throat and jet sizes of a

carburetor, Types of carburetors and working. Timed and continuous injection systems, multipoint fuel injection system, Introduction to Gasoline Direct Injection (GDI).

Advantages of petrol injection, need to have a closed loop control over air fuel ratio in S.I engines for emission reduction, cylinder port and the manifold injection systems

UNIT-4

Objectives: To make the students understand the fuel admission in C.I engines and understand the functioning of various components involved in fuel injection in C.I engines and Governors.

C.I engine fuel systems: Fuel filters, transfer pumps, injection pumps, injection nozzles, their functions, Diesel fuel pumps: principle delivery characteristics of fuel pumps, effects of ignition lag on injection, pressure waves in fuel lines, rotary distributor pumps. Factors affecting atomization and vaporization.

Fuel spray characteristics: Types of injection nozzles and their characteristics, Multihole, Pintle and Pintaux nozzles. Unit injectors. Common Rail Direct Injection.

Governors: Maximum and minimum speed governors. Mechanical and pneumatic governors, Electronic Governors.

UNIT-5

Objectives: To make the students understand the combustion phenomenon in S.I & CI engines and learn about the fuel characteristics.

Combustion in IC engines:

Combustion in S.I engines: Normal combustion and Abnormal combustion- Importance of flame speed and effect on engine variables- Types of abnormal combustion, pre-ignition and knocking (explanation of)- Fuel requirements and fuel ratings, Anti-knock additives- Combustion chamber- Requirements, types.

Combustion in C.I engines: Four stages of combustion- Delay period and its importance- Effect of engine variables- Diesel Knock- Need for air movement, suction, compression and combustion induced turbulence- open and divided combustion chambers and nozzles used- fuel requirements and fuel rating. Types of turbochargers

COURSE OUTCOMES:

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

1. Get knowledge in automotive engine in detail, understand the terminology, construction and principle of operation of various engine components.
2. Understand working of various engine systems such as cooling and lubrication systems
3. Understand combustion principles and fuel supply systems
4. Get awareness regarding pollution caused by automobiles and their controlling methods.

TEXTBOOKS:

1. M L MATHUR & R P SHARMA- A course in Internal combustion engines- Dhanpat Rai
2. V. GANESAN- TMH- I.C ENGINES
3. K. NEWTON and STEEDS- The Motor Vehicle, SAE Publications

REFERENCES BOOKS:

1. B.P. OBERT I C ENGINES & AIR POLLUTION- Harper & ROW Publications
2. BOSCH GASOLINE & DIESEL MANAGEMENT- Bosch Publication

Course Code :		**AUTOMOTIVE ENGINES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓		✓									
	CO 2	✓		✓									
	CO 3			✓									
	CO 4							✓					
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	BASIC ELECTRICAL & ELECTRONICS ENGINEERING (17170403)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)					

COURSE OBJECTIVES:

1. Analyze the various electrical networks.
2. Understand the operation of DC generator, 3-point starter and conduct the Swinburne's test.
3. Analyze the performance of transformer, operation of three phase alternator and 3-phase induction motors.
4. Analyze the operation of half wave, full wave rectifiers, op-amps and explain the single stage CE amplifier and concept of feedback amplifier.

UNIT-1

Electrical Circuits:

Basic definitions, types of network elements, ohm's law, Kirchhoff's law, inductive networks, capacitive networks, series, parallel circuits, star – Delta and Delta – Star transformations.

UNIT-II

DC Machines:

Principle of operation of DC generator – emf equation, types, DC motor types, torque equation, applications, three point starter, swinburn's test, speed control methods.

UNIT-III

AC Machines:

Principle of operation of single phase transformers, e.m.f. equation, efficiency and regulation.
Principle of operation of alternators, principle of operation of 3-phase induction motor - slip-torque characteristics, efficiency.

UNIT-IV

Rectifiers and Linear IC's:

PN junction diodes, diode applications-half wave and bridge rectifiers. Characteristics of operation amplifiers(OP-AMP) – application of OP-AMPS (inverting, Non inverting, integrator and differentiator).

UNIT-V

Transistors:

PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

COURSE OUTCOMES:

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

1. Analyse the various electrical networks.
2. Understand the operation of DC generator, 3-point starter and conduct the swinburne's test.

3. Analyse the performance of transformer, operation of three phase alternator and 3-phase induction motors.
4. Analyse the operation of half wave, full wave rectifiers, op-amps and explain the single stage CE amplifier and concept of feedback amplifier.

TEXT BOOKS:

1. Electronic Devices and Circuits, R.L.Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
2. Electrical Technology by surinder pal bali, pearson publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group

REFERENCE BOOKS:

1. Basic electrical engineering by M.S. Naidu and S.Kalnakshiah, TMH Publications
2. Fundamentals of electrical engineering by rajendra Prasad, PHI Publications, 2th edition
3. Basic electrical engineering by Nagasarlcar, sukhija, Oxford publications, 2nd edition
4. Industrial electronics by GK Mittal, PHI

Course Code :		**Basic Electrical and Electronics Engineering**											
Course Designed by		Department of Electrical and Electronics Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓											
	CO 2	✓	✓										
	CO 3	✓					✓						
	CO 4	✓		✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	FLUID MECHANICS & HYDRAULIC MACHINERY (17170404)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)					

COURSE OBJECTIVES:

To make the student able to

1. Describe basic working of single and multi-stage centrifugal pumps and blowers.
2. Calculate performance and design of turbines
3. Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory
4. State and visualize fluid kinematics. predict and design a fluid dynamical system based on inviscid theory.

UNIT I

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

UNIT II

Fluid kinematics: stream line, path line and streak lines and stream tube, classification of flows-steady & Unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow.

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III

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

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

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

UNIT IV

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

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design – draft tube- theory- functions and efficiency.

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

UNIT V

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

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

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Describe basic working of single and multi-stage centrifugal pumps and blowers.
2. Calculate performance and design of turbines
3. Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory
4. State and visualize fluid kinematics. predict and design a fluid dynamical system based on inviscid theory.

TEXT BOOKS:

1. Fluid Mechanics and Hydraulic Machines by Bansal.
2. Hydraulics, fluid mechanics and Hydraulic machinery by Modi and Seth.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Course Code :		**FLUID MECHANICS & HYDRAULIC MACHINERY**											
Course Designed by		Department of Electrical and Electronics Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓											
	CO 2			✓									
	CO 3									✓			
	CO 4	✓											
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MANUFACTURING PROCESSES (17170405)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)					

COURSE OBJECTIVES:

To make the student able to

1. Differentiate and choose the manufacturing process
2. Analyze the manufacturing process.
3. Apply principles of production techniques and be able to fabricate basic parts.
4. Organize the manufacturing process

UNIT – I

CASTING: Steps involved in making a casting – Advantage of casting and its applications. – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems

UNIT – II

Methods of melting and types of furnaces, Solidification of castings, Solidification of pure metals and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, Basic principles and applications of Centrifugal casting, Die casting and Investment casting.

UNIT – III

Welding : Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting.

Basic principles of Arc welding, Manual metal arc welding, Sub merged arc welding, Inert Gas welding- TIG & MIG welding.

Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma welding, Laser welding, electron beam welding, Soldering & Brazing.

Heat affected zones in welding; pre & post heating, Weldability of metals, welding defects – causes and remedies – destructive and nondestructive testing of welds, Design of welded joints

UNIT – IV

Plastic deformation in metals and alloys, hot working and cold working, Strain hardening and Annealing.

Bulk forming processes: Forging - Types Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

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

UNIT – V

Sheet metal forming - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Springback and its remedies, Coining, Spinning, Types of presses and press tools.

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

COURSE OUTCOMES:

After successful completion of these course, succesful student able to

1. Differentiate and choose the manufacturing process
2. Analyse the manufacturing process .
3. Apply principles of production techniques and be able to fabricate basic parts.
4. Organise the manufacturing process

TEXT BOOKS:

1. Manufacturing Processes for Engineering Materials - Kalpakjian S and Steven R Schmid- Pearson Publ , 5th Edn.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH
3. Fundamentals of Modern Manufacturing - Mikell P Groover- Wiley publ – 3rd Edition

REFERENCES :

1. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd
2. Process and materials of manufacture- Lindberg- PHI
3. Production Technology- R.K. Jain- Khanna
4. Production Technology-P C Sharma-S. Chand
5. Manufacturing Processes- H.S. Shaun- Pearson
6. Manufacturing Processes- J.P. Kaushish- PHI

Useful Web-links : http://nptel.ac.in/courses.php
http://mit.espe.edu.ec/courses/mechanical-engineering/

Course Code :		**Manufacturing Processes (17170405)**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓											
	CO 2			✓									
	CO 3									✓			
	CO 4			✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**				**Professional Subjects**			
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year B.Tech. – II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	SOFT SKILLS-1 (17179406)	1	2	-	1
Teaching	Total contact hours - 60				
Prerequisite (s)					

UNIT 1: PLACES		Theory/Lab	Time frame
Reading	Introducing the theme; Scanning for information/numbers; understanding key vocab; making predictions	Punctuation Understanding unknown text	
Writing	Punctuation, sentence structure, writing different sentences		
Listening & Pronunciation	listening for main ideas/details; wordstress vowel sounds	Lab	
Speaking	Organizing information for a presentation; Making a presentation	Lab	
Grammar	Parts of speech: Nouns, verbs and adjectives; Subject + verb; There is / There are; Past simple		
Vocabulary	Vocabulary to describe places		
UNIT 2: FESTIVALS AND CELEBRATIONS		Theory/Lab	Time frame
Reading	Previewing a text using the title, sub-titles and photographs; recognizing text types, skimming the text	Pre-reading requires viewing of a video	
Writing	Organizing sentences into a paragraph; writing a first draft; writing paragraph :descriptive ,narrative etc.		
Listening & Pronunciation	Listening and taking notes; listening for examples; Stressed words and unstressed sounds	Lab	
Speaking	Making suggestions; Giving a poster presentation, understanding intonation	Lab	
Grammar	Prepositions of time and place: *on, in, at;* Adverbs of frequency; Sentence structure: subject and verb order; Prepositional phrases; Present tense question forms		
Vocabulary	Vocabulary to describe festivals; Collocations		
UNIT 3: SCHOOL AND EDUCATION		Theory/Lab	Time frame
Reading	Skimming for main ideas; reading for details; making inferences	Pre-reading requires viewing of a video	

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Writing	Paragraph organization: topic sentence and supporting sentences, selection of type of paragraph, ordering and sequencing		
Listening & Pronunciation	Using visual clues to listen; following native accent and intonation	Lab	
Speaking	Giving opinions in a debate: agreeing and disagreeing,convincing	Lab	
Grammar	Tense and aspect, use of *because* and *so;* basic verb patterns		
Vocabulary	Vocabulary in academic context; Collocations about learning; Prepositional phrases		
UNIT 4: THE INTERNET AND TECHNOLOGY		Theory/Lab	Time frame
Reading	Understanding theme; Scanning to predict content; Making inferences	Pre-reading requires viewing of a video	
Writing	Describing an ordering steps,structurizing information		
Listening & Pronunciation	Listening for reasons; Listening and predicting the inner theme and conclusion ,consonant sounds	Lab	
Speaking	Presenting additional or contrasting information;	Lab	
Grammar	Compound nouns; *and, also* and *too*; *but* and *however; can / be able to*		
Vocabulary	Vocabulary for Internet and technology		
UNIT 5: LANGUAGE AND COMMUNICATION		Theory/Lab	Time frame
Reading	Reading for main ideas, identifying the meaning, preparing captions	Pre-reading requires viewing of a video	
Writing	Writing supporting sentences; Reviewing a paragraph for content and structure, report writing ,types of report		
Listening & Pronunciation	Listening for genre; Listening for instructions; Consonant sounds	Lab	
Speaking	Sequencing words to organize instructions; Planning and giving a set of instructions	Lab	
Grammar	Countable and uncountable nouns; Articles *a, an* or no article; Quantifiers: *some, many, a lot of, a few, a little;* Imperative clauses; Verb patterns		
Vocabulary	Vocabulary for every day communication		

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MACHINE DRAWING (17170477)	-	-	3	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Computer Aided Engineering Drawing Practice				

COURSE OBJECTIVES:

To make the student able to

1. Adapt International standards
2. Assemble the parts of an any mechanical component
3. Communicate through the drawings
4. Model simple assembly drawings and prepare detailed part drawings with geometric dimensioning and tolerance

Machine Drawing Conventions:

Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
d) Title boxes, their size, location and details - common abbreviations & their liberal usage
e) Types of Drawings – working drawings for machine parts.

I. Drawing of Machine Elements and simple parts

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

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Keys, cottered joints and knuckle joint.
c) Rivetted joints for plates
d) Shaft coupling, spigot and socket pipe joint.
e) Journal, pivot and collar and foot step bearings.

II. Assembly Drawings:

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
c) Valves: Steam stop valve, spring loaded safety valve, feed check valve and air cock.

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

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COURSE OUTCOMES:

After successful completion of these course, succesful student able to

1. Adapt International standards
2. Assemble the parts of an any mechanical component
3. Communicate through the drawings
4. Model simple assembly drawings and prepare detailed part drawings with geometric dimensioning and tolerance

TEXT BOOKS:

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

REFERENCES:

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

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

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

Course Code :		**Machine Drawing**											
Course Designed by		Department of Electrical and Electronics Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓											
	CO 2	✓					✓						
	CO 3	✓								✓			
	CO 4	✓		✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	ENGINE COMPONENTS & TESTING LAB (17170411)	-	-	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)	Chemistry of combustion, Modes of heat transfer, Fluid Mechanics, Engineering Materials, Lubrication principles.				

COURSE OBJECTIVES:

To make the student able to

1. Assemble and Dis-assemble the engines
2. Conduct performance test and Analyse the performance of an various engines
3. Decide the valve and port timing
4. Conduct the tests on fuels and lubricants and determine its properties

LIST OF EXPERIMENTS:

1. Dismantling and Assembly of 2 Stroke and 4 Stroke Engines.
2. Testing of IC Engine –Measurement of Speed, Fuel flow, Air consumption and measurement of BHP.
3. Determination of IHP, BHP, Mechanical efficiency, brake thermal efficiency, indicated thermal efficiency, volumetric efficiency, SFC and drawing heat balance sheet for petrol and diesel engines.
4. Test on multi cylinder engines, Morse test
5. Valve and port timing diagrams, determination of compression ratio
6. Tests on fuels and lubricants.
   a. Viscosity-Viscometer Redwood
   b. Viscosity Index – Saybolt Viscometer
   c. Flash and Fire Points of fuels Flash and Power points of Lubricants
   d. Calorific Value of Liquid Fuels Calorific Value of Gaseous Fuels
   e. Density Test of Petrol/ Diesel
7. Performance test on VCR (Variable Compression Ratio) Engine.

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COURSE OUTCOMES:

1. Assemble and Dis-assemble the engines
2. Conduct performance test and Analyse the performance of an various engines
3. Decide the valve and port timing
4. Conduct the tests on fuels and lubricants and determine its properties

Course Code :		**ENGINE COMPONENTS & TESTING LAB**											
Course Designed by		Department of Electrical and Electronics Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓	✓										
	CO 2	✓	✓				✓						
	CO 3	✓	✓							✓			
	CO 4	✓	✓	✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME II Year, II Semester

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	BASIC ELECRICAL & ELECTRONICS ENGINEERING LAB (17170412)	-	-	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)					

Course Objectives:

1. To calculate the efficiencies of transformers, DC motors, Three-phase Induction Motor
2. To plot the performance characteristics of DC shunt motor and calculate Regulation of alternator
3. To plot the characteristics of PN junction diode, Transistor, Rectifiers, and CE amplifier
4. To design the RC phase shift oscillator and observe the characteristics of power amplifier

Any five experiments are to be conducted from each part.

PART -A

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

PART-B

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

COURSE OUTCOMES

After completion of the lab, the students able to

CO1: Calculate the efficiencies of transformers, DC motors, Three-phase Induction Motor
CO2: Plot the performance characteristics of DC shunt motor and calculate Regulation of alternator
CO3: Plot the characteristics of PN junction diode, Transistor, Rectifiers, and CE amplifier
CO4: Design the RC phase shift oscillator and observe the characteristics of power amplifier

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Course Code	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**											
Course Designed by		Department of Automobile & Mining Engineering										
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓			✓								
	CO 2	✓				✓							
	CO 3	✓											
	CO 4	✓											

Category	**General Humanities**	**Basic Sciences**	**Engineering Sciences And Technical**	**Professional Subjects**
			✓	

Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	DYNAMICS OF MACHINERY (17170501)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Kinematics of Machinery				

COURSE OBJECTIVES:

To make student able to

1. Analyze, choose and diagnose the battery.
2. Select, analyze and diagnose the ignition, charging system and alternator
3. Incorporate electrical systems in a vehicle
4. Analyze, Establish and diagnose the electronic control systems

UNIT–I

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

UNIT–II

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

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

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

UNIT–III

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

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

UNIT–IV

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

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UNIT–V

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

Course Outcomes:

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

CO-1. Analyze stabilization of sea vehicles, aircrafts and automobile vehicle
CO-2. Compute frictional losses, torque transmission of mechanical systems
CO-3. Analyze dynamic force analysis of slider crank mechanism and design of flywheel
CO-4. Describe how to determine the natural frequencies of continuous systems starting from the general equation of displacement
CO-5. Estimate the unbalanced forces in reciprocating and rotary masses

TEXT BOOKS:

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

REFERENCES:

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

Course Code :		DYNAMICS OF MACHINERY											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✔											
	CO 2		✔										
	CO 3						✔						
	CO 4							✔					
	CO 5			✔									
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical			Professional Subjects				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOTIVE ELECTRICAL AND AUTOTRONICS (17170502)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	BASIC AUTOMOBILE ENGINEERING,BEEE				

COURSE OBJECTIVES:

To make student able to

1. Analyse, choose and diagnose the battery.
2. Select, analyse and diagnose the ignition, charging system and alternator
3. Incorporate electrical systems in a vehicle
4. Analyse, Establish and diagnose the electronic control systems

UNIT-I

Storage Battery: Types of batteries, Principles of lead acid cells and their characteristics. construction and working of lead acid battery. testing of batteries, effect of temperature on capacity and voltage, battery capacity, voltage, efficiency, charging of batteries, sulphation and desulphation, maintenance and servicing. Fault diagnosis. New developments in electrical storage.

UNIT-II

a)Ignition System: Conventional ignition system and study of its components. Types of ignition systems, spark advance and retarding mechanisms. Types of spark plugs.

b)Starter motor: Construction and working of series and shunt automotive starter motor, starter motor troubles and repairs.

c)Charging system: Principle of generation of direct current. construction and working of alternator generating systems. Maintenance, servicing and trouble shooting. compact alternator.

UNIT-III

Wiring for auto electrical Systems: Earth return and insulated return systems, six volt and twelve volt systems, fusing of circuits, low and high voltage automotive cables, wiring diagram for typical automotive wiring systems, maintenance and servicing.

Dash board units and electrical accessories: Principle of automobile illumination, head lamp construction and wiring, horn, wind screen wiper signaling devices, fog lamps, auxiliary lighting , temperature gauge, oil pressure gauge, fuel gauge, speedometer, odometer, Central locking, Power windows.

UNIT-IV

Sensors: Sensors - Air flow, Pressure, Temperature, Speed, Exhaust gas Oxygen, Knock and Position, Principle of operation, construction and characteristics.

Electronic Gasoline Injection Systems: Open loop and closed loop systems, Mono-point, Multi-point, Direct injection systems and Air assisted systems – Principles and Features, Types of injection systems, Idle speed, lambda, knock and spark timing control.

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UNIT – V

Electronic Diesel Injection Systems: Heat release, control of fuel injection, Inline injection pump, Rotary Pump and Injector– Construction and principle of operation, Electronic control, Common rail and unit injector systems – Construction and principle of operation.

Electronic Control Systems: Electronic ignition systems, Antilock brake system circuit, Traction control, Electronic control of automobile transmission, Active suspension, Engine management system, ESP, EEA, AMT, ECAS, GPS (Telematics), SLD.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Analyse, choose and dignose the battery.
2. Select, analyse and diagnose the ignition, charging system and alternator
3. Incorporate electrical systems in a vehicle
4. Analyse, Establish and diagnose the electronic control systems

TEXTBOOKS

1. Automotive Electrical auxiliary systems -By N. R. Khatawale
2. Automotive Electrical & Electronic Systems - Tom Denton, SAE International
3. Automobile Electrical & Electronic Equipments- Young, Griffithe, The English Language book co., London
4. Understanding Automotive Electronics- William B.Ribbens-ELSEVIER
5. Gasoline Engine management, 3rd Edition, Robert Bosch, Bently pub., 2004
6. Diesel Engine Management, 4th Edition, Robert Bosch, Newness Publications, 2005

REFERENCES

1. Automotive Electrical systems -By Young and Griffith, Butterworth
2. Basic automotive electrical systems -By C.P.Nakra, Dhanpat Rai.
3. Automotive mechanics -By William H. Grouse, TMH
4. Automotive Electrical Equipment -By P.l. Kohli, TMH

Course Code :		**AUTOMOTIVE ELECTRICAL AND AUTOTRONICS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓										
	CO 2		✓										
	CO 3		✓	✓									
	CO 4		✓							✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	DESIGN OF AUTOMOBILE COMPONENTS (17170503)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Mechanics, Mechanics of Solids				

Course Objectives:

To make the student able to

1. Apply theories of failures and estimate strength of a machine member
2. Design a riveted, welded and bolted joints and choose the joining process
3. Design, analyse and choose shafts and couplings
4. Design, analyse the various engine parts

UNIT – I

Introduction: General considerations in the design of Engineering Materials and their properties – Manufacturing consideration in design. Tolerances and fits –BIS codes of steels.

Stresses in Machine Members: Simple stresses – Combined stresses – Torsional and bending stresses - Various theories of failure – factors of safety – Design for strength and rigidity – preferred numbers. Static strength design based on fracture toughness.

Strength of Machine Elements : Stress concentration –Fatigue stress concentration factor-notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line – Modified goodman's line.

UNIT – II

Rivited and welded joints – Design of joints with initial stresses, Bolted joints – Design of bolts with pre-stresses – both of uniform strength.

UNIT – III

Shafts, keys and cotters:

Shafts : Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter.

Couplings: Design of Rigid couplings: Muff, Split muff and Flange couplings-Flexib le couplings.

UNIT – IV

Bearings : Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, Bearing life.
Lubricants Types & properties.

UNIT – V

Engine Parts: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts. Pistons, Forces acting on piston – Construction Design and proportions of piston, Cylinder liners.

Course outcomes:

After successful completion of this course, successful student able to

1. Apply theories of failures and estimate strength of a machine member
2. Design a riveted, welded and bolted joints and choose the joining process
3. Design, analyse and choose shafts and couplings
4. Design, analyse the various engine parts

TEXT BOOKS:

1. Dr P. Kannaiah Scitech Publishers
2. Design of Machine Elements/ T.J. Prabhu
3. Machine Design / Soundararaja Murthy and shanmugam
4. Machine design – Pandya & shah.

REFERENCES:

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.
3. Mech. Engg. Design / JE Shigley
4. Machine Design / Sarma and Agarwal
5. Machine Design / V.V. Bhandari
6. Machine Design Hand Book / V.V. Bandari

Course Code :		**DESIGN OF AUTOMOBILE COMPONENTS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓	✓	✓									
	CO 2		✓	✓									
	CO 3		✓	✓								✓	
	CO 4		✓	✓									✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	VEHICLE TRANSPORT MANAGEMENT (17170504)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Not Required				

COURSE OBJECTIVES:

To make the student able to

1. Adapt the infrastructure required for transport management .
2. Organize the transport system in effective way
3. Prevent the accidents
4. Estimate the fare

UNIT – I

Historical Back ground: Introduction, the growth of a network, trams, trolley buses, private car's subsidies.

The Infrastructure: Road- Approach Road. Highways National, State, District, traffic condition, relief of congestion, pedestrians, zebra lines, margins, shopping centres. Bus-stops. Shelters, Bus stations, Garages layout of premises, equipment, use of machinery, conveyance of staff, facilities for passengers. Maintenance -preventive, breakdown, overhauling -major, minor.

UNIT - II

Organization and Management: Forms of ownership, principle of transport management - STU (State Transport Undertaking) staff administration: industrial relation, administration, recruitment and training, welfare, health and safety.

Public relations divisions: Dissemination of information, handling complaints, traffic advisory. Committees- local contractors -inter departmental liaison advertisements, signs, notice and directions-general appearance of premises, specialized publicity.

UNIT - III

Prevention of accidents: Emphasis of safe driving-annual, awards, bonus encouragement vehicle design platform, layout, location of steps, scheduled route hazards records elimination of accident prone devices.

Route planning: Source of traffic, town planning, turning points, stopping places, shelters survey of route preliminary schedule test runs elimination of hazards factors affecting. Frequency direction of traffic flow estimated traffic possibility single verses double deck.

UNIT - IV

Timing, bus working and schedules : Time table layout uses of flat graph method of presentation preparation of vehicle and crew schedule preparation of the duty roster, co-operation with employers use of the vehicle running numbering- determination of vehicle efficiency, checking efficiency of crew, duty arrangements.

The fare structure: Basis of fares historical background effects of competition and control calculating average zone system straight and tapered scale.

UNIT - V

Operating cost and types of vehicles: Classification costs, average speed running costs supplementary costs depreciation obsolescence, life of vehicles- sinking fund factor- wages and overheads 100 seats miles basis, average seating capacity vehicles size and spread overs, types of vehicle economic considerations authorization of trolley, bus services, statuary procedure taxes and hire cars.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Adapt infrastructure required for transport management .
2. Organize the transport system in effective way
3. Prevent the accidents
4. Estimate the fare

TEXT BOOKS:

1. Bus Operation -L.D.Kitchen, Lliffe & Sons
2. Bus & Coach Operation -Rex W. Fautks, Butterworth Version Of 1987

REFERENCES:

1. Compendium Of Transport Terms Cirt, Pune
2. M.V. Act 1988 Central Law Agency, Allahabad
3. The Elements Of Transportation -R.J. Eaton
4. Goods Vehicle Operation -By C.S. Dubbar
5. Road Transport Law- L. Dkitchen
5. Road Transport Law – L.D. Kitchen
6. Compendium Of Transport Terms Cirt, Pune (Report
7. M.V. Act 1988, Pub Central Law Agency, Allahabad

Course Code :		**VEHICLE TRANSPORT MANAGEMENT**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓					✓			✓			
	CO 2						✓		✓		✓	✓	
	CO 3				✓								
	CO 4						✓		✓			✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
							✓						
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	HEAT TRANSFER (17170505)	3	1	0	3
Teaching	Total contact hours – 60				
Prerequisite (s)	Thermodynamics, Fluid Mechanics				

UNIT–I

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

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

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

UNIT–II

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

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

UNIT–III

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

FORCED CONVECTION

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

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

UNIT–IV

HEAT TRANSFER WITH PHASE CHANGE

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

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

HEAT EXCHANGERS:

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

UNIT – V

RADIATION HEAT TRANSFER:

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

COURSE OUTCOMES

After successful completion of this course student will be able

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

TEXTBOOKS

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

REFERENCEBOOKS:

1. "Heat and Mass Transfer", Cengel, McGraw-Hill.
2. "Heat and Mass Transfer", D.S. Kumar, S.K. Kataria &Sons.

Course Code :		HEAT TRANSFER											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	√					√						
	CO 2		√				√						
	CO 3		√	√									
	CO 4												
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical			Professional Subjects				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	VEHICLE PERFORMANCE & TESTING (17170506)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic Automobile Engineering, Automotive Engines				

COURSE OBJECTIVES:

To make the student able to

1. Estimate the vehicle performance
2. Check the transmission performance
3. Test the vehicles in Laboratory
4. Test the vehicles on road
5. Know various control systems

UNIT- I

VEHICLE PERFORMANCE ESTIMATION & PREDICTION

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.

Introduction to Public Transportation System & Coordinated Transportation System

UNIT- II

DYNAMIC VEHICLE TESTING

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. Heat Balance, combustion, Emission, Load test.

Engine testing – noise, vibrations, emission, power & fuel consumption, Vehicle testing on chassis dynamometers.

UNIT- III

VEHICLE TRANSMISSION PERFORMANCE

Characteristics & features of friction clutches, mechanical gear transmission & Epicyclic gear boxes.

OPERATIONAL PERFORMANCE

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

Braking arrangements & Characteristics, weight transfer, steering arrangements, rigid & independent suspension, roll centre, torsion bar, stabilizer, radius bar.

UNIT-V

VEHICLE PERFORMANCE TESTING ON ROAD & TRACK

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.

Course outcomes:

After successful completion of this course, successful student able to

1. Estimate the vehicle performance
2. Check the transmission performance
3. Test the vehicles in Laboratory
4. Test the vehicles on road

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.

Course Code :		**VEHICLE PERFORMANCE & TESTING**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓				✓						
	CO 2		✓				✓						
	CO 3				✓								
	CO 4				✓								
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
							✓						
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	HEAT TRANSFER LAB (17170511)	0	0	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)					

Course Objectives:

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

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

Course Outcomes:

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

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	BASIC AUTOMOBILE COMPONENTS MANUFACTURING LAB (17170512)	0	0	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)	Engineering Workshop				

Minimum of 12 Exercises need to be performed

I. METAL CASTING:

To Perform Pattern and Mould Preparation for Engine Components-Connectingrod, Crank Shaft

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

II. WELDING:

To Perform Welding operation of Automobile Body Components

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

III METAL FORMING AND POWDER METALLURGY:

To Perform Basic Chasis Components by Forming Operation

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

IV PROCESSING OF PLASTICS:

To Perform Plastic Moulds of Mirror, housing head lamp & tail lamp mountings.

1. Injection Moulding
2. Blow Moulding

Course outcomes:

After successful completion of this course, successful student able to

1. Apply some of the manufactures process directly in the industry for preparation of complicated jobs.
2. Choose the joining process
3. Process plastics
4. Select the manufacturing process

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Course Code :		**BASIC AUTOMOBILE COMPONENTS MANUFACTURING LAB**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓										✓	
	CO 2											✓	
	CO 3											✓	
	CO 4											✓	✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MINI PROJECT - II (17170521)	0	0	0	2
Teaching					
Prerequisite (s)					

The student has to do fabrication at any workshop in the summer after II B.Tech., II Sem. The student has to submit a detailed report in the next sem i.e. III B.Tech., I Sem. The evaluation will be done by the committee consisting of HoD , Senior staff from the same branch and another senior faculty member from any other branch from the same college

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (17170601)	3	1	0	3
Teaching	Total Contact hours – 60				
Prerequisite(s)	Knowledge of Economics, Demand analysis, Production Analysis, Fundamentals of Accounting and Ratio analysis.				

Course Objectives:

1. The aim of this is to equip the students with fundamental concepts of economics, budgeting, management & accounting.
2. It helps them to understand the Intricacies of business units.
3. The study of this subject strengthens them to start an enterprise on their own accord.
4. To impart the knowledge on how to make Financial Analysis on the business organizations.
5. To make the students to know above what is capital? And capital budgeting.

UNIT- I

Introduction to Managerial Economics and demand Analysis:

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

UNIT-II

Production and Cost Analysis:

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

UNIT-III

Introduction to Markets, Theories of the Firm and Pricing Policies:

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

UNIT- IV

Types of Business Organizations and Business Cycles:

Features and Evaluation of Sole trader – Partnership – Joint Stock Company – State / Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle.

Capital, Capital Budgeting:

Capital, Significance of Capital, Sources of Finance (Capital) - Meaning of Capital Budgeting Need for Capital Budgeting - Techniques of Capital Budgeting - Traditional and Modern Methods.

UNIT- V

Introduction to Financial Accounts:

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

TEXT BOOKS:

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

REFERENCE:

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

Course outcomes:

After successful completion of this course, successful student able to

1. budgeting, management & accounting of a capital
2. Apply the Intricacies of business units.
3. Start an enterprise on their own accord.
4. Make Financial Analysis on the business organizations.

Course Code :		**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**											
Course Designed by		Department of Humanities and Basic Sciences											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓										✓	✓
	CO 2								✓				
	CO 3									✓		✓	✓
	CO 4	✓					✓					✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MACHINE TOOLS & METROLOGY (17170602)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Manufacturing Process				

Course Objectives:

To make the student able to

1. analyse the metal cutting process.
2. Produce finished products by using machine tools
3. Determine and provide the tolerance
4. Measures the angles, tapers and surface roughness

UNIT – I

Elementary treatment of metal cutting theory – element of cutting process – geometry of single point tool angles, chip formation and types of chips – built up edge and its effects chip breakers, mechanics of orthogonal cutting –Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials.

UNIT – II

Engine Lathe : principle of working, specification of lathe – types of lathe – work holders tool holders – operations performed- box tools taper turning, thread turning – for lathes and attachments, turret and capstan lathes – collet chucks – other work holding – tool holding devices. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes.

Shaping, slotting and planning machines: Principles of working – principal parts – specifications, operations performed, machining time calculations

UNIT – III

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

Milling machine: Principles of working – specifications – classification of Milling Machines – machining operations, types of cutters and geometry.

Grinding: Theory of grinding – classification of grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

UNIT-IV

Systems of Limits and Fits: Introduction, nominal size, tolerance, limits, deviations, fits and their types-unilateral and bilateral tolerance system, hole and shaft basis systems interchangeability.

Linear measurement: Length standards, end standards, slip gauges- calibration of the slip gauges, dial indicators, micrometers.

Measurement of angles and tapers: Different methods – bevel protractor, angle slip gauges inclinometer Limit gauges: Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges.

UNIT-V

Optical measurement instruments: Tools maker's microscope and uses - collimators, optical projector, optical flats and their uses.

Surface roughness measurement: Differences between surface roughness and surface waviness.

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

Course outcomes:

After successful completion of this course, successful student able to

1. Analyse the metal cutting process.
2. Produce finished products by using machine tools
3. Determine and provide the tolerance
4. Measures the angles, tapers and surface roughness

TEXT BOOKS

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Workshop Technology – B.S.Raghu Vamshi – Vol II
3. Engineering Metrology by Mahajan / Dhanpat Rai Publishers

REFERENCES

1. Production Engineering, K.C Jain & A.K Chitaley, PHI Publishers
2. Engineering Metrology by R.K.Jain / Khanna Publishers

Course Code :		**MACHINE TOOLS & METROLOGY**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓		✓									
	CO 2	✓										✓	
	CO 3	✓		✓									
	CO 4	✓		✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course (Code)	CAD/CAM (17170603)	3	1	-	3
Teaching	Total contact hours – 60				
Prerequisite (s)	COMPUTER GRAPHICS				

UNIT – I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT- II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – III

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

UNIT –I V

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages. Computer aided processes planning – importance, types

COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods- contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – V

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

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COURSE OUTCOMES:

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

CO-1: Describe fundamentals of computer aided design, manufacturing and the mathematical basis in the technique of representation of geometric entities.

CO-2: Understand part programming codes for CNC machines and to list the various types of Group Technology and Computer aided Process planning.

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

TEXT BOOKS:

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

REFERENCES:

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

Course Code :		**CAD/CAM**											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcome	CO 1	✔	✔										
	CO 2					✔	✔						
	CO 3				✔								
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES (17170604)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Not Required				

COURSE OBJECTIVES:

To make the student able to

1. Produce and use vegetable oils, gaseous fuels, hydrogen fuels, alcohol fuels
2. Determine and predict the properties, performance, emission characteristics of vegetable oils, gaseous fuels, hydrogen fuels, alcohol fuels
3. Judge the effect of alternative fuels on fossil fuels when use in combination with both fuels
4. Design, analyse and build the electric and hybrid automobiles

UNIT-I

Introduction: Need for non-conventional energy sources. Energy alternative : solar, photo-voltaic, Hydrogen, Bio mass. Electrical - their merits and demerits.

Vegetable Oils: 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.

UNIT-II

Gaseous Fuels: 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.

Energy from Bio mass: Photosynthesis, photosynthetic oxygen production, energy plantation. Biogas production from organic waste, description and types of Bio gas plants, Application and limitations - Merits and demerits performance characteristics and their comparison.

UNIT-III

Hydrogen Fuel: Hydrogen Energy: Properties of Hydrogen, sources of Hydrogen, Thermodynamics of water splitting Production of Hydrogen, Electrolysis of water. Thermal decomposition of water. Thermo-chemical production, Biochemical production.

Hydrogen fuel, Storage and Transportation methods, Applications to engines modifications necessary, precautions and safety measures - Performance characteristics in Engine and their comparison.

UNIT IV

Alcohol Fuels: 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.

UNIT-V

Electric & Hybrid Vehicles: cost of' electric car, Availability of energy for recharging. Traction motors and types. Electric Automobiles: Design considerations, limitations. Opportunities for improvement Batteries, problems. future possibilities , capacities, types , material requirement

Solar & Fuel Cell Vehicles : Solar photo-voltaic conversion, Collection and storage of solar energy, collection devices, flat plate collectors, concentrating type collectors, principles and working of photo-voltaic Conversion, Applications to automobiles.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Produce and use the alternative fuels
2. Determine and predict the properties, performance, emission characteristics of alternative fuels
3. Judge the effect of alternative fuels on fossil fuels when use in combination with both fuels
4. Design, analyse and build the electric and hybrid automobiles

TEXT BOOKS:

1. G.D. Rai 'Non-conventional sources of energy Khamma Lab.
2. William Hamilton 'Electric Automobiles', PHI
3. Alternative sources and control system.Yes Dee publishing pvt Ltd

REFERENCE BOOKS:

1. S.P. Sukhatme 'Solar Energy', Tata McGraw Hill .
2. S. Rao & B.B. Larulekar 'Energy Technology', Khamma Lab
3. Frank Kreith & Jan F. Krieder' Principles of Solar Engineering' McGraw Hill.
4. J.A. Duffie&W.A. Beckman 'Solar Energy -thermal Process' McGrawHil1
5. E, D ;Totta, 'Solar Hydrogeff Energy-Systems'
6. T.N. Veziroglu. Alternative energy sources.
7. Mitsui E. Stal, Biological solar energy conversion

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Course Code :		**ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓								✓	
	CO 2		✓	✓									
	CO 3				✓								
	CO 4			✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	TWO AND THREE WHEELER TECHNOLOGY (17170665a)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic Automobile Engineering,Automotive Engines				

COURSE OBJECTIVES:

1. Choose the engine
2. Construct two and three wheeler vehicles.
3. Demonstrate the wheels, tyres, suspensions and braking systems.
4. Identify the latest models of two wheelers

UNIT-I

POWER UNIT

Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams. Types of scavenging processes, merits and demerits – scavenging efficiency. Scavenging pumps – Rotary valve engine.

UNIT-II

FUEL AND IGNITION SYSTEM

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, and starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III

CHASSIS AND SUB – SYSTEMS

Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices

UNIT IV

BRAKES AND WHEELS

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links lay-outs. Brake actuation mechanism. Spoked wheel, cast wheel, alloy wheel & its merits and demerits. Tyres and tubes Construction & its Types- vulcanizing methods. Steering column construction, steering geometry for two & three wheelers.

UNIT V

TWO & THREE WHEELER CASE STUDY

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Importance of maintenance – general maintenance schedule –Servicing of two and three wheeler – periodic checkups. Recent developments.

SAFETY: Impact protection basics, physics of impact between deformable bodies, design for crash worthiness, occupant and cargo restraint, passive restraint systems, side impact analysis, bumper system energy absorbent foams, laws of mechanisms applied to safety.

COURSE OUTCOMES

After successful completion of this course, successful student able to

1. Choose the engine
2. Construct two and three wheeler vehicles.
3. Demonstrate the wheels, tyres, suspensions and braking systems.
4. Identify the latest models of two wheelers.

TEXT BOOK:

1. Irving,P.E., Motor cycle Engineering, Temple Press Book, London, 1992.
2. Marshal Cavandedish, 'Encyclopedia of Motor cycling', New York, 1989
3. Srinivasan.S., 'Motor cycle, Scooter, Mopeds', New century book house, 1988.

REFERENCES:

1. The Cycle Motor Manual, Temple Press Ltd., London, 1990.
2. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai,
3. Encyclopedia of Motorcycling, 20 volumes, Marshall Cavensih, New York and London, 1989.
4. Bryaut,R.V., Vespa Maintenance and Repair series.
5. Raymond Broad, Lambretta – A practical guide to maintenance and repair, 1987.

Course Code :		**TWO AND THREE WHEELER TECHNOLOGY**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓											
	CO 2	✓										✓	
	CO 3	✓					✓						
	CO 4	✓								✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOTIVE CHASSIS COMPONENTS DESIGN (17170665b)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic Automobile Engineering,Automotive Engines				

COURSE OBJECTIVES:

To make the student able to

1. Design the chassis to accommodate all the systems of an automobile
2. Construct the chassis
3. Develop the control systems
4. Modify the chassis

UNIT- I

LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM

Basic construction of chassis, Types of Chassis layout, with reference to Power Plant location and drive, various, types of frames, Loads acting on vehicle frame, Types of Front Axles and Stub Axles, Front Wheel Geometry. Condition for True Rolling Motion. Ackerman's and Davi's Steering Mechanisms, Steering Linkages, Different Types of Steering Gear boxes, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, Power Steering.

UNIT II

DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL

Driving Thrust and its effects, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, Propeller Shaft, Universal Joints, Constant Velocity Universal Joints, Final drive, different types of final drive, Worm and Worm wheel, straight bevel gear, spiral bevel gear and hypoid gear final drive. Differential principle. Constructional details of differential unit, Differential housings, Non–Slip differential, differential locks.

UNIT III

REAR AXLES, WHEELS, RIMS AND TYRES

Construction of rear axles, Types of Loads acting on rear axles, Full –Floating, Three–Quarter Floating and Semi–Floating Axles, Twist beam rear axle, Types, Multi axles vehicles. Wheels and Rims, Types of Tyres and their constructional details. Tubeless, cross ply radial type, tyre sizes and designation

UNIT IV

SUSPENSION SYSTEM

Requirement of Suspension System, Types of Suspension Springs, Constructional details and characteristics of Single Leaf, Multi–Leaf spring, Coil and Torsion bar Springs, Rubber, Pneumatic and Hydro – elastic Suspension Spring Systems, Independent Suspension System, Shock Absorbers, Types and Constructional details of Leaf and Coil Springs, Sprung and unsprung mass, torsion bar springs.

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UNIT V

BRAKE SYSTEMS

Need for Brake systems, Stopping Distance, Time and Braking Efficiency, Effect of Weight Transfer during Braking, Classification of brakes , Braking Torque, drum brake and disc Brake Theory, Types and Construction of Hydraulic Braking System, Mechanical Braking System, Pneumatic Braking System, Power–Assisted Braking System, Servo Brakes, Retarders – antilock braking systems(ABS).

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Design the chassis to accommodate all the systems of an automobile
2. Construct the chassis
3. Develop the control systems
4. Modify the chassis

TEXT BOOKS

1. Newton Steeds and Garret, "Motor Vehicles" 13th Edition, Butterworth, London, 2005.
2. Heinz Hazler, "Modern Vehicle Technology", Butterworth, London, 2005.
3. Devaradjane. Dr. G., Dr. M. Kumaresan, "Automobile Engineering", AMK Publishers, 2013.

REFERENCES

1. Heldt P.M., "Automotive Chassis" Chilton Co., New York, 1990.
2. Giri. N.K., "Automotive Mechanics" Khanna Publishers, New Delhi, 2005.
3. "Motor Vehicles", Newton, Steed and Garrot, 13th Edition, Butterworth London.
4. "Vehicle and Engine Technology", Heisler, Second Edition SAE International Publication

Course Code :		**AUTOMOTIVE CHASSIS COMPONENTS DESIGN**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓		✓								
	CO 2				✓							✓	
	CO 3									✓			
	CO 4						✓					✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	UNCONVENTIONAL MACHINING PROCESS (17170665c)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Manufacturing Technology I & II				

UNIT – I

INTRODUCTION: Need for non-traditional machining methods - classification of modern machining processes – considerations in process selection, applications.

ULTRASONIC MACHINING – Elements of the process, mechanics of material removal, material removal rate (MRR) process parameters, economic considerations, applications and limitations.

UNIT – II

ELECTRO CHEMICAL MACHINING (ECM): Fundamentals of ECM, electro chemical grinding, electro chemical honing and deburring process, MRR in ECM, tool design, surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate, fundamentals of chemical, machining, advantages and applications.

UNIT - III

THERMAL METAL REMOVAL PROCESSES: General principle and applications of Electric Discharge Machining (EDM), Electric Discharge Grinding and wire EDM – Power circuits for EDM, mechanics of metal removal in EDM, process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface.

UNIT – IV

ELECTRON BEAM MACHINING, LASER BEAM MACHINING AND PLASMA MACHINING: Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications

UNIT-V

ABRASIVE JET MACHINING, WATER JET MACHINING AND ABRASIVE WATER JET MACHINING: Basic principles, equipment, process variables, mechanics of material removal, MRR, applications and limitations.

Magnetic abrasive finishing, abrasive flow finishing.

Comparison of various unconventional machining processes based on Material Removal Rate, surface finish, efficiency and cost.

COURSE OUTCOMES:

Upon completion of this course, the student can able to:

CO-1. Develop an understanding to the need, working principles and the mechanism of material removal in the modern machining processes. **(PO4)**

CO-2. Solve the practical problems related to selection of suitable unconventional machining method for the given machining process and for the given material. **(PO7)**

CO-3. To know the influence of various process parameters on the performance and the applications. **(PO6)**

TEXT BOOK:

1. "Advanced Machining Processes", V. K. Jain, Allied Publishers Pvt. Ltd., New Delhi, 2007
2. "Fundamentals of Modern Manufacturing", Mikell P Groover, WileyPublications- 3 ed.

REFERENCES:

1. "Modern Machining Process", Pandey P.C. and Shah H.S.., TMH.
2. "New Technology", Bhattacharya A, The Institution of Engineers, India 1984

Course Code :		**UNCONVENTIONAL MACHINING PROCESS**											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✔										
	CO 2	✔											
	CO 3					✔							
	CO 4			✔									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	DISASTER MANAGEMENT (17170665d)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)					

COURSE OBJECTIVES:

1. To make the student able to Predict the disasters.
2. To make the student able to Measure the intensity of an disaster
3. To make the student able to identify the type of disaster
4. To make the student able to manage disasters

UNIT- I

INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Tsunami,Tornado,Hurricanes,Power grid Failures, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters. Responsibilities as a citizen/engineer

UNIT II

APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

UNIT- III

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use , Climate Change Adaptation-Severe Summer & Cold Climate, IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT- IV

DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, and Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and

legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment Responsibilities as a rescue team member.

UNIT- V

DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Predict the disasters.
2. Measure the intensity of an disaster
3. Identify the type of disaster
4. Manage disasters

TEXT BOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13:978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

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Course Code :		**DISASTER MANAGEMENT**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1				✓								✓
	CO 2				✓								✓
	CO 3				✓								✓
	CO 4				✓								✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	NON-DESTRUCTIVE TESTING (17170665e)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Engineering Physics				

UNIT – I

Introduction to non-destructive testing: Radiographic test**,** Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

UNIT – II

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT – III

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

UNIT – IV

Magnetic Particle Test: Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle test.

UNIT – V

Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing.

Industrial Applications of NDT: Span of NDT Activities- Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDT of pressure vessels, castings, welded constructions.

COURSE OUTCOMES:

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

CO1- Discuss the techniques and methods of non-destructive testing.

CO2- Apply methods knowledge of non-destructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc.

CO3- Evaluate the methods of application of non-destructive testing.

TEXT BOOKS:

1. "Non-destructive test and evaluation of Materials," J Prasad, GCK Nair, TMH Publishers, 2011.
2. "Ultrasonic testing", Krautkramer and Krautkramer , Springer; 4th edition ,1990.
3. "Non-destructive testing", Warress, JMc Gonmade, AIRWALK PUBLICATIONS, 1 edition 2017.

REFERENCES:

1. "Ultrasonic inspection training for NDT" E. A. Gingel, Prometheus Press, 4th edition ,1999.
2. "Non-destructive Hand Book" – R. Hamchand, McGraw-Hill Education; 2edition, 2012.

Course Code :		NON-DESTRUCTIVE TESTING											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✔										
	CO 2						✔						
	CO 3				✔								
	CO 4												
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical			Professional Subjects				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	TROUBLE SHOOTING, SERVICING & MAINTENANCE OF AUTOMOBILES (17170665f)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic Automobile Engineering, Automotive Engines				

COURSE OBJECTIVES

1. To make the students able to Trouble shoot, Service and maintain the Automobile
2. To make the students able to maintain the workshop its schedules and records
3. To make the students able to choose the proper repairing and overhauling method
4. To make the students able to maintain the fleet

UNIT- I

INTRODUCTION AND TROUBLE SHOOTING

Check list on trouble shooting - Engine, clutch, gear box, rear axle, front axle, steering, Brakes, Suspension, Tyre wear, electrical systems - Trouble shooting on engine management system - On board diagnosis using multi-scanner - Testing of SI engine using computerized engine analyzer.

UNIT- II

MAINTENANCE OF WORKSHOP, ITS SCHEDULE AND RECORDS

Importance of maintenance - Types of maintenance, Periodic maintenance, Preventive maintenance, Annual maintenance, Statutory maintenance, seasonal maintenance, schedule and unscheduled maintenance - scope of maintenance - vehicle down time - vehicle inspection, reports, log books, trip sheet.

UNIT- III

ENGINE REPAIR AND OVERHAULING

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, Air intake & Exhaust system - Study of trouble shooting chart for MPFI & CRDI Engines.

UNIT- IV

MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS

Maintenance - servicing and repair of clutch, fluid coupling, gear box, torque converter, propeller shaft - Maintenance of front axle, rear axle, brakes, steering systems, tyre.

MAINTENANCE AND REPAIR OF VEHICLE BODY & ELECTRICAL SYSTEMS

Body panel tools for repairing - Tinkering and painting - Use of soldering, metalloid paste, Wheel alignment, wheel balancing.

Service, maintenance, testing and trouble shooting of battery, starter motor, alternator rectifier and transistorized regulator.

UNIT- V

FLEET MAINTENANCE MANAGEMENT

Need for automobile dealer ships, 3s(Sales, Service & Spares),2s(Service & Spares),1s(Service), Types of dealer ships, 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.

COURSE OUTCOMES

After successful completion of this course, successful student able to

1. To make the students able to Trouble shoot, Service and maintain the Automobile
2. To make the students able to maintain the workshop its schedules and records
3. To make the students able to choose the proper repairing and overhauling method
4. To make the students able to maintain the fleet

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.

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Course Code :		**TROUBLE SHOOTING, SERVICING & MAINTENANCE OF AUTOMOBILES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓		✓								
	CO 2											✓	
	CO 3			✓							✓	✓	
	CO 4			✓									✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMATION IN AUTOMOTIVE MANUFACTURING (17170606)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Manufacturing Process ,Machine Tools & Metrology				

COURSE OBJECTIVS:

1. To make the student able to manufacture automotive components
2. To make the system able to design and analyse the automated flow lines
3. To make the student able to establish the automation in manufacturing system
4. To make the student able to control the machining parameters

UNIT-I

INTRODUCTION: Types and strategies of automation, pneumatic and hydraulic components, circuits, automation in machine tools, mechanical feeding and tool changing and machine tool control.

UNIT – II

AUTOMATED FLOW LINES: Methods of part transport, transfer mechanism, AGV, buffer storage, control function, design and fabrication considerations.

UNIT – III

ANALYSIS OF AUTOMATED FLOW LINES: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

ASSEMBLY SYSTEM AND LINE BALANCING: Assembly process and systems, assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – IV

AUTOMATED MATERIAL HANDLING: Types of equipment, functions, analysis and design of material handling systems, conveyor systems, and automated guided vehicle systems.

AUTOMATED STORAGE SYSTEMS: Automated storage and retrieval systems; Kanban system, JIT, work in process storage, interfacing handling and storage with manufacturing.

UNIT – V

ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, adaptive control with constraints, application of a.c. in machining operations. Use of various parameters such as cutting force, temperatures, vibration and acoustic emission.

Automated inspection: Fundamentals, types of inspection methods and equipment, CMM, machine vision.

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COURSE OUTCOME:

On successful Completion of this course the student will be able to

1. Manufacture automotive components
2. Design and analyze the automated flow lines
3. Establish the automation in manufacturing system
4. Control the machining parameters

TEXT BOOKS

1. Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover./ PE/PHI
2. Manufacturing process and systems: Ostwals Munoz

REFERENCES

1. Computer Control of Manufacturing Systems by Yoram Coren.
2. CAD / CAM/ CIM by Radhakrishnan.
3. Automation by W. Buekinsham.
4. Mechanical assemblies – Daniek E. Whitney

Course Code :		**AUTOMATION IN AUTOMOTIVE MANUFACTURING**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓								✓	
	CO 2		✓	✓									
	CO 3											✓	✓
	CO 4				✓								
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	SOFT SKILLS II (17178697)	1	2	3	1
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be consistent with global employment scenario and professional communicative skills				

Course Objectives: To help the students

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

UNIT-1

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT- V

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

COURSE OUTCOMES:

The students will be able to

1. Be effective communicators and participate in group discussions with confidence. Also be able to make presentations in a professional context.

2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
4. Make the transition smoothly from campus to corporate.

PRESCRIBED TEXT:

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

SUGGESTED READING:

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

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MACHINE TOOLS & METROLOGY LAB (17170611)	0	0	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)	Engineering Workshop				

Note: minimum of 6 experiments from each section

COUSE OBJECTIVES:

1. To make the student able to measure the length, height, diameters, gear geometry, angle, taper, flatness, thread geometry, surface roghness by using specialized tools
2. To make the student able to test tool alignment in machine tools
3. To make the student able to identify the design
4. To make the student able to manufacture finished products

SECTION-I

METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier calipers and checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on milling machine.
6. Angle and taper measurements by bevel protractor, Sine bars, etc.
7. Use of spirit level in finding the straightness of a bed and flatness of a surface.
8. Thread measurement by two wire/ three wire method & tool makers microscope.
9. Surface roughness measurement by Talysurf.

SECTION-II

MACHINE TOOLS LAB

1. Introduction of general purpose machines -lathe, drilling machine, milling machine, shaper, planning machine, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. Drilling and tapping
5. Shaping and planning
6. Slotting
7. Milling
8. Cylindrical surface grinding
9. Grinding of tool angles.

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Course Outcome:

After successful completion of this course, successful student able to

1. Measure the length, height, diameters, gear geometry, angle, taper, flatness, thread geometry, surface roghness by using specialized tools
2. Test tool alignment in machine tools
3. Identify the design
4. Manufacture finished products

Course Code :		**MACHINE TOOLS & METROLOGY LAB**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓										
	CO 2		✓										
	CO 3		✓							✓			
	CO 4		✓							✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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AME III Year II Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	CAD/CAM LAB (17170612)	0	0	3	2
Teaching	Total contact hours - 42				
Prerequisite (s)	CAEDP				

COURSE OBJECTIVES:

To make the students learn:

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

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

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

3. a) Determination of deflection and stresses in 2D and 3D trusses and beams.
   b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.
   c) Determination of stresses in 3D and shell structures (at least one example in each case)
   d) Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
   e) Steady state heat transfer Analysis of plane and Axisymmetric components.
4. a) Development of process sheets for various components based on tooling Machines.
   b) Development of manufacturing and tool management systems.
   c) Study of various post processors used in NC Machines.
   d) Development of NC code for free form and sculptured surfaces using CAM packages
   e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.
   f) Quality Control and inspection.

Packages to be provided to cater to drafting, modeling & analysis from the following:
Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

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COURSE OUTCOMES:

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

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	SPECIAL PURPOSE VEHICLES (17170761a)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not required				

COURSE OBJECTIVE:

1. To make students able to design and construct special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc
2. To make student to incorporate safety systems in a
3. To make student to design and develop farm machinery.
4. To make student to design and develop control systems

UNIT I
EARTH MOVERS AND CONSTRUCTIONAL EQUIPMENT

Construction details, capacity and applications of earthmovers for dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrappers, and motor graders. criteria for selection of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II
POWER TRAIN CONCEPTS

Engine – converter match curves. Epicyclic type transmissions. Selection criteria for universal joints. Constructional details of steerable and drive axles of dumper.

UNIT III
VEHICLE SYSTEMS AND FEATURES

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Design aspects of 28 dumper body, loader bucket and water tank of sprinkler. Articulated vehicles, double Decker. Firefighting equipment.

UNIT IV
VEHICLES FOR INDUSTRIAL APPLICATIONS

Constructional features, capacity and stability of jib cranes. Vibratory compactors. Stackers, bore well machines, concrete mixtures.

UNIT V
FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES

Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles. Harvesting vehicles.

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COURSE OUTCOMES:

After successful completion oof this course, successful student able to

1. Design and construct special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc
2. Incorporate safety systems in a vehicles
3. Design and develop farm machinery.
4. Design and develop control systems

TEXT BOOKS

1. K. Abrosimov, A. Bromberg and F. Katayer, 'Road making machineries', MIR Publisher, Moscow, 1975.
2. SAE Handbook – Vol III, 1995.

REFERENCES

1. Pipenger, 'Industrial Hydralics', Mcgraw Hill, Tokoyo, 1979.
2. A. Astakhov, 'Truck cranes', MIR Publishers, Moscow, 1971.
3. Bart H Vanderveen, 'Tanks and Transport Vehicles', Frederic Warne and co. Ltd., London, 1974.

Course Code :		**SPECIAL PURPOSE VEHICLES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓									
	CO 2				✓								
	CO 3					✓							
	CO 4					✓							
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MODERN VEHICLE DESIGN (17170761b)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not required				

COURSE OBJECTIVE:

1. To make the student to select the suitable material for vehicle design
2. To make the student to design the knowledge in modeling of the various components
3. To make the student to analyze the aerodynamic forces
4. To make the student to design the knowledge in design and analysis of the chassis
5. To make the student to analyze the accidents and injuries

UNIT I

INTRODUCTION TO AUTOMOTIVE ENGINEERING DESIGN

The development of the world motor industry, Streamlining, Structure and manufacturing technology of automotive materials, Mechanical and physical properties of automotive materials, Materials selection for automotive components. The manufacturing challenge for automotive designers.

UNIT-II

BODY DESIGN: THE STYLING PROCESS

Introduction, The studios, working environment and structure, Product planning, Brainstorming, The package, Review of competition, Concept sketching and package related sketching, Full sized tape drawing, Clay modeling, 2D systems, 3D systems.

UNIT-III

BODY DESIGN: AERODYNAMICS

Introduction, Aerodynamic forces, Drag, Drag reduction, Stability and cross-winds, Noise, under hood ventilation, Cabin ventilation, Wind tunnel testing, Computational fluid dynamics.

UNIT-IV

CHASSIS DESIGN AND ANALYSIS

Load case, introduction, Chassis types, introduction, Structural analysis by simple structural surfaces method, Computational methods.

UNIT-V

CRASHWORTHINESS AND ITS INFLUENCE ON VEHICLE DESIGN

Introduction, Accident and injury analysis, Vehicle impacts: general dynamics, Vehicle impacts: crush characteristics, Structural collapse and its influence upon safety.

FAILURE PREVENTION – THE ROLE OF ENDURANCE AND DURABILITY STUDIES IN THE DESIGN AND MANUFACTURE OF RELIABLE VEHICLES:

Introduction , Important aspects of failures in the real engineering world, Testing and failure prediction, Automotive technology and the importance of avoiding failures, Case studies – typical examples of automotive failures.

COURSE OUTCOMES:

After successful completion oof this course, successful student able to

1. Select the suitable material for vehicle design
2. Decide the modeling of the various components
3. Analyze the aerodynamic forces
4. analyzing the accidents and injuries

TEXT BOOKS

1. Julian Happian- Smith , "Modern Vehicle Design", NY, 2002.

Course Code :		**MODERN VEHICLE DESIGN**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓									
	CO 2					✓							
	CO 3					✓							
	CO 4				✓								
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	PRODUCT DESIGN & ASSEMBLY AUTOMATION (17170761c)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not required				

COURSE OBJECTIVE:

1. To make the student to design various automatic feeding devices
2. To make the student to analyze the automation and automatic assembly transfer systems
3. To make the student to design the high speed assembly and robot assembly systems.
4. To make the student to develop sophisticated technologies using Robots in assembly lines.

UNIT –I

AUTOMATIC FEEDING AND ORIENTING DEVICES: Vibrator feeders: Mechanics of vibratory conveying, estimating the mean conveying velocity, load sensitivity, solutions to load sensitivity, spiral elevators, balanced feeders. Orientation of typical oriental system, effect of active orienting devices on feed rate, analysis of orienting systems, performance of an orienting device, natural resting aspects, of parts for automatic handing, analysis of a typical orienting system, out-of-bowl tooling. Mechanical feeders. Reciprocating -tube hopper feeder; magazines.

UNIT-II

Assemble Automation: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

Automatic assembly transfer systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

UNIT-III

Product design for high speed automatic assembly and robot assembly :Introduction, design of parts for: high speed, feeding and orienting, example, additional feeding difficulties, high speed automatic insertion, example, analysis of an assembly, general rules for product design for automation, design of parts for feeding and orienting, summary of design rules for high speed automatic assembly, product for robot assembly.

UNIT-IV

Design of manual assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

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UNIT-V

Performance And Feasibility of Automation: Avoiding jams during assembly, reducing risk assembly problems, effects of holding down, manual assembly data base and design data sheets, application of the DFA methodology and general design guidelines.

Performance and economics of assembly systems: Indexing machines, free transfer machines, basis for economic comparisons of automation equipment, comparison of indexing and free – transfer machines' economics of robot assembly.

Feasibility study for assembly automation: Machine design factors to reduce machine downtime due to defective parts. Visibility study.

COURSE OUTCOME:

After successful completion oof this course, successful student able to

1. Compare various automatic feeding devices
2. Evaluate the automation and automatic assembly transfer systems
3. Test the high speed assembly and robot assembly systems.
4. Create sophisticated technologies using Robots in assembly lines.

TEXT BOOKS

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.

REFERENCES

1. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.
2. A Delbainbre "Computer Aided Assembly London, 1992.

Course Code :		**PRODUCT DESIGN & ASSEMBLY AUTOMATION**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓					✓						
	CO 2		✓		✓								
	CO 3		✓										
	CO 4									✓		✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**				**Professional Subjects**			
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MANAGEMENT SCIENCE (17170761d)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not required				

COURSE OBJECTIVE:

1. To make the student to understand the concept and nature of Management, Evolution of Management theories, Motivation and leadership styles
2. To make the student to equip with the concepts of operations and inventory control
3. To make the student to understand the main functional areas of organization
4. To make the student to understand drawing the net work diagram and crashing the projects
5. To make the student to equip with the concept and practical issues relating to Strategic Management

UNIT - I

Introduction to Management: Concepts of Management and organization- Nature and Importance of Management, Functions and Evolution of Management, Motivation theories-Leadership styles- Decision making process – designing organization structure- Principles and types of organization.

UNIT - II

Operations Management: Principles and Types of Management- Work study – Statistical quality control-control charts (P-Charts, R-Charts, and C-Charts) simple problems.

Material Management: Need for inventory control- EOQ, ABC analysis (Simple problems) and Types of ABC analysis (HML, SDE and FSN analysis)

UNIT - III

Functional Management: Concept and functions of finance, HR, Production and Marketing, Functions of HR Management – Wage payment plans (Simple problems)-Job evaluation and Merit rating – Marketing strategies based on product life cycle, channels of distributions.

UNIT - IV

Project Management: (PERT/CPM) Concept, Development of Network – Difference between PERT and CPM – Identification of critical path – Probability crashing (Simple problems).

Strategic Management: Vision, Mission, Goals, Strategy- Elements of Corporate Planning Process-Environmental Scanning – SWOT analysis – Steps in strategy formulation and implementation, Genetic Strategy alternatives.

UNIT V

Contemporary Management Practices: Basic concepts of MIS, MRP, Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levies, Supply chain

management, Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

COURSE OUTCOME:

After successful completion of this course, successful student able to

1. Understand the concept and functions of Management and theories of motivation, styles of leadership
2. Understand the main idea of inspection and scrutinize the different methods of inspection, the concept of inventory management and control of inventory pricing
3. Understand the different functional areas in an organization and their responsibilities – Product life cycles of distribution
4. Familiar with the meaning of Vision, Mission, Goals and Strategies of the Organization and to implement successfully

TEXT BOOK

1. Dr. P. Vijay Kumar & Dr N. AppaRao, 'Introduction to Management Science' Cengage, Delhi
2. Dr A R Aryasri: *Management Science*, TMH, New Delhi 2011.

REFERENCES

1. Koontz & Weihrich: *Essentials of Management*, TMH, 2011
2. Seth & Rastogi : Global Management System, Cengage Learning, Delhi, 2011.
3. Robbins: Organizational behavior, Person pub, 2011
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2011.
5. Philip Kotler & Armstrong; Principles of marketing, Person pub.
6. Biswajit Patnaik: Human resource management, PHI, 2011
7. Management shapers, Universities press
8. Dr P V V Satya : Strategic Human Resources Management, Discovery pub, New Delhi

Course Code :		**MANAGEMENT SCIENCE**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓					✓						
	CO 2		✓		✓								
	CO 3		✓										
	CO 4									✓		✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	COMPUTATIONAL FLUID DYNAMICS (17130706e)	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite(s)	Basic Mathematics, Fluid Mechanics & Heat Transfer				

COURSE OBJECTIVES

1. To make the student able to understanding for the major theories, approaches and methodologies used in CFD
2. To make the student able to solve problems in the actual implementation of CFD methods
3. To make the student able to perform the application of CFD analysis to real engineering designs
4. To make the student able to apply various numerical tools like finite volume, finite difference etc. for solving the different fluid flow problems

UNIT-I

ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, conditioning and numerical instability, computational methods for error estimation, convergence of sequences.

UNIT – II

APPLIED NUMERICAL METHODS: Solution of a system of simultaneous linear algebraic equations, iterative schemes of matrix inversion, direct methods for matrix inversion, and direct methods for banded matrices.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-Stokes equations, conservation of energy principle, special forms of the Navier-Stokes equations.

UNIT - III

Steady flow, dimensionless form of momentum and energy equations, Stokes equation, conservative body force fields, stream function - vorticity formulation.

Finite difference applications in heat conduction and convention – heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT – IV

Finite differences, discretization, consistency, stability and fundamentals of fluid flow modeling, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT – V

FINITE VOLUME METHOD: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

COURSE OUTCOMES:

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

CO-1. Develop an understanding for the major theories, approaches and methodologies used in CFD.
CO-2. Solve problems in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modeling etc.) in using commercial CFD codes
CO-3. Perform the application of CFD analysis to real engineering designs
CO-4. Apply various numerical tools like finite volume, finite difference etc. for solving the different fluid flow problems

TEXT BOOKS:

1. "Numerical heat transfer and fluid flow," Suhas V. Patankar, CRC press, 1 ed.,2017.
2. "Computational fluid dynamics-Basics with applications," John. D.Anderson, Mc Graw Hill, 3 ed, 2008.

REFERENCES:

1. "Computational Fluid Flow and Heat Transfer," Niyogi P, Pearson Publications, 2006.
2. "Fundamentals of Computational Fluid Dynamics," Tapan K. Sengupta, Universities Press, 2004.
3. "Computational fluid dynamics," John Wendt, Springer publishers, 3 ed, 2012.

Course Code :		**COMPUTATIONAL FLUID DYNAMICS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1				✔								
	CO 2							✔					
	CO 3						✔						
	CO 4			✔									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	VEHICLE BODY ENGINEERING AND SAFETY (17170761f)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not required				

COURSE OBJECTIVES:

1. To make the student to design the construction of vehicle, aerodynamics, paneling of passenger car and commercial vehicle body design
2. To make the student to analyze the construction details of bus body
3. To make the student to select the various materials in construction of vehicle body
4. To make the student to select different mechanisms in vehicle construction

UNIT I
CAR BODY DETAILS

Types of Car body - Saloon, hatch back, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility- regulations, driver's visibility, improvement in visibility and tests for visibility. Driver seat design -Car body construction-Various panels in car bodies. Safety: Safety design, safety equipment for cars.

UNIT II
BUS BODY DETAILS

Types of bus body: based on capacity, distance travelled and based on construction. Bus body lay out, floor height, engine location, entrance and exit location. Types of metal sections used – Regulations – Constructional details: Conventional and integral.

UNIT III
COMMERCIAL VEHICLE DETAILS

Types of commercial vehicle bodies - Light commercial vehicle body. Construction details of Flat platform body, Tipper body and Tanker body – Dimensions of driver's seat in relation to controls – Drivers cab design.

UNIT IV
VEHICLE AERODYNAMICS

Objectives, Vehicle drag and types. Various types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

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UNIT V

BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR

Types and properties of materials used in body construction-Such as steel sheet, timber, plastics and GRP. Body trim items-body mechanisms. Hand tools-power tools for body repair. Vehicle corrosion-Anticorrosion methods-Modern painting process procedure.

COURSE OUTCOMES:

After successful completion oof this course, successful student able to

1. Classify different aspects of car body, bus body and commercial vehicle bodies
2. Evaluate various aerodynamic forces and moments, measuring instruments in vehicle body design
3. Select the material used in body building, tools used in body repairs
4. Create command over vehicle body engineering applications

TEXT BOOKS:

1. Powloski, J., Vehicle Body Engineering, Business Books Ltd., 1998.
2. James E Duffy, Body Repair Technology for 4-Wheelers, Cengage Learning, 2009.

REFERENCES:

1. Giles, G.J., Body construction and design, Illiffe Books Butterworth & Co., 1991.
2. John Fenton, Vehicle Body layout and analysis, Mechanical Engg. Publication Ltd., London, 1992.
3. Braithwaite, J.B., Vehicle Body building and drawing, Heinemann Educational Books Ltd., London, 1997.
4. Dieler Anselm., The passenger car body, SAE International, 2000

Course Code :		**VEHICLE BODY ENGINEERING AND SAFETY**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓			✓						
	CO 2		✓	✓									
	CO 3			✓			✓						
	CO 4									✓		✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	VEHICLE DYNAMICS (17170702)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Engineering Mechanics, Kinematics of Machinery, Dynamics of Machinery, Design of Machine Elements				

COURSE OBJECTIVES:

1. To make the student to analyze various kinds of vibrations
2. To make the student to distinguish various kinds of vibrations caused due to different aspects like uneven road, engine unbalance
3. To make the student to measure the intensity of vibration
4. To make the student to reduce the vibration effect on a vehicle

Unit-I

Undamped free vibration: Single degree of freedom Systems, introduction, undamped free vibration -Natural frequency' of free vibration, Rayleigh's method, stiffness of spring elements, effects of spring mass, Energy method, Newton's method and D' Alembert's principle- problems.

Damped free vibration: Single degree of freedom systems, different types of damping, concept of critical damping and its importance, response study of viscous damped systems for cases of under damping and over damping, logarithmic decrement. Semi active suspension and active suspension.

Unit-II

Forced vibration: Single degree of freedom systems, steady state solution with viscous damping due to harmonic force solution by complex algebra, concept of response, reciprocating and rotating unbalance, vibration isolation Transmissibility ratio, energy dissipated by damping equivalent. Viscous damping. Structural damping, sharpness or resonance, base excitation.

Unit-III

Systems with two degree of freedom: Introduction, principle modes and normal modes coordinate coupling, generalized and principle co-ordinate, free vibrations in terms of natural conditions. Lagrange's equation, semi-definite systems, forced oscillations. Harmonic excitation.

Unit-IV

Vehicle vibrations: Vehicle vibration with single degree of freedom free vibration, forced vibration, vibration due to road roughness, vibration due to engine unbalance, transmissibility of engine mounting vibration with two degree of freedom, free vibration, compensated suspension systems forced vibration, vibration due to road roughness.

Vibration measuring instruments -Accelerometers and vibrometers. Whirling of shafts with and without air damping, discussion of speeds above and below critical speeds.

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Unit-V

Numerical methods for multi degree of freedom systems: Introduction, influence coefficients, Maxwell's reciprocal theorem, Dunkerley's equation, orthogonality principle, method of matrix iteration- method of determination of all the natural frequencies using sweeping matrix and orthogonality principle, Holzer's method for systems with free, fixed free and fixed ends.

COURSE OUTCOME:

After successful completion oof this course, successful student able to

1. Analyze various kinds of vibrations caused due to different aspects like road construction, engine unbalance
2. Evaluate vibration measuring techniques
3. Design and develop a suspension system
4. Reduce the vibration effect on a vehicle

TEXT BOOKS

1. Mechanical Vibration -By G.K.Grovcr, Nernchand & Brothers
2. Vehicle dynamics, Theory and applications-reza N. Jazar-Springer International
3. Vibration Theory & Applications -By William I Thomson, Prentice Hall

REFERENCES:

1. Theory & Problems of Mechanical Vibration -By William W. Seto, McGrawHil1
2. Problems in Automobile Mechanics-By N.K.Giri, Khanna Pub.
3. Mechanics of Pneumatic Tyre -By S.K.C. fark, Prentice Hall
4. Mechanical Vibration Analysis -By PSrinivasan, TMH
5. Mechanical Vibration -By Church. Wife) international

Course Code :		**VEHICLE DYNAMICS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓									
	CO 2			✓									
	CO 3			✓						✓			
	CO 4				✓								
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**				**Professional Subjects**			
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

Regulation	GR-17 (B.Tech.)	L	T	P	C
Course (Code)	INSTRUMENTATION & CONTROL SYSTEM (17170703)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	BEEE				

COURSE OBJECTIVE:

1. To make the student able to analyze various engineering principles for measuring different parameters
2. To make the student able to analyze the principles of design engineering, thermal engineering and production engineering to find out various parameters
3. To make the student able to solve inter disciplinary engineering problems by applying various techniques of thermal, design, automation technologies

UNIT – I

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

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

UNIT – II

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

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

UNIT – III

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

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

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

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

UNIT – IV

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

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

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

UNIT – V

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

Course OUTCOMES:

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

1. Apply fundamental knowledge of science and various engineering principles for measuring different parameters.
2. Use the principles of design engineering, thermal engineering and production engineering to find out various parameters.
3. Solve inter disciplinary engineering problems by applying various techniques of thermal, design, automation technologies.

TEXT BOOKS:

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

REFERENCES:

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

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Course Code :		**INSTRUMENTATION & CONTROL SYSTEM**											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✔											
	CO 2		✔										
	CO 3				✔								
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course (Code)	FINITE ELEMENT METHODS (17170704)	3	1	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Strength of Materials, Mathematics (Matrices, Differential Equations, Numerical integration), Heat transfer.				

COURSE OBJECTIVE:

1. To make the student able to Describe the concepts behind variational methods and weighted residual methods in FEM
2. To make the student able to Develop element characteristic equation procedure and generation of global stiffness equation will be applied
3. To make the student able to Apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form
4. To make the student able to Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow

UNIT –I

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

UNIT – II

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

UNIT – III

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

UNIT-IV

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

UNIT – V

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

COURSE OUTCOMES

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

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

CO-2: Develop element characteristic equation procedure and generation of global stiffness equation will be applied.

CO-3: Apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.

CO-4: Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering by Tirupathi R. Chandrupatla, Ashok D. Belegundu, Fourth edition, Pearson education, 2011.
2. The Finite element method in engineering," S. S. Rao, 5th edition, Elsevier publications, 2010.

REFERENCES:

1. An introduction to the Finite element method, JN Reddy, McGraw Hill Education, 3rd edition, 2005
2. Finite Element Analysis: Theory and Programming, C.S. Krishnamoorthy, Tata McGrawHill Education, 1995.
3. Finite element analysis, S.S. Bhavikatti, New Age International, 2005.

Course Code :		**FINITE ELEMENT METHODS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1				✔								
	CO 2	✔											
	CO 3				✔								
	CO4		✔										
	CO5			✔									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	ENVIRONMENT POLLUTION & CONTROL (17170765a)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)					

COURSE OBJECTIVES:

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

UNIT I

Air Pollution

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

UNIT II

Water Pollution

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

UNIT III

Noise Pollution

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

UNIT IV

Land Degradation

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

UNIT V

Socio Economics Impact

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

COURSE OUTCOMES:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	BUILDING TECHNOLOGY (17170765b)	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of Building materials, basic ingredients of concrete, design of concrete material, durability of concrete, components of buildings are required. Basics of Various structures, Material requirement, Concrete under various environment concrete in various environment.				

COURSE OBJECTIVES

The objective of the course is to expose the student to

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

Unit 1: STONES, BRICKS, TIMBER

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

Unit 2: CEMENT, LIME, STEEL

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

Unit 3: CEMENT CONCRETE:

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

Unit 4: BUILDING COMPONENTS

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

Unit 5: CONSTRUCTION METHODS AND SAFETY ENGINEERING

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

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

COURSE OUTCOMES:

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

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

TEXT BOOKS

1. "Basic concepts in Civil Engineering by Dr.B.C. Punmia, Ashok K.Jain, Arun K.Jain Laxmi Publications(P) LTD.
2. "Engineering Materials", Rangwala, S.C, (36th edition),Anand Charotar Publishing House, 2009.
3. "Building planning and drawing", (3rd edition), Kumara swami & Kameswara rao, N., Anand Charotar Publishing House Pvt Ltd, 2010.
4. Concrete Technology by M.S.Shetty. – S.Chand & Co.; 2004.

REFERENCES

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

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	SOCIAL NETWORK ANALYSIS (17170765c)	3	-	-	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

Course Objective(s)

1. Understand the concept of semantic web and related applications
2. Learn knowledge representation using antology
3. Understand human behaviour in social web and related communities
4. Learn visualization of social networks.

UNIT-1

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

UNIT-II

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

UNIT-III

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

UNIT-IV

Predicting Human behaviour and Privacy Issues - Understanding and predicting human behaviour for social communities - User data management — Inference and Distribution — Enabling new human experiences — Reality mining — Context — Awareness — Privacy in online social networks — Trust in online environment — Trust models based on subjective logic — Trust network analysis — Trust

transitivity analysis - Combining trust and reputation — Trust derivation based on trust comparisons — Attack spectrum and countermeasures.

UNIT-V

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

TEXT BOOKS

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

REFERENCE BOOKS

1. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking - Techniques and applications", First Edition Springer, 2011.
2. Dian Goh and Schubert Foo, "Social information Retrieval Systems: Emerging technologies and Applications for Searching the Web Effectively", IGI Global Snippet,2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
4. John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	RENEWABLE ENERGY SOURCES AND SYSTEMS (17170765d)	3	-	-	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT-1:
Fundamentals Of Solar Enegy Systems
Energy conversation principle - Energy Scenario(World and India) - Solar Radiation: Outside earth's atmosphere – earth surface – Analysis of solar radiation data – geometry – radiation on tilted surfaces – Numeraical Problems.

UNIT-2:
Solar photovoltaic Systems: balance of systems – IV Characteristics – System Design: Storage sizing – PV System Sizing – Maximum Powerpoint Techniques: Perturb and observe(P&O) Technique – Hill Climbing Technique, Incremental Conductance Method
Solar Thermal Systems: Liquid flat plate collections: Performance analysis – Transmissivity – Absorptivity Product, Collector Efficiency Factor – Collector Heat Removal Factor – Numerical Problems. Introduction to solar air heaters – Concentrating collectors & Solar pond.

UNIT-3:
Wind Energy: wind Patterns – Types of turbines – kinetic energy of wind – betz coefficient – tip speed ratio – efficiency – power output of wind turbine – selection of generator(Synchronous, Induction) – Maximum power tracking.

UNIT-4:
Hydro and Tidal power Systems: Hydro systems: basic working principle – large, small, micro – Measure of head and flow – Energy Equation – Types of turbines – Numerical Problems
Tidal Power: Basics – Kinetic Energy Equation – Numerical Problems. Wave Power – Basics – Kinetic Energy Equation.

UNIT-5:
Bio Mass, Fuel Cells and Geothermal Systems: Bio mass energy: Fuel classification – pyrolosis – Direct combustion of heat – Different digesters and sizing.
Fuel Cell: Classification – Efficiency – VI Characteristics
Geo Thermal: Classification – Dry Rock and acquifier – Energy Analysis

COURSE OUTCOMES
After completion of this course, a successful student will be able to:
CO 1: Analyze solar radiation data, extra terrestrial radiation. Radiation on Earths surface
CO 2: Design Solar thermal collectors
CO 3: Develop maximum powerpoint techniques in solar PV and wind.

Text books:
1. Godfrey Boyle "Renewable Energy", Oxford Publications, Second edition.
2. G. D. Rai, "Non-Conventional Energy Sources", Khanna Publishers, First edition.

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Reference books*:*

1. Roger H.Charlier, Charles W. "Ocean Energy- Tide and Tidal Power"ISBN: Library of Congress Control Number: 2008929624_c Springer-Verlag Brerlin Heidelberg 2009.
2. John Twidell & Toney Weir: E&F.N. Spon, "Renewable Energy Sources", Taylor & Francis New York, 2nd edition.
3. John F.Walker & N.Jenkins, "Wind Energy Technology", John Willey and Sons Chichester, U.K – 1997

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	INTERNET OF THINGS (17170765e)	3	-	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

COURSE OBJECTIVES:

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

UNIT-I

Fundamental of IoT

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

UNIT-II

Communication Protocols for IoT

Wired Communication Protocols: I2C, SPI, One Wire,RS232, Ethernet, RS 485, UART, USART, USB,

Wireless Communication Protocols: Blue tooth, ZigBee, Z-Wave, LoWPAN, WiFi-ah, NFC, RFID), Application Protocols MQTT, CoAP, HTTP.

UNIT-III

Threats, Security, Privacy and IoT Cloud

IoT as Interconnection of Threats: Phase attach, Attack as per Architecture, Attach based on Components.

Security Engineering for IOT Development: Building Security into design and development, Secure Design: Safety and Security Design, Processes and Agreements, Technology Selection.

Mitigating to Privacy Concern: Privacy Challenges introduced by IoT, Guide to perform PIA, PbD Principles, and Privacy Engineering Recommendations

IOT Cloud: Concepts of Cloud, Your Organization and Cloud Computing, Cloud Computing Services (IaaS, PaaS , SaaS).

Case Study: ThingSpeak Cloud, Blynk Cloud, MQTT Cloud

UNIT-IV

Measurement Errors and Sensors

Measurement Errors: Gross Error, Systemic error, Absolute Error, Relative Error, Accuracy, Precision, Resolution, Significant Figure, Measurement Error Combinations, Basics of Statistical Analysis.

Sensors and Transducers: Passive and Active Sensors, Resistive Sensors, Capacitive Sensors and Inductive Sensors, Temperature Sensor, Humidity Sensor, Ultra-Sonic Sensor, IR Sensor, PIR Sensor, Vibration Sensor, Gas Sensor, Hall Effect Sensor.

UNIT-V

Development Platform: Hardware, Software, Programming Language

Hardware: Arduino Uno Board, NodeMCU Board

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

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

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

COURSE OUTCOMES:

CO1: Learn about the IOT Development cycles, Challenges and Requirements.

CO2: Learn about the Wired and Wireless Communication Protocols implementation.

CO3: Learn about Privacy, Threats and Security challenges present in IOT and IoT Clouds.

CO4: Learn about types of measurement errors and its impact on measurement and various sensor operation and construction mechanism.

CO5: Learn about Development platform " Arduino IDE", Sensors Libraries and Programming.

TEXT BOOKS:

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

WEB LINKS:

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

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	HYBRID VEHICLES (Not for AME Students) (17170765f)	3	-	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

COURSE OBJECTIVES

1. Analyzing various aspects of hybrid and electric drive trains such as their configuration, types of electric machines that can be used, energy storage devices, etc.
2. Get exposed to research and development challenges involved in various types of fuel cells.

UNIT I - FUELCELL TECHNOLOGY

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

UNIT II - FUEL CELL BASED VEHICLES STRUCTURE

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

UNIT III - HYBRID ELECTRIC TECHNOLOGY

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

ELECTRIC DRIVETRAINS

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

UNIT IV - HYBRID ELECTRIC VEHICLES

Principles of Hybrid Electric Drive trains, 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

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

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology",* Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and Aulice Scibioh, M., *"Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.
3. Hoogers, G., Edr. *"Fuel Cell Technology Handbook*", CRC Press, Washington D. C., 2003.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, "*Vehicular Electric Power Systems"*, Marcel Dekker, Inc., 2004.

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IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	ROBOTICS (17170765g)	3	-	-	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Kinematics of machines /Dynamics of machines /mathematics :matrices ,differential equations				

UNIT – I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.Robot applications in manufacturing

UNIT II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems. **MANIPULATOR KINEMATICS:** Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT –IV

Differential transformation and manipulators, Jacobians – problems, Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT – V

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

COURSE OUTCOMES:

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

CO-1. Identify various robot configuration and components.(PO4)

CO-2. Select appropriate actuators and sensors for a robot based on specific application. .(PO6)

CO-3. Solve kinematic and dynamic problems for simple serial kinematic chains. .(PO7)

CO-4.Plan trajectory for a manipulator for avoiding obstacles..(PO5)

TEXT BOOKS:

1. Industrial Robotics",Groover M P,MitchellWeiss,Roger N. Nagel,Tata McGraw-Hill,india,edition-3,2008 /Pearson Education.
2. Robotics and Control" R K &Nagrath I J / Tata McGraw-Hill,india,edition, 2003.

REFERENCES:

1. "Robotics"K .S.Fu,R.C.Gonzalez,C.S.G.Lee,Tata McGraw-Hill,india,edition-2, 2008.
2. "Robotic engineering: an integrated approach",Richard David Klafter, Thomas A. Chmielewski, Michael Negin,Prentice Hall, 1989

Course Code		**ROBOTICS**											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1				✔								
	CO 2						✔						
	CO 3							✔					
	CO4					✔							
	CO5												
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	PRINCIPLES OF MANAGEMENT (17170765h)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not Required				

LEARNING OBJECTIVES

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

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

Contemporary issues – (Brief Study) Quality circle-Total Quality Management - Business Process Reengineering (BPR)- Six sigma.

COURSE OUTCOMES

On completion of this course the students would be able to

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

TEXT BOOK

1. Heinz Weilrich, Mark V. Cannice& Harold Koontz, Management a Global and Entrepreneurial Perspectives. Tata McGraw-Hill Education, New Delhi. 2014. ..
2. Essential of Management - Horold Koontz and Iteinz Weibrich - McGrawhills International
3. Management Theory & Practice - J.N.Chandan 3. Essential of Business Administration - K.Aswathapa Himalaya Publishing House
4. Principles & practice of management - Dr. L.M.Parasad, Sultan Chand & Sons - New Delhi
5. Business Organization & Management - Dr. Y.K. Bhushan
6. Management: Concept and Strategies By J. S. Chandan, Vikas Publishing
7. Principles of Management, By Tripathi, Reddy Tata McGraw Hill 8. Business organization and Management by Talloo by Tata McGraw

REFERENCES

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

JOURNALS

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

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOTIVE POLLUTION & CONTROL (17170706)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not Required				

COURSE OBJECTIVES:

1. To make the student to analyze and identify the emissions released from the IC engines
2. To make the student to use the pollution norms while designing and manufacturing the vehicle
3. To make the student to estimate the cost of a vehicle
4. To make the student to measure the pollutants

UNIT I

Pollutants from SI engines, Mechanism & formation of HC, CO, NOx, Particulates in SI engines. Engines and operating variables affecting pollution in SI engines.

Pollution for CI engines, Mechanism & formation of HC, CO, NOx, Particulates, and root in CI engines. Factor affecting emissions in CI engines.

UNIT-II

Laws and regulations: Historical background, regulatory test procedures (European cycles), BS I, BS II, BS III, BS IV, BS V and BS VI. Exhaust gas pollutants (European rail road limits), particulate pollutants, European statutory values, inspection of vehicles in circulation (influence of actual traffic conditions and influence of vehicle maintenance) Analysis of pollutants: Carbon and Nitrogen compounds-(CO.CO2 Nox), Ammonia and Amines, Hydrocarbons. Volatile compounds, evaporative losses, analysis of particulates.

UNIT-III

Lean burns & stratified charge engines. Multipoint fuel injection and gasoline direct injection methods. Common rail fuel injection in diesel engines. Post combustion treatments: Introduction, exhaust gas recirculation, exhaust gas composition before treatment, catalytic convertors, oxidation and three way types thermal reactors, installation of catalysts in exhaust lines treatment in diesel engines, particulate traps for diesel engines, particulates trap regeneration, SCR (Selective Catalytic reduction), CCS (Carbon Capture & Storage), Char coal caniser.

UNIT-IV

Economic challenges: Introduction, cost of improvement to SI engines, cost of injection systems, cost of improvement in Diesel engines, economic consequences of introducing the catalyst, additional costs incurred by diesel traps, cost of periodic inspection of pollution control system and evaporative control system.

UNIT-V

Instrumentation for pollution measurements: NDIR- analysers, thermal conductivity and flame ionization detectors, analysers for NOx, gas chromatograph. Orsat apparatus, smoke meters-spot sampling and continuous indication types like Bosch, Hartridge. Particulate measuring systems, dilution tunnels- full and partial flow.

SI and CI engines fuel requirements. Knock in SI and CI engines. Knock rating of SI and CI Engines fuels. Alternative fuel like Hydrogen, Natural gas, LPG, vegetable oil and biodiesel, their production, properties, storage and performance as engines fuels.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Analyse and identify the emissions released from the IC engines
2. Use the pollution norms while designing and manufacturing the vehicle
3. Estimate the cost of a vehicle
4. Measure the pollutants

TEXT BOOKS

1. Bosch – Gawline fuel injection – Bosch Publications
2. Bosch – Diesel fuel injection – Bosch Publications
3. IC Engine Combustion & Emissions - B P Pundhir, 1st Vol.

REFERENCES

1. Automobiles and Pollution – PaulDegobert(SAE)
2. Diesel engine operation manual – V.L. Maleev, CBS Pub
3. I.C. Engines – E.F. Obert, Harper & Row
4. Engine emission – Springer and Patterson, Plenum Press
5. Heins Aeisth – Internal Combustion Engines – SAE Publications.

Course Code :		**AUTOMOTIVE POLLUTION & CONTROL**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓									
	CO 2							✓					
	CO 3						✓					✓	
	CO 4							✓					
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	SERVICING & MAINTENANCE OF AUTOMOBILE & INSTRUMENTATION LAB (17170711)	0	0	3	2
Teaching	Total contact hours - 42				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To make the student to assemble and dis-assemble the various components of an automobile
2. To make the student to troubleshoot the vehicle to identify the problem location
3. To make the student to test and overhaul the components of an vehicle
4. To make the student to calibrate measuring instruments

Section-I AUTOMOBILE ENGINEERING LAB

1. Dismantling and assembly of LMV components as following:
   a) Gear box b) clutch assembly c) Propeller shaft d) differential gear box
   e) rear axle t) suspension system g) steering mechanism.
2. Dismantling and assembly of door frames, door locks and window locks
3. Study of driver's seat layout in anyone LMV and anyone HMV.
4. Testing, servicing and charging of batteries
5. Servicing of generator, alternator and starter motor with dismantling, testing, inspection and assembly.
6. Servicing of ignition systems
7. Drawing of general electrical wiring diagrams of various vehicles { two and four wheelers)
8. Calibration of micrometer, measurement of plain plug, measurement of plain ring gauge, taper gauge
9. Measurement of taper using sine bar and other instruments.
10. Measurement of base circle diameter and tooth thickness of spur and helical gears
11. Use of slip gauges, measurement of screw threads using screw thread micrometer, use of comparators, experiments involving profile projectors.
12. Overhauling &testing of fuel injection pumps on test bench.
13. Overhauling & testing of air brake components in the brake system on test bench.

Note: Driving practice of a geared two wheeler and anyone LMV for a minimum of 10 hours duration need to be provided.

Section-II INSTRUMENTATION LAB

1. Calibration of Pressure Gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.

6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotometer for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low pressure.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Assemble and dis-assemble the various components of an automobile
2. Troubleshoot the vehicle to identify the problem location
3. Test and overhaul the components of an vehicle
4. Calibrate measuring instruments

Course Code :		**SERVICING & MAINTANANCE OF AUTOMOBILE & INSTRUMENTATION LAB**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1											✓	
	CO 2				✓								
	CO 3		✓										
	CO 4		✓										
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	TUNING OF AUTOMOBILES THROUGH REAL TIME WORKSHOP INTERACTION LAB (17170712)	0	0	3	2
Teaching	Total contact hours - 42				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To make the student to troubleshoot the problems in a vehicle by using OBD TOOL
2. To make the student to balance and align the wheel
3. To make the student to test the vehicle
4. To make the student to design the layouts body depots, service stations and vehicle layout

LIST OF EXPERIMENTS

1. Computerized engine analyzer study and practice.
2. Computerized wheel balancing machine study and practice.
3. Computerized wheel alignment machine study and practice.
4. Exhaust emission test of petrol and diesel engine
5. Two wheeler chassis dynamometer study and practice
6. Study of wind tunnel -determining of coeff of drag for a given aerofoil
7. Road worthiness test a) Acceleration b) Gradability c) Maximum speed d) Constant speed fuel consumption (High way drive) e) city drive fuel consumption tests f) Braking distance test.
8. Head light focusing test.
9. Visibility test.
10. Drawings of automobile bodies -light and heavy vehicles for different seating capacities.
11. Dimensional drawings of bus depots and service station workshop layouts.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Troubleshoot the problems in a vehicle by using OBD TOOL
2. Balance and align the wheel
3. Test the vehicle
4. Design the layouts body depots, service stations and vehicle layout

****This is not a Laboratory, it is a student activity similar to internship**

The student has to visit Local workshops & scanning centers and complete any of 10 (Ten) of the above experiments and submit the report.

Note : The student will be permitted to visit the workshop/Automobile scanning centers in the respective Lab time slots

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Course Code :	**TUNING OF AUTOMOBILES THROUGH REAL TIME WORKSHOP INTERACTION LAB**											
Course Designed by		Department of Automobile Engineering										
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1				✓								
	CO 2		✓									✓	
	CO 3		✓				✓						
	CO 4			✓		✓				✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – I Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MINI PROJECT-2 (17170731)	0	0	0	2
Teaching					
Prerequisite(s)					

The student has to do fabrication project at outside workshop or inside the college laboratories during summer vacation after III B.Tech. II Sem. Course and it will be evaluated during IV B.Tech. I Sem. The student has to submit the model and brief report.

The evaluation will be done by the expert committee consisting of HOD, A senior faculty member from the same branch and another senior faculty member from any other branches of the same college.

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	HYBRID, ELECTRIC & FUEL CELL VEHICLES (17170801)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not Required				

COURSE OBJECTIVES

1. To make the student to design and develop the fuel cell vehicle, electric vehicles and hybrid vehicles
2. To make the student to distinguish various vehicles
3. To make student to incorporate sophisticated technology
4. To make student to develop eco-friendly vehicles

UNIT- I
FUELCELL TECHNOLOGY

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

UNIT – II
FUEL CELL BASED VEHICLES STRUCTURE

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

UNIT - III
HYBRID ELECTRIC TECHNOLOGY

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

ELECTRIC DRIVETRAINS

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

UNIT – IV
HYBRID ELECTRIC VEHICLES

Principles of Hybrid Electric Drive trains, 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

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). Plug in hybrid electric vehicles.

COURSE OUTCOMES

After successful completion of this course, successful student able to

1. Design and develop the fuel cell vehicle, electric vehicles and hybrid vehicles
2. Distinguish various vehicles
3. Incorporate sophisticated technology
4. Develop eco-friendly vehicles

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology",* Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and Aulice Scibioh, M., *"Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.
3. Hoogers, G., Edr. *"Fuel Cell Technology Handbook*", CRC Press, Washington D. C., 2003.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, "*Vehicular Electric Power Systems"*, Marcel Dekker, Inc., 2004.

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Course Code :		**HYBRID,ELECTRIC & FUEL CELL VEHICLES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1			✓		✓							
	CO 2		✓										
	CO 3									✓			✓
	CO 4							✓					
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	VEHICLE MAINTENANCE (17170863a)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)	Not Required				

COURSE OBJECTIVES:

To make the student

1. To maintain vehicle and workshop properly
2. To maintain engine subsystems and drive line components.
3. To maintain vehicle systems

UNIT - I

MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS

Maintenance – Need, importance, classification of maintenance, basic problem diagnosis. Automotive service procedures – workshop operations – Safety – Personnel, machines and equipment, vehicles, fire safety - First aid. Basic tools – special service tools – measuring instruments.

UNIT - II

ENGINE AND ENGINE SUBSYSTEM MAINTENANCE

General Engine service- Dismantling of Engine components- Engine repair- Service of basic engine sub systems- cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls

UNIT - III

TRANSMISSION AND DRIVELINE MAINTENANCE

Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT - IV

STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE

Maintenance and Service of steering system-Inspection, Maintenance and Service of brake system-Drum brake, Disc brake, Parking brake. Bleeding of brakes. Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers-Dismantling and assembly procedures. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation. Inspection,

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UNIT V
AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE

Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

COURSE OUTCOMES

End of the course student would have deep knowledge on

1. Importance of Vehicle maintenance
2. Service procedure of engine and subsystems
3. Service procedure of drive line
4. Maintenance of electrical and air conditioning system

TEXT BOOKS

1. William H Crouse and Donald L Anglin "Automotive Mechanics" Tenth Edition, Mc Graw Hill Publications, 2007
2. Ed May, Automotive Mechanics Volume One , Mc Graw Hill Publications, 2003
3. Ed May, Automotive Mechanics Volume Two , Mc Graw Hill Publications, 2003

REFERENCES

1. Bosch Automotive Handbook, Sixth Edition,2004
2. Vehicle Service Manuals of manufacturers

Course Code :		**VEHICLE MAINTENANCE**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓			✓								
	CO 2					✓							
	CO 3		✓										
	CO 4											✓	✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOTIVE AERODYNAMICS (17170863b)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To learn the basics of fluid mechanics on vehicle motion and expose to the optimization techniques followed in automotive industry in reducing aerodynamics drag, fuel consumption and improving vehicle stability.
2. This course will also expose the students to testing techniques practiced in industry.

UNIT I
BASICS OF FLUID DYNAMICS ON VEHICLE MOTION

Importance of study - timeline developments -basics of fluid mechanics -flow phenomenon related to vehicles - external flow problem -various resistances to vehicle motion - performance, fuel consumption and traction force diagram of a passenger car.

UNIT II
DRAG FRACTIONS AND LOCAL ORIGINS IN A PASSENGER CAR

Car as a bluff body - generation & transportation of vortices around car -types of aerodynamic drag forces& its contribution to total drag - analysis of aerodynamic drag at local origins - shape and detail optimization techniques with case studies.

UNIT III
VEHICLE HANDLING

The origin of forces and moments on a vehicle - lateral stability problems - methods to calculate forces and moments – vehicle dynamics under side winds - the effects of forces and moments, dirt accumulation on the vehicle, wind noise. Add-ons to improve stability of road vehicles.

UNIT IV
COMMERCIAL VEHICLE AERODYNAMICS

Tractive resistance & fuel consumption – Drag coefficients of various commercial Vehicles – Scope for reducing drag on commercial vehicles (Trucks with trailers and buses), Advantages of commercial vehicles aerodynamics & its effects – Vehicle soiling & its effects on driving.

UNIT V
WIND TUNNELS FOR ROAD VEHICLES AERODYNAMICS

Need of a wind tunnel, principle of wind tunnel technology, problems with reduced scale models, full scale wind tunnels examples and case studies, instrumentation& measurement techniques, Introduction to numerical analysis (CFD).

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COURSE OUTCOMES :

1. Know the forces & moments influencing drag
2. Solve simple numerical related to fuel economy & drag
3. Learn the techniques of optimization practiced in industry
4. Learn the relation between drag, stability & fuel economy

TEXT BOOKS:

1. R.H.Barnard - "Road vehicle aerodynamic design, An Introduction" , Mechaero publications, Third edition
2. Hucho .W.H. – "Aerodynamic of Road Vehicles – From Fluid Mechanics to Vehicle Engineering" , Society of Automotive Engineers,U.S,Fourth edition
3. Alan Pope, Jewel B. Barlow, William H. Rae "Low speed wind tunnel testing" , John Wiley & SonsThird edition

REFERENCES:

1. Automotive Aerodynamic, Update SP-706 – SAE – 1987
2. Vehicle Aerodynamics – SP-1145-SAE-1996.

Course Code :		**AUTOMOTIVE AERODYNAMICS**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓									
	CO 2		✓			✓							
	CO 3			✓						✓			
	CO 4											✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	DESIGN FOR MANUFACTURE (17170863c)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

UNIT - I

Introduction: Design Philosophy-Steps in design process - General design rules for manufacturability-Basic principles of designing for economical production - Creativity in design.

UNIT –II

Machining processes: Overview of various machining processes-General design rules for machining-Dimensional tolerance and surface roughness- Design for machining – Ease –Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT – III

Metal casting: Appraisal of various casting processes, selection of casting process- General design considerations for casting-Casting Tolerance-Use of solidification, simulation in casting design - Product design rules for sand casting.

UNIT –IV

Metal joining: Appraisal of various welding processes, factors in design of weldments – General design guidelines-Pre and post treatment of welds effects of thermal stresses in weld joints-Design of brazed joints.

Forging: Design factors for forging – Closed die forging design – Parting lines of dies – Drop forging die design – General design recommendations.

UNIT - V

Extrusion & Sheet metal work: Design guide lines extruded sections- Design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – Component design for blanking.

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components-Design considerations for injection molding – Design guidelines for machining and joining of plastics.

COURSE OUTCOMES:

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

CO-1: Describe the design process considering manufacturability and economical production **(PO1)**

CO-2: Simulate the casting design and choose the suitable casting process for product **(PO5)**

CO-3: Design components for Machining, Casting, Welding, Closed die, drop forging and sheet metal forming processes **(PO3)**

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CO-4: Apply design principles for molding, machining and joining of plastics **(PO2)**

TEXT BOOKS:

1. "Design for Manufacture: Strategies, Principles and Techniques", John Corbett, Mike Dooner, John Meleka, Christopher Pym, Pearson Education, ISBN 10: 0201416948, 1991

2. "Product Design for Manufacture and Assembly", Geoffrey Boothroyd, Peter Dewhurst, Winston A Knight, CRC Press, 3rd Edition, 2010

3. "Design for Manufacturability Handbook", James G. Bralla, McGraw Hill, 2nd Edition, 1998

REFERENCES:

1. "ASM Handbook – Material Selection and Design", George E Dieter, ASM International, Vol. 20, 1997

Course Code :		**DESIGN FOR MANUFACTURE**											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✔											
	CO 2					✔							
	CO 3			✔									
	CO 4		✔										
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	OPERATION RESEARCH (17170863d)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

UNIT –I:

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

UNIT – II:

TRANSPORTATION PROBLEM: Formulation, optimal solution, unbalanced transportation problem, degeneracy.

ASSIGNMENT PROBLEM: Formulation, optimal solution, variants of assignment problem-traveling salesman problem.

SEQUENCING – Introduction, flow –shop sequencing, n jobs through two machines, n jobs through three machines, job shop sequencing, two jobs through 'm' machines.

REPLACEMENT: Introduction – replacement of items that deteriorate with time, when money value is not counted and counted, replacement of items that fail completely, group replacement.

UNIT – III:

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

UNIT-IV:

WAITING LINES: Introduction – single channel, Poisson arrivals, exponential service times, with infinite population and finite population models, multichannel, Poisson arrivals, exponential service times with infinite population single channel Poisson arrivals.

INVENTORY: Introduction – single item, deterministic models, purchase inventory models with one price break and multiple price breaks, shortages are not allowed.

UNIT – V:

DYNAMIC PROGRAMMING: Introduction – Bellman's principle of optimality, applications of dynamic programming, capital budgeting problem, shortest path problem, linear programming problem.

SIMULATION: Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages.

COURSE OUTCOMES:

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

CO-1: Formulate the Linear programming problem for real life problems. (PO4)
CO-2: Apply the Linear programming to solve problems. (PO1)
CO-3: Evaluate the Transportation, assignment, game, inventory, replacement, sequencing, queuing techniques for real life problems. (PO4)
CO-4: Apply the dynamic programming to solve problems of discreet and continuous variables. (PO2)
CO-5: Design the solutions to real world problem and simulate. (PO3)

TEXT BOOKS:

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

REFERENCES:

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

Course Code :		**OPERATION RESEARCH**											
Course Designed by		Department of Mechanical Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1				✔								
	CO 2	✔											
	CO 3				✔								
	CO 4		✔										
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MICRO ELECTRO MECHANICAL SYSTEMS (17170863e)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To learn basics of Micro Electro Mechanical Systems (MEMS).
2. To learn about various sensors and actuators used in MEMS.
3. To learn the principle and various devices of MOEMS, Fluidic, bio and chemical systems.

UNIT – I

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT – II

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT – III

MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS: Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT – IV

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectro phoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect,

electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic Channel, micro fluid dispenser, micro needle, molecular gate, micro pumps.

UNIT – V

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

CHEMICAL AND BIO MEDICAL MICRO SYSTEMS: Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemo resistors, chemo capacitors, chemo transistors, electronic nose (E-nose), mass sensitive chemo sensors, fluorescence detection, calorimetric spectroscopy.

TEXT BOOK:

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

REFERENCE BOOKS:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. MEMS and NEMS, Sergey Edwrd Lyshevski, CRC Press, Indian Edition.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
4. Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.

COURSE OUTCOMES:

Upon successful completion of this course the student shall be able to know the importance and various devices of MEMS and their applications.

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	AUTOMOTIVE CHASSIS & SUSPENSION (17170863f)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVE:

1. To make the student to design and develop the chassis and frame
2. To make the student to align and balance the wheel
3. To make the student to analyse and design and develop the braking, steering, suspension systems
4. To make the student to select the suspension system

UNIT - I

Introduction to Chassis System: Introduction: Requirements of an automobile with types of automobiles, layout of an automobile with reference to power plant, power required for propulsion, various resistances to motion of the automobile.

Frames: Types of frames-Ladder, Rigid, Monocope, semi monocope, Joggled, Sliced etc. Frame materials, calculation of stresses on sections, constructional details, loading points, testing of frames.

Wheels and tyres: Types of wheels, construction. Structure and function of tyres.

UNTI - II

Steering systems: types of steering gears, front axle. Under steer and over steer, wheel alignment, power steering, steering geometry, wheel balancing, centre point steering, steerability.

UNIT - III

Brakes: Necessity of brake, stopping distance and time. Brake efficiency, weight transfer, brake shoe theory, determination of braking torque, braking systems -mechanical, hydraulic, air (Pneumatic) brakes, brake disc, parking and emergency brakes, servo and electrical brakes, ABS, details of hydraulic system, mechanical system and components. Types of master cylinders, factors influencing operation of brakes such as operating temperature, lining, types of brake lining, brake clearance, pedal pressure, linkages etc.

UNIT - IV

Suspension: Types of suspension, leaf springs and their types, materials, independent suspension, torsion bar, air bellows or pneumatic, suspension, hydraulic suspension, constructional details of telescopic shock absorbers, types, vibrations and riding comfort, role axis of spring suspension.
Front Wheel Mounting, Rear Wheel Mounting, engine mounting, various types of springs used in suspension system. Requirements and various types, Material, Tyres, types of tyres, Types of wheel rims.

UNIT-V

Testing: Testing procedures, types of tests and chassis components, equipment for lab and road tests,

preparation of test reports.

Two and three wheelers: Classification of two and three wheelers, construction details, construction details of frames and forks, suspension systems and shock absorbers, different arrangement of cylinders. Carburetion system and operation.

COURSE OUTCOME:

After successful completion of this course, student able to

1. Design and develop the chassis and frame
2. Align and balance the wheel
3. Analyze and design and develop the braking, steering, suspension systems
4. Select the suspension system

TEXTBOOKS

1. Automotive chassis and body -P. L. Kohli, TMH
2. Automobile engineering – Sudhir kumar – university science press

REFERENCES

1. Introduction to automobile engineering -N.R. Khatawate. Khanna pub.
2. Automotive mechanics -Joseph I heintner. Affiliated East West Press
3. Problems in Automobile Engineering -N.K.Giri, Khanna Pub
4. Automotive Chassis -P.M. Heldt, Chilton & Co.
5. Automobile Engineering -T.R. Banga & Nathu Singh, Khanna

Course Code :		**AUTOMOTIVE CHASSIS & SUSPENSION**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓									
	CO 2		✓							✓			
	CO 3		✓									✓	
	CO 4	✓	✓										
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	OFF ROAD VEHICLES (17170864a)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To make students able to design and construct off – road vehicle
2. To make student to analyse the performance of ana off – road vehicles
3. To make student to design and develop farm machinery
4. To make student to design and develop vehicle systems

UNIT - I
CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES

Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multiaxle vehicles.

UNIT - II
EARTH MOVING MACHINES

Earthmovers like dumpers, loaders – single bucket, Multi bucket and rotary types – bulldozers, excavators, backhoe loaders, scrappers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earth moving machines.

UNITY - III
SCRAPPERS, GRADERS, SHOVELS AND DITCHERS

Scrappers, elevating graders, motor graders, self powered scrappers and graders, Power shovel, revolving and stripper shovels – drag lines – ditchers – capacity of shovels.

UNIT - IV
FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES

Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.

UNIT - V
VEHICLE SYSTEMS, FEATURES

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Design aspects on dumper body, loader bucket and water tank of sprinkler.

COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Design and construct off – road vehicle
2. Analyse the performance of ana off – road vehicles
3. Design and develop farm machinery
4. Design and develop vehicle systems

TEXT BOOKS:

1. Robert L Peurifoy, "Construction, planning, equipment and methods" Tata McGraw Hill Publishing company Ltd.
2. Nakra C.P., "Farm machines and equipments" Dhanparai Publishing company Pvt. Ltd.
3. Abrosimov.K. Bran berg.A and Katayer.K., "Road making machinery", MIR Publishers, Moscow, 1971.
4. SAE Handbook Vol. III., Society of Automotive Engineers, 1997
5. Wong.J.T., "Theory of Ground Vehicles", John Wiley & Sons, New York, 1987.

REFERENCES:

1. Ia. S. Ageikin, "Off the Road Wheeled and Combined Traction Devices: Theory and Calculation", Ashgate Publishing Co. Ltd. 1988.
2. Schulz Erich.J, "Diesel equipment I & II", McGraw Hill company, London, 1982. 3. Bart H Vanderveen, "Tanks and Transport Vehicles", Frederic Warne and Co Ltd., London.
3. Satyanarayana. B., "Construction planning and equipment", standard publishers and distributors, New Delhi, 1985.

Course Code :		**OFF ROAD VEHICLES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓									
	CO 2		✓										
	CO 3		✓	✓									
	CO 4		✓	✓									
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	MODERN VEHICLE TECHNOLOGY (17170864b)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To make the student to design and develop modern vehicles
2. To make the student to analyze and control the exhaust emissions and noise
3. To make the student to analyze the vehicle operation and incorporate and develop the electronic control systems
4. To make the student to distinguish and choose the fuel injection system

UNIT-I

Trends in Automotive Power Plants: Hybrid Vehicles - Stratified charged / lean burn engines - Hydrogen Engines-Electric vehicles-Magnetic track vehicles solar powered vehicle Combined power source vehicle, types of hybrid drives, Toyota hybrid system.

UNIT-II

Suspension: Interconnected air and liquid suspensions, Hydrolastic suspension system, Hydra gas suspension.

Braking systems and safety: Modern rear wheel brake, indirect floating caliper disc brake, self energizing disc brake, brake limiting device, anti-slide system, Ford Escort and Orion anti lock system. Closed loop suspension; Regenerative braking; Passenger comfort.

UNIT-III

Emission and Noise Pollution Control: Introduction, Engine emissions, types of catalytic conversion, open loop and closed loop operation to the oxidizing catalytic converter, Evaporative emissions, Internal and External Noise, Identification of Noise sources, Noise Control Techniques. SCR, DPF and DOC.

UNIT-IV

Vehicle Operation and Control: Fundamentals of Automotive Electronics - sensors, actuators, Processors, Computer Control for pollution, noise and for fuel economy - Electronic Fuel Injection and Ignition system.

UNIT-V

Fuel Injection Systems: SPFI, MPFI, DI, Pilot Injection, Unit Injection. CRDI; Two Wheeler Technology: DTS- i, DTS - Fi, DTS - Si; Four Wheeler Technology: WT, Cam less Engine, GDI.

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COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Design and develop modern vehicles
2. Analyze and control the exhaust emissions and noise
3. Analyze the vehicle operation and incorporate and develop the electronic control systems
4. Distinguish and choose the fuel injection system

TEXT BOOKS:

1. Crouse/Anglin "Automotive Mechanics"
2. K.Newton, W.Steeds "The Motor Vechicle"

REFERENCES

1. K.K. Ramalingam, "Automobile Engineering", Scitech Publications Pvt. Ltd., 2005
2. Dr. N.K. Giri, "Automobile Mechanic", Khanna Publishers, 2006
3. Heinz Heisler " Advanced Vehicle Technology" ELSEVIER

Course Code :		**MODERN VEHICLE TECHNOLOGY**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓										✓
	CO 2		✓										
	CO 3					✓							✓
	CO 4								✓	✓			
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	RAPID PROTOTYPING (17170864c)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To make the student to develop the protype
2. To make the sstudent to select the suitable material for rapid protyping
3. To make the student to choose the manufacturing method for rapid prototyping
4. To make the student to apply revese engineering principles and new technologies

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UNIT - I

INTRODUCTION

History – Development of RP systems – Applications in Product Development, Reverse Engineering, Rapid Tooling, Rapid Manufacturing- Principle – Fundamental – File format – Other translators – medical applications of RP – On demand manufacturing – Direct material deposition – Shape Deposition Manufacturing.

UNIT - II

LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS

Classification – Liquid based system – Stereo lithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system – Fused Deposition Modeling, principle, process, products, advantages, applications and uses – Laminated Object Manufacturing

UNIT - III

POWDER BASED RAPID PROTOTYPING SYSTEMS

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses. Three Dimensional Printing – process, major applications, research and development. Direct shell production casting – key strengths, process, applications and uses, case studies, research and development. Laser Sintering System, e-manufacturing using Laser sintering, customized plastic parts, customized metal parts, e-manufacturing – Laser Engineered Net Shaping (LENS).

UNIT - IV

MATERIALS FOR RAPID PROTOTYPING SYSTEMS

Nature of material – type of material – polymers, metals, ceramics and composites- liquid based materials, photo polymer development – solid based materials, powder based materials – case study.

UNIT - V

REVERSE ENGINEERING AND NEW TECHNOLOGIES

Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing – types of medical imaging, software for making medical models, medical materials, other applications – Case study.

COURSE OUTCOMES

After successful completion of this course, successful student able to

1. Develop the protype
2. Select the suitable material for rapid protyping
3. Choose the manufacturing method for rapid prototyping
4. Apply revese engineering principles and new technologies

TEXT BOOKS

1. Rafiq I. Noorani, Rapid Prototyping, "Principles and Applications", Wiley & Sons, 2006.
2. Chua C.K, Leong K.F and Lim C.S, "Rapid Prototyping: Principles and Applications", Second Edition, World Scientific, 2003.

REFERENCES:

1. N.Hopkinson, R.J.M, Hauge, P M, Dickens, "Rapid Manufacturing – An Industrial revolution for the digital age", Wiley, 2006
2. Ian Gibson, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototying", Wiley, 2006
3. Paul F.Jacobs, "Rapid Prototyping and Manufacturing : Fundamentals of Stereolithography", McGraw Hill 1993.
4. Pham. D.T., and Dimov. S.S., "Rapid Manufacturing", Springer Verlog 2001.

Course Code :		**RAPID PROTOTYPING**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓	✓										
	CO 2					✓						✓	
	CO 3												✓
	CO 4											✓	✓
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	PRINCIPLES OF ENTERPRENEURSHIP (17170864d)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVES:

1. To make the student to become entrepreneur
2. To make the student to estimate the capital required to establish the new venture
3. To make the student to apply production and marketing techniques to manage organization
4. To make the student to manage human resources

UNIT - I

Introduction to Entrepreneurship Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Entrepreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

UNIT - II

Creating and Starting the Venture Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process.

The Business Plan: Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.

UNIT- III

Financing and Managing the new venture Sources of capital, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

New venture Expansion Strategies and Issues Features and evaluation of joint ventures, acquisitions, Merges, franchising. Public issues, rights issues, bonus issues and stock splits. Institutional support to Entrepreneurship. Role of Directorate of Industries.

UNIT- IV

Production and Marketing Management Thrust of production management, Selection of production Techniques, plant utilization and maintenance, designing the work place, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

UNIT –V

Recruitment – motivation and leading teams, Insights of Industrial Relations – Labour legislation, Salient Provision under Indian factories act, Industrial disputes act, Employee state insurance act., Workmen's compensation act and payment of bonus act.

COURSE OUTCOME

After successful completion of this course, successful student able to

1. Become entrepreneur
2. Estimate the capital required to establish the new venture
3. Apply production and marketing techniques to manage organization
4. Manage human resources

TEXT BOOKS:

1. Robert Hirsch, & Michael Peters: Entrepreneurship, TMH, 5th Edition.
2. Dollinger: Entrepreneurship,4/e, Pearson, 2004.

REFERENCE BOOKS:

1. Vasant Desal: Dynamics of Entrepreneurial Development and management, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Robert J.Calvin: Entrepreneurial Management, TMH, 2004.
4. Gurmeet Naroola: The Entrepreneurial Connection, TMH, 2001.

Course Code :		PRINCIPLES OF ENTERPRENEURSHIP											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1	✓					✓						
	CO 2					✓				✓			
	CO 3			✓								✓	
	CO 4	✓			✓								
Category		General Humanities		Basic Sciences		Engineering Sciences And Technical				Professional Subjects			
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	NANO TECHNOLOGY (17170864e)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

COURSE OBJECTIVE:

On successful completion of the course, students should be able to:

1. Understand the basic scientific concepts of nanoscience.
2. Understand the properties of nano materials, characterization of materials, synthesis and fabrication.
3. Understand the applications of nano technology in various science, engineering and technology fields.

UNIT-I

INTRODUCTION: History of nano science, definition of nano meter, nano materials, nano technology. Classification of nano materials. Crystal symmetries, crystal directions, crystal planes. Band structure.

PROPERTIES OF MATERIALS: Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-II

SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

UNIT-III

CHARECTERIZATION TECHNIQUES: X-Ray diffraction and Scherer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

UNIT-IV

CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nano crystalline diamond films, grapheme, applications of carbon nano tubes.

UNIT-V

APPLICATIONS OF NANO TECHNOLOGY: Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin fins, applications of quantum dots.

TEXT BOOKS:

1. Nano science and nano technology by M.S Ramachandra Rao, Shubra Singh, Wiley publishers.

REFERENCE BOOKS:

1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Nanotechnology by Jermy J Ramsden, Elsevier publishers.
3. Nano Materials- A.K.Bandyopadhyay/ New Age Introdu.
4. Nano Essentials- T.Pradeep/TMH.
5. Nanotechnology the Science of Small by M.A Shah, K.A Shah, Wiley Publishers.
6. Principles of Nanotechnology by Phani Kumar, Scitech.

COURSE OUTCOMES:

Upon successful completion of this course the student shall be able to:

1. Identify the essential concepts used in nanotechnology.
2. Identify the materials, properties, syntheses and fabrication, characterization and applications in various fields.

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	SIMULATION OF SI & CI ENGINES (17170864f)	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite(s)					

Course objective:

1. To make the student to design SI and CI engines
2. To make the student to analyse the engine design
3. To make the student to validate the engine design
4. To make the student to develop the validated design

UNIT - I

INTRODUCTION: Simulation principles – simulation exercises using computers, validation of models.

COMBUSTION PROCESS: Reactive process, heat of reaction, adiabatic flame temperature, isentropic changes of stage, temperature change due to fuel vaporization.

UNIT-II

SIMULATION OF SI ENGINE PROCESSES:

SI engine simulation with air as working medium: Ideal otto cycle, deviation with ideal and actual cycle.

SI engine simulation with adiabatic combustion: Temperature drop due to fuel vaporization, full throttle, part throttle and supercharged operations, problems.

UNIT-III

SI engines simulation with progressive combustion, gas exchange process, evaluation of performance parameters.

Simulation of two strokes SI engine processes.

UNIT-IV

SIMULATION OF CI ENGINE PROCESS:

CI engines simulation with air as working medium: deviation with ideal and actual cycle.

CI engines simulation with adiabatic combustion: Naturally aspirated and super charged operations, problems.

UNIT-V

CI engines simulation with progressive combustion, combustion modeling, zero dimensional combustion models, heat release and heat transfer models.

CI engines simulation with gas exchange process. Evaluation of performance parameters.

Introduction to CFD simulation of IC engine flow mixture formation and combustion

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COURSE OUTCOMES:

After successful completion of this course, successful student able to

1. Design SI and CI engines
2. Analyze the engine design
3. Validate the engine design
4. develop the validated design

TEXT BOOKS

1. Computer simulation of SI engine process, V.Ganesan, Orient Longman Ltd.,
2. Computer simulation of CI engine process, V.Ganesan, Orient Longman Ltd.,

REFERENCES

1. Introduction to modelling and control of Internal Combustion Engine Systems, Lino Guzzella, Christopher H.Onder,Springer,2010.
2. Computer Optimization of Internal Combustion Engines, Y.Shi,et,al;Springer,2011.
3. 3D – CFD Simulation of IC Engine Flow, Mixture Formation and Combustion with AVL FIRE, Gunter P.Merker,Springer,2010.

Course Code :		**SIMULATION OF SI & CI ENGINES**											
Course Designed by		Department of Automobile Engineering											
	Program Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Course Outcomes	CO 1		✓	✓									
	CO 2		✓			✓							
	CO 3		✓									✓	
	CO 4					✓						✓	
Category		**General Humanities**		**Basic Sciences**		**Engineering Sciences And Technical**			**Professional Subjects**				
						✓							
Mode of Evaluation : Quiz, Assignment, Seminar, Written Examination													

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	PROJECT WORK (17170841)	0	0	0	9
Teaching	Total contact hours - 90				
Prerequisite(s)					

COURSE OBJECTIVES:

The aim of the course is to make the student perform a comprehensive project work that involves either or all of the following: optimum design of a mechanical component or an assembly, thermal analysis, computer aided design & analysis, cost effective manufacturing process, material selection, testing procedures or fabrication of components and prepare a detailed technical thesis report. The completed task should also take into account the significance of real time applications, energy management and the environmental affects.

COURSE OUTCOMES:

After completing the project work the student should learn the technical procedure of planning, scheduling and realizing an engineering product and further acquire the skills of technical report writing and data collection.

Course content:

The student should work in groups to achieve the aforementioned objectives and the outcomes.

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IV Year B.Tech. (AME) – II Sem.

	GR-17 (B.Tech.)	L	T	P	C
Course/ Code	IPR & PATENTS (17179895)	1	2	0	1
Teaching	Total contact hours - 60				
Prerequisite(s)					

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

REFERENCE BOOKS: -

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press) Cyber Law. Texts & Cases, South-Western's Special Topics Collections

3. Prabhuddha Ganguli: 'Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi
4. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
5. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
6. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Pub.