DEPARTMENT OF AUTOMOBILE ENGINEERING
INDUS INSTITUTE OF TECHNOLOGY & ENGINEERING
INDUS UNIVERSITY

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –I TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	TOTAL
1	SH0101	Differential Calculus & Matrix Algebra	04	02	00	05	06	30	10	60	00	00	100
2	SH0002	Engineering Chemistry	03	00	02	04	05	30	10	60	40	60	200
3	ME0004	Mechanical Workshop	00	00	02	01	02	00	00	00	40	60	100
4	ME0002	Elements of Mechanical Engineering	03	00	02	04	05	30	10	60	40	60	200
5	CE0001	Computer Programming	03	00	02	04	05	30	10	60	40	60	200
6	CV0002	Engineering Mechanics	03	02	00	04	05	30	10	60	00	00	100
7	CV0001	Environmental Science	01	00	02	02	03	30	10	60	40	60	200
8	SH0102	Technical English	01	02	00	02	03	30	10	60	00	00	100
TOTAL			18	06	10	26	34	210	70	420	200	300	1200

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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –II TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

SR NO	CODE	SUBJECTS	L	T	P	CREDITS	HOURS	MID	IE	ESE	CIE	ESE	TOTAL
1	SH0201	Integral Calculus and Linear Algebra	04	02	00	05	06	30	10	60	00	00	100
2	SH0001	Engineering Physics	03	00	02	04	05	30	10	60	40	60	200
3	EL0001	Electrical Workshop	00	00	02	01	02	00	00	00	40	60	100
4	EL0002	Elements of Electrical Engineering	03	00	02	04	05	30	10	60	40	60	200
5	ME0001	Engineering Graphics	01	06	00	04	07	30	10	60	00	00	100
6	EC0001	Basic Electronics	02	00	02	03	04	30	10	60	40	60	200
7	MT0001	Materials Science	03	00	00	03	03	30	10	60	00	00	100
8	SH0202	Business Communication and Presentation Skill	01	02	00	02	03	30	10	60	00	00	100
TOTAL			**17**	**10**	**08**	**26**	**35**	**210**	**70**	**420**	**160**	**240**	**1100**

The EXAMINATION SCHEME headers: THEORY spans CIE (MID, IE) and ESE; PRACT spans CIE and ESE.

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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	SH0301	Differential Equations and Integral Transforms	3	2	0	4	05	30	10	60	00	00	100
2	AU0301	Kinematics of Machines	4	0	2	5	06	30	10	60	40	60	200
3	AU0302	Fluid Mechanics	3	0	2	4	05	30	10	60	40	60	200
4	AU0303	Machine Design & Industrial Drafting	3	0	2	4	05	30	10	60	40	60	200
5	AU0304	Automobile Measurements and Metrology	3	0	2	4	05	30	10	60	40	60	200
6	AU0305	Automobile Manufacturing Processes	4	0	2	5	06	30	10	60	40	60	200
7	SH0307	Human Values and Professional Ethics	1	0	0	0	01	-	-	-	-	-	100
TOTAL			21	2	10	26	33	180	60	360	200	300	1200

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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	SH0401	Complex Analysis and Numerical Methods	3	2	0	4	5	30	10	60	0	0	100
2	AU0401	Engineering Thermodynamics	4	2	0	5	6	30	10	60	0	0	100
3	AU0402	Vehicle Transport Management	3	0	0	3	3	30	10	60	0	0	100
4	AU0403	Strength of Materials	3	2	2	5	7	30	10	60	40	60	200
5	AU0404	Automobile Machining Processes	3	0	2	4	5	30	10	60	40	60	200
6	AU0405	Automobile Systems	4	0	2	5	6	30	10	60	40	60	200
7	CE0407	Cyber Security and IPR	1	0	0	0	1	-	-	-	-	-	100
TOTAL			21	6	6	26	33	180	60	360	120	180	1000

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –IV TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

DEPARTMENT OF AUTOMOBILE ENGINEERING
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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		
								CIE		ESE	CIE	ESE	TOTAL
			L	T	P			MID	IE				
1	AU0501	Heat Transfer	3	2	2	5	7	30	10	60	40	60	200
2	AU0502	Automobile Engines	4	0	2	5	6	30	10	60	40	60	200
3	AU0503	Two & Three Wheeler Technology	4	0	2	5	6	30	10	60	40	60	200
4	AU0504	Automobile Electrical Systems	3	0	2	4	5	30	10	60	40	60	200
5	AU0505	Vehicle Body Engineering	3	0	0	3	3	30	10	60	00	00	100
6	AU0506	Alternate Fuels & Pollution Control	3	0	2	4	5	30	10	60	40	60	200
7	SH0507	Technical Communication and Soft Skill	1	0	0	0	1	-	-	-	-	-	100
TOTAL			21	2	10	26	33	180	60	360	200	300	1200

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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	AU0601	Off Road Vehicles	3	0	0	3	3	30	10	60	00	00	100
2	AU0602	Automobile Component Design	3	2	2	5	7	30	10	60	40	60	200
3	AU0603	Automotive Hydraulics & Pneumatics Systems	3	2	2	5	7	30	10	60	40	60	200
4	AU0604	Vehicle Fault Diagnosis & Testing	3	0	4	5	7	30	10	60	40	60	200
5	AU0605	Automotive Safety, Ergonomics & Auxiliary systems (DE-I)	3	0	2	4	5	30	10	60	00	00	100
6	AU0615	Tires and Alignment Basics – MOOC (DE-I)	-			4	Offered by www.class-central.com						
7	AU0606	Automotive and Combustion Engine Technology (DE-II)	3	0	0	3	3	30	10	60	-	-	100
	AU0607	Automobile Materials (DE-II)											
	AU0608	Industrial Engineering (DE-II)											
	AU0609	Automotive Infotronics & Autotronics (DE-II)											
	AU0611	Vehicle Performance & Testing (DE-II)											
	AU0612	Automotive Quantitative Techniques (DE-II)											
	AU0613	Automobile Air Conditioning (DE-II)											
8	SH0607	Advanced Technical Communication and Soft Skill	1	-	-	-	1	-	-	-	-	-	100
TOTAL			19	4	10	29	33	180	60	360	120	180	1000

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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	AU0701	Automobile Systems Design	3	2	2	5	7	30	10	60	40	60	200
2	AU0702	Vehicle Dynamics	3	0	2	4	5	30	10	60	40	60	200
3	AU0703	Computer Integrated Manufacturing	3	0	2	4	5	30	10	60	40	60	200
4	AU0704	Modern Quality Tools	4	2	0	5	6	30	10	60	40	60	100
5	AU0705	Electric and hybrid vehicles	3	0	2	4	5	30	10	60	00	00	200
6	AU0706	Fuel Cells & Applications (DE-III)	03	00	00	03	03	30	10	60	00	00	100
	AU0707	Automobile Computer Aided Design(DE-III)											
	AU0708	Advanced Automotive Technology(DE-III)											
	AU0709	Nano technology (DE-III)											
	AU0710	Noise Vibration & Harshness (DE-III)											
	AU0711	Automotive Instrumentation and Testing (DE-III)											
	AU0712	Tribology (DE-III)											
	AU0714	Production Technology (DE-III)											
7	CV0707	Disaster Management	1	0	0	0	1	-	-	-	-	-	100
		TOTAL	**20**	**4**	**08**	**29**	**32**	**180**	**60**	**360**	**160**	**240**	**1100**

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SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	AU0801	Project	00	00	40	20	40	00	00	00	40	60	100
TOTAL			00	00	40	20	40	00	00	00	40	60	100

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –VIII TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

1ST SEMESTER

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	TOTAL
1	SH0101	Differential Calculus & Matrix Algebra	04	02	00	05	06	30	10	60	00	00	100
2	SH0002	Engineering Chemistry	03	00	02	04	05	30	10	60	40	60	200
3	ME0004	Mechanical Workshop	00	00	02	01	02	00	00	00	40	60	100
4	ME0002	Elements of Mechanical Engineering	03	00	02	04	05	30	10	60	40	60	200
5	CE0001	Computer Programming	03	00	02	04	05	30	10	60	40	60	200
6	CV0002	Engineering Mechanics	03	02	00	04	05	30	10	60	00	00	100
7	CV0001	Environmental Science	01	00	02	02	03	30	10	60	40	60	200
8	SH0102	Technical English	01	02	00	02	03	30	10	60	00	00	100
TOTAL			18	06	10	26	34	210	70	420	200	300	1200

ME/CVL/AUTO ENGINEERING, SEMESTER –I TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

Subject: **Differential Calculus & Matrix Algebra**								
Program: **B.Tech All Branches**				Subject Code: SH0101			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	2	0	5	60	00	40	00	100

Course Objectives:

1. To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.

2. To provide an ability to apply knowledge of basic science and engineering fundamentals.

3. To provide an ability to undertake problem identification, formulation and solution.

4. To provide an ability to analyze different mathematical models within science and technology and work creatively, systematically and critically.

5. To provide an ability to find strategies for the solution of different types of mathematical models using knowledge about the possibilities and limitations of the different methods and tools.

6. To provide an ability to develop abstract, logical and critical thinking and the ability to reflect critically upon their work and work of others.

7. To provide an ability to insight their strengths and weakness as learners and to appreciate the value of errors or mistakes as powerful motivators to enhance learning and understanding.

Contents

UNIT I   **Differential Calculus**   **10 hrs.**

Derivatives of nth Derivative of some Elementary Functions
Leibnitz's Theorem
Taylor's Series and Maclaurin's Series Expansions
Indeterminate Forms.
Functions of Several Variables: Limit and Continuity

UNIT II   **Partial Differentiation and its Applications**

         13 hrs.

Partial Differentiation
Variable Treated as Constant, Total Derivative
Partial Differentiation of Composite Functions: Change of Variable-Differentiation of an Implicit Function -Euler's Theorem
Jacobian, Error and Approximations
Taylor's Theorem for Function of two Variables
Maxima and Minima of Functions of two Variables: with and without constraints
Lagrange's Method of Undetermined Multipliers.

UNIT III   **Basic of Matrix algebra**   **13 hrs.**

Concepts of Determinants and Matrices, Types of Matrices
Row Echelon and Reduced Row Echelon form
Inverse of a Matrix, Rank of a Matrix, Normal Form
System of Linear Homogeneous Equations
System of Non-Homogeneous Equations, Gaussian Elimination Method

UNIT IV   **Vector Differential Calculus**   **12hrs.**

Curvilinear coordinate system, Cartesian, Spherical and Cylindrical coordinate system
Vector Differentiation, Directional Derivative, Gradient of a Scalar Function and Conservative Field
Directional Derivative, Gradient of a Scalar Function and Conservative Field
Divergence and Curl, Related Properties of Gradient, Sums of Divergence and Curl

Subject: **Engineering Chemistry**								
Program: **B.Tech All Branches**				Subject Code: SH0002			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
				University Theory Examination	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
Lecture	**Tutorial**	**Practical**	**Credits**					
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. To study the basic concepts of chemistry & Engineering Applications of Chemistry.

2. To address the principles of general chemistry and specific topics relevant to various engineering disciplines, wherein the students should apply this learning in their respective areas of expertise.

3. To present sound knowledge of chemistry fundamentals.

4. To enrich students to understand the role of Applied Chemistry in the field of science and engineering.

5. To inculcate habit of scientific reasoning to do the task rationally.

6. To develop an ability to identify, formulate & solve chemistry & Engineering related Problems.

7. To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.

8. Understand the various basic concepts used in engineering and process calculations.

9. Use fundamental chemistry concepts with direct application to the built environment.

10. Solve chemistry problems typically found on the Fundamentals of Engineering exam.

CONTENTS

UNIT I   **(A) Electrochemistry**   **7 hrs.**

Conductance, Cell constant and its determination; Electrochemical Cell, Galvanic Cell, Electrolytic Cell, Types of electrodes, Single electrode potentials, Reference Electrodes, Standard Hydrogen Electrode (SHE), Standard Calomel Electrode (SCE), Quinhydrone Electrode, EMF series, Cell emf measurement, Nernst equation, Conductometric titrations, Numerical.

(B) Corrosion   **6 hrs.**

Definition and types of corrosion, Dry (chemical corrosion), Wet (Electrochemical corrosion) and its mechanisms; Types of electrochemical corrosion, (differential aeration, galvanic, concentration cell, water line, pitting, stress, erosion and soil corrosion, Caustic embrittlement, Factors affecting on corrosion (Metallic and Environmental), Pourbaix diagram, Protective measures to control Corrosion, Sacrificial anode and Cathode process for corrosion control.

UNIT II   **Water Treatment Technology**   **10 hrs.**

Sources of water, Soft Water & Hard Water, Types of hardness, Units of hardness measurement, Impurities in water, Disadvantages of hard water, Determination of water hardness by EDTA method, Alkalinity of water and its significance, Boiler feed water, Scale and sludge formation in boilers and pipes etc , Boiler Corrosion, Water softening through Soda lime process, Zeolite Process & Ion-exchange Process, Characteristics of Potable water, Specifications for drinking water (BIS and WHO standards), Sources and quality of drinking water, Treatment of water for domestic use: Filtration, Coagulation, Sedimentation and Disinfection, Concept of water harvesting, storage and recycling. Desalination through Electro Dialysis & Reverse Osmosis, Numerical problems.

UNIT III   **(A) Dimensions, Units & Energy balances**   **6 hrs.**

Dimensions and Units: Basic chemical calculations – atomic weight, molecular weight, equivalent weight, Mole concept, Inter-conversion of concentration units.
Material Balance without chemical reactions: Flow diagram for material balance, simple material balance with or without recycles or bypass.
Material Balance involves chemical reactions: concept of limiting reactant, conversion, yield, selectivity and liquid phase reaction, gas phase reaction with or without recycle or bypass.

(B) Instrumental Techniques   **6hrs.**

Fundamentals of Spectroscopy; Principles and applications of UV-visible, IR, NMR, Mass & Atomic absorption Spectroscopy; Principles and applications of Chromatographic techniques including TLC, PC, Gas, HPLC.

UNIT IV   **(A) Advance Organic Materials**   **6 hrs.**

Liquid Crystals: Introduction, classification and applications, Organic Electronic Materials: Introduction, types and applications, Chemical Sensors: Introduction, types and applications, Ionic Liquids: Introduction and applications, Chromic Materials: Introduction, types and applications.

(B) Catalysis & Adsorption   **7hrs.**

Catalysis: Types of catalysis, Positive & Negative catalysis, Homogeneous and Heterogeneous catalysis, Characteristics of Catalytic action, Poisoning of catalysis, Promoters, Auto Catalysis, Acid-Base Catalysis, Industrial Applications of Catalysts. Adsorption: Types of adsorption, adsorption isotherm: Freundlich adsorption isotherm, Langmuir adsorption Isotherm, Determination of surface area by BET method, Application of adsorption.

Text Books

1. P.C. Jain, M. Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, **2005**.

2. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.**2004**.

Reference Books

1. Dara, S.S., Umare S.S.; A Text Book of Engineering Chemistry (Twelfth edition); S. Chand. Co. 2010.
2. P. Atkins, J.D. Paula, Physical Chemistry, Oxford University Press, **2002**.
3. A. J. Mee, Physical Chemistry, 6th Ed. English Language Book Society and Heinemann Educational Books Ltd. London, **1962**.
4. Douglas A. Skoog, Donald M. West, Fundamentals of Analytical Chemistry, Cengage Learning, Ninth Edition, **2014**.
5. Puri B. R., Sharma L. R. , Pathania M.S; Principles of Physical Chemistry; Vishal Publishing Co. (46nd Edition), **2013**.
6. Arthur E. Morris, Gordon Geiger and H. Alan Fine, Handbook on Material & Energy Balance Calculations in Material Processing,Third Edition, **2011**.

Digital Learning Resources & Moocs

1. http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/
2. http://nptel.ac.in/courses/113108051/
3. http://ocw.mit.edu/index.htm
4. https://www.khanacademy.org/

List of Practical:

1. Determination of the alkalinity of unknown water sample.
2. Estimation of hardness of water sample by EDTA method.
3. Estimation of dissolved oxygen in water sample.
4. Determination of metal ions (Ca^{2+}/Zn^{2+}) from the mixture by EDTA titration.
5. Determination of metal ions (Pb^{2+}/Mg^{2+}) from the mixture by EDTA titration.
6. Determination of the concentration of chloride ions in unknown water sample.
7. Thin Layer Chromatography (TLC) and Paper Chromatography (PC).
8. Determination of strength of Acid or Base by pH meter.
9. Determination of strength of Acid or Base by Conductometer.
10. To calculate the Acid value of the given sample of oil.
11. Determination of the saponification value of a given oil sample.
12. Determination of iron content from unknown sample by spectrophotometer.

Text Books:

1. G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition, Longman Group of Publication, UK, **1989**.
2. Manual on Engineering Chemistry, S.K. Bhasin, S. Rani, Dhanpat Rai Publishing Company, New Delhi, 2011.

Subject: **Mechanical Workshop**								
Program: **B.Tech All Branches**				Subject Code: ME0004			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
				University Theory Examination	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
Lecture	**Tutorial**	**Practical**	**Credits**					
0	0	2	1	60	00	40	00	100

Content

Unit - I

1. **Introduction**

   Introduction to Mechanical Workshop, Safety, and Safety rules, Safety Slogans, Tools and Equipments used for safety purpose.

Unit- II

2. **Fitting Shop:**

   Introduction, Fitting materials, Tools and Equipments used in Fitting, Fitting Joints.
   1 Job in for practical demonstration

Unit- III

3. **Carpentry Shop:**

   Introduction, Carpentry materials, Tools and Equipments used in Carpentry, Carpentry Joints.
   1 Job in for practical demonstration

Unit- IV

4. **Welding Shop:**

   Introduction, Welding Tools, Equipments and Machines, Various Welding Joints
   1 Job in for practical demonstration

Text Books

1. Workshop Technology Vol. 1 and 2, by Raghuvanshi B.S. Dhanpat Rai & Sons 1998.

Reference Books

1. Mechanical Workshop Practice by K C John, PHI Learning.

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2. Workshop Technology by Chapman W.A. J and Arnold E. Viva low priced student edition, 1998.
3. Workshop Practices, H S Bawa, Tata McGraw-Hill, 2009.
4. Workshop Practices and Materials, B J Black, CRC Press

Web Resources
1. www.nptel.ac.in

Subject: **Elements of Mechanical Engineering**								
Program: **B.Tech All Branches**				Subject Code: ME0002			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Content

Unit - I

1. **Basic Concepts of Thermodynamics**
   Basic units and dimensional analysis, Intensive and Extensive Properties, Energy, heat, temperature, specific heat capacity, Interchange of heat, change of state, mechanical equivalent of heat, Internal energy, enthalpy, entropy, efficiency, Open and Closed systems, statements of Zeroth Law, First law and its limitations, Second law of Thermodynamics

2. **Properties of Gases**
   Ideal and Real Gases, Gas laws, Boyle's law, combined gas law, gas constant, Internal energy, Relation between Cp and Cv, Enthalpy, Non flow process, constant volume process, Constant pressure process, Isothermal process, Poly-tropic process, Adiabatic process.

Unit- II

3. **Fuels and Lubricants**
   Different types of fuels, their properties and applications. Different types of lubricants, their properties and applications.

4. **Internal Combustion Engines**
   Classifications, Difference between I.C. and E.C. , Otto four-stroke engine, Diesel-four-stroke engine, Difference between Otto cycle and Diesel engine, Two-stroke engines, Difference between two- stroke and four-stroke engines, indicated power (ip), Brake power (bp), Efficiencies.

Unit- III

5. **Properties of Steam**

Introduction, steam formation, types of steam, enthalpy, specific volume of steam and dryness fraction of steam, Internal energy, steam tables, Measurement of dryness fraction throttling calorimeter, separating calorimeter, Combined calorimeter.

6. **Steam Boilers**
   Introduction, Classification, Simple vertical and horizontal boiler, Boiler details, Boiler performance. Functioning of different mountings and accessories.

Unit- IV
7. **Refrigeration and Air-conditioning**
   Introduction, Refrigerant, Vapor compression & absorption cycles & system, basic applications.

8. **Transmission of Motion and Power**
   Introduction, Couplings methods of drive, power transmission elements, shaft and axle, Belt-drive, pulleys, power transmitted by a belt, Chain drive, Friction drive, Gear drive.

Text Books

1. Basant Agrawal 'Basic mechanical Engineering' Wiley-India, 2008.
2. Shanmugam G and Palanichamy M S, 'Basic Civil and Mechanical Engineering', Tata McGraw Hill publishing Co., New Delhi.

Reference Books
1. Elements of Mechanical Engineering by K.P. Roy and Prof. S.K. Hajra Chaudhary, Media Promoters and publishers Pvt. Ltd. Bombay

2. A Text Book of Elements of Mechanical Engineering by S. M. Bhatt, H. G. Katariya, J. P. Hadiya – Books India Publications, New Delhi
3. Basic & Applied Thermodynamics by P K Nag - Tata McGraw Hill Pvt. Ltd., Mumbai

Web Resources
1. www.nptel.ac.in

Subject: **Computer Programming**		
Program: **B.Tech All Branches**	Subject Code: CE0001	Semester: **I/II**

Teaching Scheme				Examination Evaluation Scheme				
				University Theory Examination	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
Lecture	**Tutorial**	**Practical**	**Credits**					
3	0	2	4	60	60	40	40	200

Course Outcomes:

1. Identify the parts of the computer system.

2. Adequately explain functioning of computer components.

3. Explain the process of problem solving using computer

4. Design an algorithmic solution for a given problem

5. Write a maintainable C program for a given algorithm.

6. Trace the given C program manually.

Contents:

Unit No	Sub unit	Name of Topic	Hours
		UNIT 1	
1	**1.1**	**Introduction to Programming** What is programming?, Problem solving methods with examples- Algorithm and Flowchart, Types of Programming languages ,Characteristics of higher level language, Some Programming languages	**4**
	1.2	**Introduction to 'C'** Introduction, Importance of C, Sample C programs, Basic structure of C programs, Programming style, executing a C program.	**3**

		Introduction, Character Set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of Variables, Defining symbolic constants.	
	1.3	**Operators and Expression:** Introduction, Arithmetic of Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Mathematical function.	4
		UNIT 2	
2	**2.1**	**Decision Making Statements** Introduction, Decision making with IF statement, Simple IF statement, the IF ELSE statement, Nesting of IF … ELSE statements, The ELSE IF ladder, The switch statement, the turnery (? :) Operator, the GOTO statement,	4
	2.2	**Looping** WHILE statement, the DO statement, The FOR statement, Jumps in loops Break and continue.	5
	2.3	**Array & Handling of Character strings:** Introduction, One-dimensional arrays, Two-dimensional arrays, Initialization of two dimensional arrays, Concept of Multidimensional arrays.	4
		UNIT 3	
3	**3.1**	**Handling of Character strings:** Introduction, Declaring and initializing string variables, Reading string from terminal, Writing string to screen, Arithmetic operations on characters, Putting string together, String Operations : String Copy, String Compare, String Concatenation and String Length, String Handling functions, Table of strings	5
	3.2	**User-Defined Functions :** Introduction, Need for user-defined functions, Return values and their types, Calling a function, category of functions, No arguments and no return values, Arguments with return values, Handling of non-integer functions, Nesting of functions,	5

		Recursion, Functions with arrays, The scope and Lifetime of variables in functions.		
		UNIT 4		
4	4.1	**Pointers:** Introduction, Understanding pointers, Accessing the address of variable, Declaring and initializing pointers, Accessing a variable through its pointer, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Pointers and Functions, Pointers and structures	5	
	4.2	**Structures and Unions:** Introduction, Structure definition, Giving values to members, Structure initialization, Comparison of structures, Arrays of structures, Arrays within structures, Structures within Structures, Structures and functions, Unions,	2	
	4.3	**Introduction to Object Oriented Concepts & Programming** Review of fundamental concepts of Object-oriented programming, Introduction to C++, class and objects, Functions in C++,Constructors & Destructors	4	
		TOTAL	45	

Text Books:

1. Programming in ANSI C, by Balagurusamy, Publisher - Tata McGraw Hill.
2. Object-oriented programming with C++,E.Balagurusamy, 2nd Edition, TMH.

Reference Books:

1. Introduction to C by Reema Thareja, Publisher-Oxford
2. Programming with ANSI and Turbo C, by Ashok N Kamthane, Publisher – Pearson Education.
3. Let us C, by Yashwant Kanitkar, Publisher – BPB Publication

Online Courses:

1. http://nptel.ac.in/courses/106105085/2

2. https://onlinecourses.nptel.ac.in/iitk_cs_101/preview
3. https://onlinecourses.nptel.ac.in/noc15_cs15/preview

Subject: **Engineering Mechanics**								
Program: **B.Tech All Branches**				Subject Code: CV0002			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	60	00	40	00	100

Course Objectives:

1. To provide fundamental knowledge of Engineering Mechanics.
2. To make students realize the importance of applications of engineering Mechanics in their day to day life.
3. To focus on the applicability aspect of the subject in their respective branch.

Course Outcomes:

1. Students will be able to understand the fundamentals of mechanics.
2. Students should be able to apply the knowledge of Engineering Mechanics to solve complex Problems by making them comprehensible and simple.
3. Students should be able to construct free-body diagrams.
4. To calculate the reactions necessary to ensure static equilibrium.
5. Students will be able to calculate centre of gravity and moment of inertia.
6. Students can analyse the dry surfaces in contact with each other considering friction between Surfaces.
7. Students will be able to determine the parameters of motion for the bodies in motion.

COURSE CONTENTS

UNIT - I   (08 HRS)

Introduction: Beginning and Development of Engineering Mechanics, Fundamental Principles of Mechanics, Idealizations in Mechanics, Branches of Mechanics, Units.

Coplanar Forces: Effect of Force, Characteristics of Force, Principle of Transmissibility of Forces, System of Forces, Resultant Force, Composition of Forces, Methods for Resultant Force, All major Laws of Forces, Principle of Equilibrium, Analytical Method for the Equilibrium of Coplanar Forces, Lami's Theorem.

Non-Coplanar Forces: Moment of a Force, Graphical Representation of Moments, Types of Moments, Varignon's Principle of Moments, Application of Moments, Levers, Types of Levers.

UNIT - II   (12 HRS)

Beams: Types of Loads, Types of Supports, Types of Beams, Analytical Method for Determination of Support Reactions of a Beam (Simply Supported Beam, Cantilever Beam).

Friction: Static Friction, Limiting Friction, Normal Reaction, Angle of Friction, Coefficient of Friction, Laws of Friction, Equilibrium of a Body on a Rough Horizontal Plane, Equilibrium of a Body on a Rough Inclined Plane, Equilibrium of a Body on a Rough Inclined Plane Subjected to a Force Acting Along the Inclined Plane, Equilibrium of a Body on a Rough Inclined Plane Subjected to a Force Acting Horizontally. Ladder & Wedge Friction.

UNIT - III   (13 HRS)

Centre of Gravity: Centroid, Methods for Centre of Gravity, Centre of Gravity by Geometrical Considerations, Axis of Reference, Centre of Gravity of Plane Figures, Centre of Gravity of Symmetrical Sections, Centre of Gravity of Unsymmetrical Sections, Centre of Gravity of Solid Bodies, Pappus Guldinus Theorem.

Moment of Inertia

Moment of Inertia of Plane area, Methods for Moment of Inertia, Moment of Inertia by Integration Method, Moment of Inertia of simple lamina, Parallel and Perpendicular Axis Theorem, Moment of Inertia of Built-up Section.

UNIT IV   (15 HRS)

Graphical Method: Method for the Resultant of two Co- Planar forces, Equilibrium of Coplanar Forces (Force Polygon), Funicular Polygon Method to find Support Reactions, Graphical Method for determination of CG, MI.

Kinematics & Kinetics: Linear Motion, Relative Motion, Rectilinear Motion of Particle, Curvilinear Motion of Particle Newton's Second Law of Motion, Work, Work Done by Force, Energy, Law of Conservation of Energy, Work- Energy Principle, Power, Efficiency.

Mechanical Vibrations: Simple Harmonic Motion, Vibrations, D'alembert's Principle, Classification of Vibration, Damping and Vibration, Derivation of Free Vibration without Damping

Text Books:

1. R C Hibbler, 'Engineering Mechanics', Pearson Publication.

Reference Books:
1. Ferdinand P. Beer & E. Russell Johnston, "Statics and Dynamics"- McGraw Hill Publication.
2. S. Ramamrutham, 'Engineering Mechanics', Dhanpat Rai Publication.
3. Basudeb Bhattacharya, 'Engineering Mechanics', Oxford University Press.
4. R S Khurmi, 'Engineering Mechanics', S Chand Publication.
5. S B Junnarkar, H J Shah, 'Applied Mechanics', Charotar Publishing House.

Web Resources:

1. http://nptel.ac.in/courses/122102004/
http://textofvideo.nptel.iitm.ac.in/122102004/

Subject: **Environmental Science**								
Program: **B.Tech All Branches**				Subject Code: CV0001			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
				University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	**Total**
Lecture	**Tutorial**	**Practical**	**Credits**					
1	0	2	2	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To make students understand the importance of Environment in their day to day life.

2. To make students familiar with environmental Bio-diversity and related concepts.

3. Also to make students familiar with environmental legislations.

Course Outcomes:

1. Students will be able to understand the studies and importance related to environmental problems.

2. Students will be able to understand the legal procedures pertaining to environmental legislations

3. Students should be able to apply the knowledge gained in their respective branches of engineering & technology.

Course Contents:

UNIT I (04 HRS)

Concepts of Environmental Sciences: Environment, Levels of organizations in environment, Structure and functions in an ecosystem; Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals, Natural Resources: Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternatives)

UNIT II (05 HRS)

Biodiversity and its conservation: Biodiversity at global, national and local levels; India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation. Environmental Pollution: Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution- Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.

UNIT III   (04 HRS)

Environmental Biotechnology: Biotechnology for environmental protection- Biological indicators, bio-sensors; Remedial measures- Bio-remediation, phytoremediation, bio-pesticides, bio-fertilizers; Bio-reactors- Design and application. Social Issues and Environment: Problems relating to urban environment- Population pressure, water scarcity, industrialization; remedial measures; Climate change- Reasons, effects (global warming, ozone layer depletion, acid rain) with case studies.

UNIT IV   (05 HRS)

Legal issues- Environmental legislation (Acts and issues involved), Environmental ethics. Environmental Monitoring: Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil Sampling techniques.

Text Books:

1. R C Hibbler, 'Engineering Mechanics', Pearson Publication.

Reference Books:
1. Ferdinand P. Beer & E. Russell Johnston, "Statics and Dynamics"- McGraw Hill Publication.
2. S. Ramamrutham, 'Engineering Mechanics', Dhanpat Rai Publication.
3. Basudeb Bhattacharya, 'Engineering Mechanics', Oxford University Press.
4. R S Khurmi, 'Engineering Mechanics', S Chand Publication.
5. S B Junnarkar, H J Shah, 'Applied Mechanics', Charotar Publishing House.

Web Resources:
1. http://nptel.ac.in/courses/122102004/
2. http://textofvideo.nptel.iitm.ac.in/122102004/

List of Practicals:
1. Plotting of bio geographical zones and expanse of territorial waters on the map of India.
2. Identification of biological resources (minimum 20) (plants, animals, birds) at a specific locations.
3. Determination of:
   (i) pH value

(ii) Water holding capacity

(iii) Electrical conductivity of different types of soils.

4. Determination of energy content of plants by bomb calorimeter.
5. Measurement and classification of noise pollution.
6. Determination of particulate matter from an industrial area by high volume sampler.
7. Determination of ico-chemical parameters (Alkalinity, Acidity) of tap water well water, rural water supply industrial effluent and sea water & potability issues.
8. Determination of ico-chemical parameters (Salinity, COD, BOD) of tap water well water, rural water supply industrial effluent and sea water & potability issues.
9. Demonstration of Remote Sensing and GIS methods.
10. Understanding Environmental Biotechnology Processes.

Subject: **Technical English**								
Program: **B.Tech All Branches**				Subject Code: SH0102			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
1	2	0	2	60	00	40	00	100

Course Objectives:

1. To help students develop comprehension and soft skills

2. To increase student's ability to improve and utilize the technical skills necessary for reading and writing.

3. To improve students' communication skills in both technical and professional contexts.

Course Content:

Unit 1:
Language Focus Vocabulary
Technical vocabulary, Synonyms and Antonyms, Idiom & Proverbs, One Word Substitutes, Phrasal Verbs, Collocations.

Unit 2:
Language Focus Grammar (Rules & Exception)
Sub-Verb-Agreement, Tenses, Numerical adjectives, Conjunction and Preposition clauses, Noun and adjective clauses, Relative clauses, Imperative and infinitive structures, Question pattern, Auxiliary verbs (Yes or No questions), Contrasted time structures, Adverbial clauses of time, place and manner, Intensifiers, Basic pattern of sentences(Simple, Complex, Compound Construction).

Unit 3:
Listening
Listening to lectures, seminars, workshops, TED Talks, Writing a brief summary or answering questions on the material listened.

Unit 4:
Speaking
Phonetics (Pronunciation, stress and intonation), Role Play Activity, Group Discussion & Debate (Acceptance & Arguing each other's view points), Verbal & Non-Verbal Communication.

Reference Books:

1. English for Engineers and Technologists, Volumes 1 and 2, Department of Humanities and Social Sciences, Anna University, Chennai, Orient Longmans Publication, 2008.

1. Balasubramanyam, M and Anbalagan, G., Perform in English, Anuradha Publications, Kumbakonam, 2010.
2. Meenakshi Raman and Sangeetha Sharma, Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2004.
3. KiranmaiDutt, P. et al., A Course on Communication Skills, Edition Foundation Books, New Delhi, 2007.
4. Ashraf Rizvi, M., Effective Technical Communication, Tata McGraw Hill Publication, New Delhi, 2008.
5. Geoffrey Leech, Jan Swartvik, 'A Communicative Grammar of English', ELBS – Longman.
6. Norman and Lewis, 'English Made Easy', Oxford Publication.
7. E- Writing: 21st –Century Tools for Effective Communication, Dianna Booher, Macmillan India Ltd., 2007, ISBN – 1403-93202-6
8. R. K Bansal, spoken English for India (Orient Longman, Madras, 1972.

Web resources/ MOOCs:

1. **Grammar Clauses: https://www.khanacademy.org/humanities/grammar/syntax-sentences-and-clauses**
2. **Parts of Speech Conjunctions & Prepositions: https://www.khanacademy.org/humanities/grammar/parts-of-speech-the-preposition-and-the-conjunction**
3. **Nouns: https://www.khanacademy.org/humanities/grammar/parts-of-speech-the-noun**
4. **Verbs: https://www.khanacademy.org/humanities/grammar/parts-of-speech-the-verb**
5. **Pronouns: https://www.khanacademy.org/humanities/grammar/parts-of-speech-the-pronoun**

6. **Adjectives & Adverbs: https://www.khanacademy.org/humanities/grammar/parts-of-speech-the-modifier**
7. **Syntax: Conventions of Standard English: https://www.khanacademy.org/humanities/grammar/syntax-conventions-of-standard-english**

2ND SEMESTER

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	TOTAL
1	SH0201	Integral Calculus and Linear Algebra	04	02	00	05	06	30	10	60	00	00	100
2	SH0001	Engineering Physics	03	00	02	04	05	30	10	60	40	60	200
3	EL0001	Electrical Workshop	00	00	02	01	02	00	00	00	40	60	100
4	EL0002	Elements of Electrical Engineering	03	00	02	04	05	30	10	60	40	60	200
5	ME0001	Engineering Graphics	01	06	00	04	07	30	10	60	00	00	100
6	EC0001	Basic Electronics	02	00	02	03	04	30	10	60	40	60	200
7	MT0001	Materials Science	03	00	00	03	03	30	10	60	00	00	100
8	SH0202	Business Communication and Presentation Skill	01	02	00	02	03	30	10	60	00	00	100
		TOTAL	**17**	**10**	**08**	**26**	**35**	**210**	**70**	**420**	**160**	**240**	**1100**

ME/CVL/AUTO ENGINEERING, SEMESTER –II TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

Subject: **Integral Calculus and Linear Algebra**								
Program: **B.Tech All Branches**				Subject Code: SH0201			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	2	0	5	60	00	40	00	100

Course Objectives:

1. To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.

2. To provide an ability to apply knowledge of basic science and engineering fundamentals.

3. To provide an ability to undertake problem identification, formulation and solution.

4. To provide an ability to analyze different mathematical models within science and technology and work creatively, systematically and critically.

5. To provide an ability to find strategies for the solution of different types of mathematical models using knowledge about the possibilities and limitations of the different methods and tools.

6. To provide an ability to develop abstract, logical and critical thinking and the ability to reflect critically upon their work and work of others.

7. To provide an ability to insight their strengths and weakness as learners and to appreciate the value of errors or mistakes as powerful motivators to enhance learning and understanding.

CONTENTS

UNIT I   **Infinite Series**   **8 hrs.**

Standard Infinite Series: Geometric Series and Harmonic Series
Tests for Convergence and Divergence
Comparison Test, Cauchy's Integral test, D'alembert's ratio Test, Cauchy's nth Root Test

Alternating Series Leibnitz's Theorem, Absolute Convergence and Conditionally Convergence, Power Series

UNIT II **Multiple Integration**   **13 hrs.**

Curve Tracing: Curves in Cartesian and Polar Form
Reduction Formulae
Double Integral, Change of order of Integration in Double integral
Change of Variables in Double Integral from Cartesian to polar
Application of Double Integral to find area and volume
Triple Integral

UNIT III **Linear Algebra**   **14 hrs.**

Eigen Values and Eigen Vectors - Properties of Eigen Values and Eigen Vectors
Cayley-Hamilton Theorem – Diagonalization, Powers of a Matrix
Real Matrices: Symmetric, Skew Symmetric, Orthogonal
Complex Matrices: Hermition, Skew Hermition, Unitary Matrices.

UNIT IV **Vector Integral Calculus**   **13 hrs.**

Vector Integration: Integration of a Vector Function of a Scalar Argument
Line Integrals: Work Done, Potential, Conservative Field and Area
Introduction to Surface Integrals, Volume Integrals
Green's Theorem in Plane, Stokes' Theorem, Gauss Divergence Theorem

Text Books

1. B.V.RAMANA: "HIGHER ENGINEERING MATHAMATICS", TATA McGraw Hill**.**
2. R K Jain, S R K Iyengar: " Advanced Engineering Mathematics. Third Edition", Narosa Publishing House

Reference Books

1. Erwin Kreyszig: "Advanced Engineering Mathematics (8th Edition) ",Wiley Eastern Ltd., New Delhi.
2. Murray Spiegel : "Advanced Mathematics for Engineering & Science: Schaum's Outline Series" ,Tata - McGraw Hill Publication
3. Dr. B.S. Grewal : "Higher Engineering Mathematics", Khanna Publishers, New Delhi
4. Merel C Potter, J L Goldberg: "Advanced Engineering Mathematics (3rd Edition)"

Web Resources & Moocs

1. http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/
2. http://nptel.ac.in/video.php?subjectId=122107036
3. http://ocw.mit.edu/index.htm
4. https://www.khanacademy.org/

Subject: **Engineering Physics**								
Program: **B.Tech All Branches**				Subject Code: SH0001			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	60	60	40	40	200

Course Objectives:

1. An ability to apply knowledge of basic physics, mathematical foundations and engineering theory in the modeling and design of real-world problems (**fundamental engineering analysis skills).**
2. An ability to design and conduct experiments, as well as to analyze and interpret data **(information retrieval skills).**
3. An ability to analyze a problem , identify and formulate using the concept of physics and to solve engineering problem**(engineering problem solving skills).**
4. Recognition of the need for, and an ability to engage in continuing professional development and life-long learning **(continuing education awareness).**
5. An ability to use current techniques, skills, and tools necessary for Physics and engineering practice **(practical engineering analysis skills).**

Course Content:

UNIT-I   [12]

Wave motion and Sound
Propagation of waves, longitudinal and transverse waves, mechanical and non-mechanical waves
Introduction to sound waves, Characteristics and Properties of Sound, Absorption co-efficient, Reverberation time, Sabine's formula (without derivation), Factors affecting architectural acoustics,
Introduction of Ultrasonic waves, Generation of ultrasonic waves, Detection of ultrasonic waves, Applications of Ultrasonic waves: NDT, SONAR & others.

Optics
Introduction to Reflection, Refraction and Total Internal Reflection;
Wavefront and Huygen's principle;Interference: Types of interferences, Thin film interference, Newton's rings and its applications

Diffraction of light waves: Types of Diffraction, Single-slit Fraunhoffer diffraction, Plane diffraction grating, Resolving power of grating, Rayleigh Criterion, Optical polarization (Introduction)

UNIT-II [11]

Quantum Mechanics

Black body radiation: Planck's law (without derivation), Wien's displacement law and Rayleigh – Jeans' law from Planck's theory; Compton effect (Theory and experimental verification), De-Broglie theorem, Uncertainty principle; Schrodinger's wave equation – Time independent and time dependent equations – Physical significance of wave function, Particle in one dimensional rigid box.

Laser

Energy levels in atoms, Absorption, Spontaneous Emission and Stimulated Emission of light, Relation between Einstein's Coefficients, Population Inversion, Metastable State, Pumping Mechanism, Optical Resonators, Fundamentals of LASER, Characteristics of Laser radiation
Types of Laser: Solid State Laser (Nd-YAG laser), Gas laser (He-Ne laser), Applications of Laser: Medical, Industrial, Holography (introduction).

UNIT-III [12]

Electromagnetism & Dielectrics

Coulomb's law for distribution of charges, Gauss's law and applications, Electric current and Equation of continuity, Electric field intensity, Electric flux, Electric dipole moment, Electric field due to dipole, Introduction to dielectrics, Polarizability, Types of polarization – electronic, ionic, orientational, Polarization of dielectrics, Gauss's law in presence of dielectric, Dielectric constant, Electric susceptibility and Permittivity, Internal (Local) field in dielectric, ClausiusMossotti equation (with derivation)
Magnetic field, Steady current, Biot-Savart law, Ampere's law and applications, Faradays law of Induction, Lenz's Law; Effect of magnetic field on current carrying conductor, Lorentz force

Magnetism

Basic important terms and units in Magnetism, Concept and origin of magnetic moment, magnetic susceptibility, Total angular momentum, Diamagnetism, Paramagnetism, Ferromangnetism, Ferrimagnetism, Antiferromagnetism, Domain theory of Ferromagnetism, Curie temperature and hysteresis loss

UNIT-IV [10]

Superconductivity

Superconductivity: Zero resistance, Critical temperature, Meissner effect, Critical field, General properties of superconductors**,** Type-I and Type-II superconductors, BCS theory of Superconductor, High temperature superconductors
Applications of Superconductors: SQUID, Maglev

Nanophysics

Nanoscale, Surface to volume ratio, Surface effects on nanomaterials, Quantum size effect, Electron confinement, Nanoparticles and Nanomaterials, Properties of Nanomaterials
Advantages & Disadvantages of Nanomaterials**,**
Synthesis of nanomaterials: Laser ablation, ball milling, chemical vapor deposition, sol gel, Carbon nanotubes: structure, synthesis, properties and applications, Applications of Nanomaterials.

Text Books:

1. Engineering Physics by Rajendran (Tata Mc Graw Hill)
2. Engineering Physics by D.K. Bhattacharya, Poonam Tandon (Oxford University Press)

Reference Books:

1. Resnick and Haliday, Physics Part-I & II, Wiley Eastern publication
2. Engineering Physics by P. Khare&Swarup (Jones & Bartlett Learning)
3. A textbook of Engineering Physics by S.O. Pillai (New Age International)
4. An introduction to Electrodynamics by David Griffiths (Pearson Education)
5. Optics by A. Ghatak (Tata McGraw-Hill)
6. Engineering Electromagnetics by W H Hayt& J A Buck (Tata McGraw-Hill)
7. Engineering Physics by K. Rajagopal (Prentice Hall India)
8. Engineering Physics by M. N. Avadhanulu, P. G. Khirsagar (S.Chand Pub.)

Web resources:

1. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Guwahati/engg_physics/index_cont.htm
2. http://ncert.nic.in/html/learning_basket.htm
3. http://science.howstuffworks.com/laser1.htm
4. http://physics-animations.com/Physics/English/optics.htm
5. http://www.epsrc.ac.uk
6. http://www.pitt.edu/~poole/physics.html#light
7. https://www.khanacademy.org/science/physics

MOOCs:

https://www.edx.org/course/subject/physics

List of Experiments:

1 <u>Photocell:</u> To verify the inverse square law using photocell.

2 <u>Ultrasonic Interferometer:</u> To determine the wavelength and velocity of ultrasonic wave through ultrasonic interferometer.

3 <u>Determination of Refractive index</u>: To determine the refractive index of a given material (prism) using spectrometer.

4 <u>Resolving power of grating</u>: To determine resolving power of a diffraction grating.

5 <u>Newton's Ring:</u> To determine the wavelength of monochromatic light

6 <u>Planck's Constant :</u> To determine the Planck's Constant using LED

7 <u>Determination of Wavelength of Laser:</u> To determine the wavelength of LASER using diffraction grating.

8 <u>Determination of wavelength of laser using single slit</u>

9 <u>Dielectric constant:</u> To determine the dielectric constant of a dielectric substance.

10 <u>Hysteresis loss:</u> To determine the Hysteresis loss in a Ferromagnetic material.

11 <u>To determine the magnetic field at the center of a coil and its variation with distance and radius of the coil.</u>

12 <u>To verify the Faraday's law of electromagnetic induction.</u>

Text Books

1. B.V.RAMANA: "HIGHER ENGINEERING MATHAMATICS", TATA McGraw Hill**.**
2. R K Jain, S R K Iyengar: " Advanced Engineering Mathematics. Third Edition", Narosa Publishing House

Reference Books

1. Erwin Kreyszig: "Advanced Engineering Mathematics (8th Edition) ",Wiley Eastern Ltd., New Delhi.
2. Dr. B.S. Grewal : "Higher Engineering Mathematics", Khanna Publishers, New Delhi
3. Murray Spiegel : "Advanced Mathematics for Engineering & Science: Schaum's Outline Series" ,Tata - McGraw Hill Publication

4. Merel C Potter, J L Goldberg: "Advanced Engineering Mathematics (3rd Edition)"Oxford India Publication.

Digital Learning Resources & Moocs

1. http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/
2. http://nptel.ac.in/video.php?subjectId=122107036
3. http://ocw.mit.edu/index.htm
4. https://www.khanacademy.org/

Subject: **Electrical Workshop**			
Program: **B.Tech All Branches**	Subject Code: EL0001		Semester: **I/II**

Teaching Scheme				Examination Evaluation Scheme				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
0	0	2	1	00	60	00	40	100

Course Objectives:

After completion of this course, expected outcomes from the students:

1. **Fundamental Engineering Analysis Skill**: Ability to apply knowledge of Electrical Engineering.
2. **Information Retrieval Skills:** Ability to design electrical circuits and conduct experiments with electrical engineering as well as to analyze and interpret data.
3. **Practical Engineering Analysis Skills:** Ability to acquire new knowledge to use modern engineering tools and equipments to analyze problems necessary for engineering practice. Knowledge of basic electrical and electronic device.

LIST OF EXPERIMENTS

Exp. No.	Title	Learning Outcome
1	Introduction to symbols and abbreviations used in electrical engineering.	• Basic knowledge of symbols and abbreviations that are used in electrical engineering
2	Introduction to IE rules.	• Understanding of safety rules • Safety precautions to be taken in the laboratory
3	Identify different types of cables/wires, switches, fuses, MCB, ELCB, MCCB with their ratings and usage.	• To understand basic working principle of different protective devices • To recognize the practical applications of these protective devices by their demonstration

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

4	Performance of Electric shock phenomena, precautions, preventions, earthing.	• To identify the importance of earthing in electric network. • To understand, how earthing works
5	Measuring instruments like Ammeter, Voltmeter, Wattmeter, Watt-hour Meter, and Megger with their description and usage.	• To get familiar with different measuring devices • To understand the working principle on which these devices work
6	To measure earthing resistance using insulation tester (Megger).	• Basic knowledge of earthing resistance • Working principle of insulation tester (megger)
7	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, Main switch and Energy meter.	• To identify different components used in wiring scheme • Basic knowledge of designing a simple wiring scheme • To identify the principle and working of energy meter
8	Wiring of light/fan circuit using Two way switches (Staircase wiring), Wiring of fluorescent lamps and light sockets (6 A)	• Basic knowledge of staircase wiring • Wiring of fluorescent lamps • Identification of sockets
9	Wiring of backup power supply including inverter, battery and load for domestic installations.	• To have the basic idea of inverter and battery • Basic knowledge of back-up power supply
10	Demonstration and measurement of power consumption of Electric Iron, Mixer Grinder, Single phase pump, exhaust fan or other home appliance.	• To have the knowledge of working of electric iron, mixer grinder and pump • To demonstrate the power consumption by these devices
11	Preparing the drawing for wiring a newly built room, without any electrical wiring along with a bill of materials with specifications; the room may be a class-room, an office, a shop, a clinic, a small workshop etc.	• Exercise for students to make a wiring scheme for any of the given example • To estimate the total cost of appliances, materials and wiring

Subject: **Elements of Electrical Engineering**								
Program: **B.Tech All Branches**				Subject Code: EL0002			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Outcome:

1. **Fundamental Engineering Analysis Skill**: Ability to apply knowledge of Electrical Engineering.

2. **Information Retrieval Skills:** Ability to design electrical circuits and conduct experiments with electrical engineering as well as to analyze and interpret data.

3. **Engineering Problem Solving Skills:** Ability to identify, formulate and solve engineering problems.

4. **Practical Engineering Analysis Skills:** Ability to acquire new knowledge to use modern engineering tools and equipment's to analyze problems necessary for engineering practice.

Contents:

UNIT-I [07]

DC Circuits

Elementary Concepts:

Ohm's Law and Kirchhoff's Laws, Analysis of series, parallel and series-parallel circuits; Star–Delta conversion; Nodal analysis, Mesh analysis, voltage sources and current sources, Super position theorem, Thevenin's theorem, Norton's theorem, Equvalence of thevenin's and norton's theorem, Maximum power transfer theorem.

UNIT-II [12]

Electrostatics:

Electric charge and Laws of electrostatic, Capacitor; Capacitor in series and parallel, variable capacitor, Instantaneous voltage and current in capacitor, charging and discharging of capacitor, Energy stored in a capacitor, types of capacitor.

Magnetic Circuit:

Magneto motive force, magnetic field strength, reluctance, Relation between magnetic circuit parameter, Laws of magnetic circuit, composite magnetic circuit: series magnetic circuit, parallel magnetic circuit, comparison of Electric and magnetic circuit, Effect of magnetic field on current carrying conductor; Statically and dynamically induced EMF; Concepts of self inductance, mutual inductance, energy stored in inductor, coefficient of coupling; Inductance in series and parallel; Hysteresis and Eddy current losses.

UNIT-III [16]

Single Phase A.C. Circuits:

Generation of sinusoidal voltage, Definition of average value, root mean square value, form factor and peak factor; Phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, R-L, R-C and R-L-C circuits; Concepts of Real power, Reactive power, Apparent power and Power factor, methods to improve power factor, Series, Parallel and Series - Parallel circuits; Power in AC circuit, Resonance in series and parallel circuits.

Three Phase A.C. Circuits:

Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits, measurement of power by two wattmeter method; Work, Power, Energy, Problems

UNIT-IV [13]

Transformers: Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency.

DC Machines: Working principle of DC machine as a generator and a motor; DC series motor, DC shunt motor, DC compound motor constructional features.

Induction Motor: Concept of rotating magnetic field; Principle of operation, types and constructional features, slip and its significance.

Text Books:

1. A. Chakrabarti, "Basic Electrical Engineering", Tata McGraw Hill
2. A.E Fitzgerald, David E. Higginbotham, Arvin Grabel, "Basic Electrical Engineering", 5th Edition, Tata McGraw Hill.

Reference Books:

1. Vincent Del. Toro (2012), "Principles of Electrical Engineering", Prentice Hall, India
2. Electrical Estimating & Costing by Surjit Singh (Dhanpat Rai & sons).
3. J.N. Swamy, "Elements of Electrical Engineering" Mahajan Publishing House.
4. Nagrath I.J. and D. P. Kothari (2001), "Basic Electrical Engineering", Tata McGraw Hill.
5. Rajendra Prasad (2009), "Fundamentals of Electrical Engineering", Prentice Hall, India

Web Resources:

1. www.nptel.ac.in
2. www.youtube.com

Subject: **Engineering Graphics**								
Program: **B.Tech All Branches**				Subject Code: ME0001			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
1	6	0	4	24/60	00	16/40	00	100

Content:

Unit - I

1. **Introduction to engineering graphics**
   Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions- Dimensioning systems – polygons-types of lines

2. **Engineering curves**
   Classification and application of Engineering Curves, Construction of different methods of Ellipse, parabola and Hyperbola, construction of Conics, Cycloid Curves – Cycloid, Hypocycloid, Epicycloids, Involutes and Spirals.

Unit- II

3. **Projections of Points and Lines**
   Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes.

4. **Projections of Planes**
   Projections of planes (polygons, circle, and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane.

Unit- III

5. **Projections of Solids**
   Classification of solids. Projections of solids (Cylinder, Cone, Pyramid, Prism) along with frustum of cone and pyramid with their inclinations to one reference plane and with two reference planes.

Unit- IV

6. **Orthographic And Sectional Orthographic Projections**
   Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, introduction of section of objects, full sectional view.

7. **Isometric Projections**
   Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.

Text Books

1. P.J. Shah, "A Text Book of Engineering Graphics"   Publication: S.Chand.
2. A Text Book of Machine Drawing By P. J. Shah S.Chand & Company Ltd., New Delhi

Reference Books

1. N.D.Bhatt , "Elementary Engineering Drawing", Charotar Publishing House, Anand

2. P.D.Patel, " Engineering Graphics" Publication: Mahajan

3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand &Company Ltd., New Delhi

4. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi

Web Resources
1. www.nptel.ac.in

Subject: **Basic Electronics**								
Program: **B.Tech All Branches**				Subject Code: EC0001			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
2	0	2	3	24/60	24/60	16/40	16/40	200

Course Outcome:

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

1. Recognize basic electronic components and devices used for different electronic functions
2. Explain the concepts of semiconductor physics
3. Design and test basic electronic circuits using active components
4. Solve basic problems in simple electronic circuits

Contents

UNIT 1 [10]

 Energy Bands in Solids
Charged Particles, Field Intensity, Potential Energy, The eV Unit of Energy, Nature of Atom, Atomic Energy Levels, Electronic Structure of the Elements, Energy distribution of electrons, Fermi-Dirac function, Energy Band Theory of Crystals, Insulators, Semiconductors and Metals

Transport Phenomena in Semiconductors
Mobility and Conductivity, Electrons and Holes in an Intrinsic Semiconductor, Donor and Acce in a Semiconductor, Electrical properties of Ge and Si, Hall Effect, Conductivity Modulation, Charges, Diffusion, The Continuity Equation, Injected Minority–Carrier Charge, Poter Semiconductor,

UNIT 2 [10]

Junction –Diode Characteristics: Open circuit p-n Junction, p-n Junction as a Rectifier, Current Components in a p-n diode, Volt-Ampere Characteristic, Temperature Dependence of the V/I Characteristic, Diode Resistance, Space Charge, Transition Capacitance, Charge-Control Description of a Diode, Diffusion Capacitance, Junction Diode Switching Times, Breakdown Diodes, Tunnel Diode, Semiconductor Photodiode, Photovoltaic Effect, Light – Emitting Diodes, Schottky diode, varactor diode, GUNN diode, SCR

Diode Circuits:

Diode as a Circuit Element, Load-Line Concept, Piecewise Linear Diode Model, Clipping Circuits, Clipping at Two Independent Levels, Comparators, Sampling Gate, Rectifiers, Other Full-Wave Circuits, Capacitor Filters, Additional Diode Circuits

UNIT 3   [5]

Transistor Characteristics:
Junction Transistor, Transistor Current Components, Transistor as an Amplifier, CB Configuration, CE Configuration, CC Configuration, Analytical Expressions for Transistor Characteristics Maximum Voltage Rating, Phototransistor, Transistor biasing.

UNIT4   [7]

Field Effect Transistors:
Junction FET, JFET Volt-Ampere Characteristics, MOSFET

Operational Amplifiers:
Introduction to Op Amps, Inverting Amplifier, Non-inverting amplifier, Op Amp applications

Introduction to Data converters:
ADC & DAC

Introduction to Microprocessors and Microcontrollers:
Basic digital ICs, Architecture of processors and controllers

Text book

1. 'Integrated Electronics' By J. Millman and C. C. Halkias, Chetan Parikh, 2nd Ed., Tata McGraw Hill Publication

Reference Books

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1. 'Electronic Principles' by Albert Malvino and David Bates, 7th Ed., Tata McGraw Hill Publication
2. 'Electronic Devices and Circuit Theory' by Robert Boylestad and Louis Nashelsky, 9th Ed., Prentice Hall India
3. "Digital Electronics" by Morris Mano, 2006

List of Experiments

1. To plot VI characteristics of PN junction diode

2. To plot VI characteristics of Zener diode

3. To plot VI characteristics of Tunnel diode

4. To measure ripple factor of a rectifier

5. Build and test wave shaping circuits

6. To plot input and output VI characteristics of CB configuration using BJT

7. To plot input and output VI characteristics of CE configuration using BJT

8. To plot input and output VI characteristics of CC configuration using BJT

9. To plot drain and transfer characteristics of a JFET

10. To build and test inverting and non-inverting amplifier

11. To build an LED driver circuit and test

12. To build and test an integrator and differentiator with Op Amp

Subject: **Materials Science**			
Program: **B.Tech All Branches**	Subject Code: MT0001		Semester: **I/II**

Teaching Scheme				Examination Evaluation Scheme				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	00	16/40	00	100

1. Course Outcomes

- Evaluate different materials for engineering applications.
- To categorize material according to their properties and requirement.
- To classify materials and understand the importance of each material in order to find applications in other fields of engineering.

2. Contents

		Time Allotted
Unit 1	Introduction, Engineering requirement of different materials, Classification of Engineering materials, Properties of engineering materials , Criteria for selection of materials for engineering application. Crystal Physics; Structure of crystalline solids; Lattices, unit cells; Indexing of directions and planes, notations, Interplanar spacings and angles, Crystal structure analysis - Bragg's law for X-ray diffraction.	8 hours
Unit 2	Ferrous metals & Alloys- Pig iron, cast iron, carbon steel, alloy steels-Classification, properties, composition and applications. Non-Ferrous Metals & Alloys- Important non-ferrous metals (Al, Cu, Pb, Zn, Sn, Mg, Ti, Ni,), Non-ferrous alloys (Cu alloys, Al alloys, Mg-alloys, Ni-alloys) – Composition, properties, classification and applications.	12 hours
Unit 3	Introduction, Simple crystal structure, Classification- Traditional (clay-products, refractories, abrasives, cement) and Engineering Ceramics- Glass Ceramics, Properties of ceramics, Application of Ceramics, Glasses, Glass structure, Properties and application of Glass, Types of glass.	12 hours

	Introduction, Classification and forms of Polymers, Thermosetting & thermoplastic polymer, types of polymerizations, Molecular weight, Plastics, Natural rubber and synthetic rubber, Applications of polymeric materials.	
Unit 4	Introduction, Classification & Applications, Dispersion-strengthened, Composites, Particulate Composites, Fiber-reinforced Composites: Influence of Fiber Length, Influence of Fiber Orientation and Concentration, The Fiber Phase, The Matrix Phase, Polymer-Matrix. Composites, Metal-Matrix Composites, Ceramic - Matrix Composites, Carbon–Carbon Composites, Processing of Fiber-Reinforced Composites. Smart materials (Shape memory material, Piezo electric material) Photoconductors, Bio-materials, Nano materials, Dielectric materials, magnetic materials, metamaterials, Cryogenics, Optical Fiber.	14 hours

3. **Text Book(s)**

   1) Material Science and Metallurgy by O.P Khanna, Dalpat Rai Publications
   2) Engineering Materials by R. K Rajput, S. Chand Publications.
   3) Material Science & Engineering – An Introduction by W.D. Callister, John Wiley.

4. **Reference Books**
   1) Introduction to Materials Science for Engineers – James Shackelford, Pearson, Prentice Hall; 8 edition.
   2) Elements of Materials Science –by L.H. Vanvlack, Addision-Wisley Series
   3) Element s of Metal lurgy by D. Swarup, Rastogi Publication
   4) Engineering Materials by S.C. Rangwala and P.S. Rangwala, Charotar publication house Pvt. Ltd.
   5) Materials Science and Engineering by Willing F. Smith, TMH publication

5. **Web Resources**
   http://nptel.ac.in/

Subject: **Business Communication and Presentation Skills**								
Program: **B.Tech All Branches**				Subject Code: SH0202			Semester: **II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
1	2	0	2	60	00	40	00	100

Course Objectives:

1. To orient students about the varied uses of business communication.

2. Under the importance of personality and its reflection in communication.

3. Train students to develop business correspondence in writing and presentation skills.

Course Content:

Unit 1:
Business Communication- **Role of Communication in Information Age**, concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication. Style and organization in technical communication covering, Language skills, Objectivity, clarity, precision, and organizational etiquettes as defining features of technical communication.

Unit 2:
Effective Presentation Skills-Oral Presentation and professional speaking, Elements of effective presentation; Planning and preparing a model presentation; organizing the presentation to suit the audience and context; Basics of public speaking and Group Discussion.

Unit 3:
Reading- Intensive reading, Predicting content, Interpretation, Inference from text, skimming & scanning techniques of reading, Critical Interpretation, Editorial of newspapers.

Unit 4:
Writing: Basic Writing skill development & Paragraph development(Unity, coherence, cohesive devices), Letters; Inquiry- reply to inquiry, Complain, request , business letters, Using e-mail for business communication; Language in e-mail.

Reference Books:

1. Fred Luthans, Organizational Behaviour, McGraw Hill

2. Lesikar and petit, Report writing for Business

3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill

4. Wallace and masters, Personal Development for Life and Work, Thomson Learning

5. Hartman Lemay, Presentation Success, Thomson Learning

6. Malcolm Goodale, Professional Presentations

7. Farhathullah, T. M. Communication skills for Technical Students

8. Michael Muckian, John Woods, The Business letters Handbook

9. Herta A. Murphy, Effective Business Communication

10. Lehman, Dufrene, Sinha BCOM, Cengage Learning

Web resources/ MOOCs:

1. **Business Conversation Rule 1 :https://www.youtube.com/watch?v=wB8mr4iViy0**
2. **Business English Conversations Rule 2:**
   https://www.youtube.com/watch?v=wB8mr4iViy0
3. **Business English Conversations 3: https://www.youtube.com/watch?v=wB8mr4iViy0**
4. **Business English Conversations Rule 4:**
   https://www.youtube.com/watch?v=wB8mr4iViy0
5. **Business English Conversations Rule 5:**
   https://www.youtube.com/watch?v=wB8mr4iViy0
6. **English Presentation Video: https://www.youtube.com/watch?v=wB8mr4iViy0**
7. **Powerful Presentation Skills: Body Language:**
   https://www.youtube.com/watch?v=wB8mr4iViy0
8. **Make Body Language Your Superpower:**
   https://www.youtube.com/watch?v=wB8mr4iViy0
9. **Make a Presentation Like Steve Jobs:**
   https://www.youtube.com/watch?v=wB8mr4iViy0

3RD SEMESTER

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		TOTAL
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	SH0301	Differential Equations and Integral Transforms	3	2	0	4	05	30	10	60	00	00	100
2	AU0301	Kinematics of Machines	4	0	2	5	06	30	10	60	40	60	200
3	AU0302	Fluid Mechanics	3	0	2	4	05	30	10	60	40	60	200
4	AU0303	Machine Design & Industrial Drafting	3	0	2	4	05	30	10	60	40	60	200
5	AU0304	Automobile Measurements and Metrology	3	0	2	4	05	30	10	60	40	60	200
6	AU0305	Automobile Manufacturing Processes	4	0	2	5	06	30	10	60	40	60	200
7	SH0307	Human Values and Professional Ethics	1	0	0	0	01	-	-	-	-	-	100
		TOTAL	**21**	**2**	**10**	**26**	**33**	**180**	**60**	**360**	**200**	**300**	**1200**

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –III TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

Subject: **Differential Equations and Integral Transforms**								
Program: **B.Tech. Automobile Engineering**				Subject Code: SH0301			Semester**: III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	24/60	-	16/40	-	100

Course Objectives:

1. To provide an ability to see differential equations as a rigorous way of modeling physical phenomena.
2. To provide an ability to derive major differential equations from physical principles.
3. To provide an ability to understand the role of initial and boundary conditions in determining the solutions of equations.
4. To provide an ability to choose and apply appropriate methods for solving differential equations.
5. To provide an ability to undertake problem identification, formulation and solution.

COURSE CONTENT

UNIT 1   [15]

ORDINARY DIFFERENTIAL EQUATIONS WITH APPLICATIONS
Revision of ordinary differential equation: Introduction of Mathematical Modeling, Basic Definitions, First Order First Degree Differential Equations, Variable Separable equation, Homogeneous Equation, Exact Differential Equations, Reduction of Non-exact Differential Equations to exact form using Integrating Factors, First Order Linear Differential Equation, Bernoulli Equation, Applications: Orthogonal Trajectories, Simple Electric Circuits., Solution of Linear differential equations of higher order with constant coefficients, complimentary function and particular integral

UNIT 2   [14]

ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS WITH APPLICATIONS
Method of variation of parameters, Method of Undetermined coefficients, Linear differential equations with variable coefficients (Cauchy's and Legendre forms), Simultaneous linear differential equations, Bessel and Legendre functions, Application of Linear differential equation - Application of Deflection of Beams, Electric circuits, Series Solution of Ordinary Differential Equations – Power series method, Formation of Partial differential equations, Directly Integrable

equation, Method of separation of variables, solution of one dimensional wave equation, heat equation and Laplace equation.

UNIT 3 [13]

LAPLACE TRANSFORMS
Relation between Laplace and Fourier Transform, Definition, Linearity property, Laplace transforms of elementary functions , Shifting theorem, Inverse Laplace transforms, Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transform in solving ordinary differential equations, Laplace transforms of periodic, Unit step and impulse functions

UNIT 4 [12]

FOURIER SERIES, FOURIER INTEGRALS, FOURIER TRANSFORMS AND Z-TRANSFORMS
Fourier series, Drichlet's conditions, Euler's formula, Fourier expansion of periodic functions, Fourier series of even and odd functions, Half range Fourier series, Fourier integral theorem (only statement), Fourier sine and cosine integrals, Complex form of Fourier integral, Fourier transforms, Fourier sine and cosine transforms, Introduction to Z-transforms: Definition and Standard Z-transforms, Linearity Property, dumping Rule and some standard results, Some useful Z-transforms

Text Books

1. Erwin Kreyszig: Advanced Engineering Mathematics (8th Ed.) , Wiley Eastern Ltd., New Delhi.

Reference Books
1. B. V. Ramana: Higher Engineering Mathematics, Mc Graw Hill, New Delhi.
2. Dr. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3. R K Jain, S R K Iyengar: Advanced Engineering Mathematics. Third Edition, Narosa Publishing House
4. Murray Spiegel: Advanced Mathematics for Engineering & Science: (Schaum's Outline Series),Tata – McGraw Hill Publication.
5. Merel C Potter, J L Goldberg: Advanced Engineering Mathematics (3rd Ed.), Oxford India Publication

Subject: **Kinematics of Machines**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0301			Semester**: III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	0	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. The course has been designed to cover the basic concepts of kinematic aspects of mechanical machines.
2. It is intended to introduce essential elements of machines and their functionality and engenders skills for kinematics analysis of machine elements like linkages, cams, and gears, within the general machine design context.

COURSE CONTENT

UNIT 1 [17]

MECHANISMS AND SPECIAL MECHANISMS
Link, Kinematic chains and their classification, mechanism and machine, Inversions of four-bar chain, single slider crank chain and Double slider crank chain mechanisms , various types of Quick return motions. . Straight line mechanism, Indicator diagram Hooke's Joint, Steering Mechanism

VELOCITY & ACCELERATION ANALYSIS OF MECHANISM
Angular and linear velocities in link mechanism, Instantaneous center method, Relative Velocity method and Acceleration Diagram for slider - crank chain and four-bar chain mechanism including coriolis component of acceleration.

UNIT 2 [19]

BELT, ROPE AND CHAIN DRIVES
Introduction, belt and ropes drives, selection of belt drive, types of belt drives, V-belts, materials used for belt and rope drives, wire rope, Slip and Creep of belt, length of Open belt drive and Cross belt drive, Power transmitted by a belt, Ratio of Driving tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains, Classification, length, angular speed ratio, Power Transmitting chains.

TOOTHED GEARING AND GEAR TRAINS

Classification of gears, types of motion, Gear Terminology, Law of Gearing, Velocity of Sliding, Forms of teeth , involute and cycloid tooth profile - interference of gears - minimum number of teeth to avoid interference, Interference between Rack and Pinion, contact ratio. Helical, spiral, worm and bevel gears, Efficiency of Helical, Spiral, Worm, Worm Gear, and Bevel Gears

Introduction, Types of Gear Trains, Simple, compound & reverted gear trains, Epicyclic gear train, Compound Epicyclic gear train, Epicyclic Gear train with Bevel gears, Torques in Epicyclic gear trains.

UNIT 3   [16]

CAMS

Classification of cams and followers, nomenclature, displacement diagrams of follower motion, kinematic coefficients of follower motion, Drawing a cam profiles for a given displacement - time diagram, SHM, Uniform velocity, Uniform Acceleration, Cylcoidal motion, Uniform Acceleration & Retardation, jump phenomenon in cam and follower system

GOVERNORS

Introduction, Objectives, Types of Governors, Working of Porter Governor and Hartnell Governor

GYROSCOPE & ITS EFFECT

Angular Velocity, Angular acceleration, Gyroscopic Torque, gyroscopic effect on naval ships, stability of automobile, stability of two wheel and four wheel automobile

UNIT 4   [20]

BALANCING OF ROTATING AND RECIPROCATING MASSES

Forces due to revolving masses. Balancing of revolving masses in one plane and in different planes. Balancing of reciprocating mass, balancing of locomotives, partial balancing of locomotives, swaying couple, hammer blow, variation in tractive effort, secondary balancing, balancing of inline engines, balancing of V-engines, balancing of radial engines.

VIBRATIONS IN MECHANICAL SYSTEMS

Introduction, Basic features of vibration systems - single degree of freedom Systems and vibration isolation. Introduction to free vibration and Forced vibration.

Text Books

1. S.S.Rattan "Theory of Machines" by, Mc Graw Hill
2. R.S.Khurmi "Theory of Machine" by. S.chand Publication

Reference Books

1. Jagdish Lal "Theory of Machines" by Metropolitan Book Co.
2. Amitabha Ghosh & Mallik "Theory of Mechanisms and Machines" by A. K East West Press
3. Rao J. S. and Dukkipati R. V. "Mechanism & Machine Theory" by New Age International Pub.
4. Charles Wilson &J.Peter Sadler E. "Kinematics and Dynamics of Machinery" by Pearson Education publications

List of Experiments

1   Study of different types of mechanisms and their Inversions
2   Study of belt and chain drive.
3   Sheet-1 To perform cam analysis using cam apparatus and generate cam profile.
4   Study of different types of gears train.
5   To study and perform gyroscopic effect .
6   Study of simple pendulum
7   Sheet-2 Velocity analysis.
8   Sheet-3 Acceleration analysis.
9   To perform experiment on Porter Governors to prepare performance characteristic Curves, and to find stability & sensitivity
10 To determine the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation.
11 Study of balancing and its application in automobile.
12 Study about longitudinal vibration of a spring mass system.

Subject: **Fluid Mechanics**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0302			Semester**: III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. The course is designed with all the basic concepts of fluids and fluid flow phenomenon, conservation equations and their applications to fluid flow problems.
2. The course is designed to give fundamental knowledge of properties of the fluid and mathematical techniques of practical flow problems.

COURSE CONTENT:

UNIT 1 [15]

PROPERTIES OF FLUID
Types of fluid, Ideal & Real Fluids, Fluid properties: Mass density, specific weight, specific volume, specific gravity, viscosity, vapour pressure, compressibility, surface tension, bulk modulus and capillarity, Newtonian and Non-Newtonian fluid

FLUID STATICS
Fluid statics: fluid pressure at a point, variation of pressure within a static fluid, hydrostatic law - Pressure head, Pascal's law. Buoyancy and Floatation. Measurement of pressure - Piezometric tube, manometry

UNIT 2 [14]

FLUID KINEMATICS
Description of fluid motion, Lagrangian and Eulerian approach, description of fluid flow - Velocity and acceleration of fluid particles - Different types of fluid flow. Description of flow pattern: Stream line, streak line, path line. Principle of conservation of mass - Continuity equation.

FLUID DYNAMICS
Euler's equation of motion along a stream line - Bernoulli's equation. Practical applications of Bernoulli's equation in flow measurement devices like venturimeter, nozzle, orificemeter and pitot tube. Momentum of momentum equation, Introduction to Notches and Weirs

UNIT 3 [13]

DIMENSIONAL ANALYSIS AND SIMILARITIES

Dimensions, dimensional homogeneity, methods of dimensional analysis-Reyleigh Method, Buckingham Pi theorem. Model analysis - Advantages and applications of model testing. Similitude, derivations of important dimensionless numbers and its significance, model laws: Reynold's model law, Fraude's model law, Euler's model law, Weber's model law, Mach's model law.

FLOW THROUGH PIPES

Major energy losses, Minor energy losses, Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Flow through nozzle at end of pipe, Water hammer in pipes

UNIT 4 [12]

VISCOUS & TURBULENT FLOW

Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe-Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, Expression for coefficient of friction -Darchy Weish bach Equation, Moody diagram resistance of smooth and rough pipes shear stress and velocity distribution in turbulent flow through pipes.

BOUNDARY LAYER THEORY AND FLUID FLOW OVER BODIES

Boundary layer development on a flat plate and its characteristics – Boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Momentum equation for boundary layer by Vonkarman, drag on flat plate, boundary layer separation and its control. Aerofoil theory, lift and drag Coefficients, streamlined and bluff bodies

Text Books

1. "Introduction to Fluid Mechanics and Fluid Machines" – S.K. Som and G. Biswas- TMH ,Delhi
2. "A text book of Fluid Mechanics and Hydraulic Machines" – Rajput R. K- S Chand and Company Ltd, New Delhi, Fourth edition, 2010.
3. "Fluid Mechanics and Hydraulics Machines"- Bansal R K , 5th edition, Laxmi publications (P) Ltd., New Delhi, Ninth Edition, 2006.

Reference Books

1. Fluid Mechanics & Hydraulics Machines-R.K.Bansal-Laxmi Publications.,Delhi
2. Engineering Fluid Mechanics –K.L. Kumar, Eurasia Publication House, Delhi
3. Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
4. Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH,Delhi
5. Fluid Mechanics: An Introduction by E. Rathakrishnan; PHI Publication
6. Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi,& SM Seth- Standard, Delhi

Online Resources:
1. http://nptel.ac.in/courses/112105171/1

List of Experiments

1. Introduction to Fluid Properties
2. Study of Buoyancy & Floatation
3. Calculation of Meta-Centric Height
4. To Verify Bernoulli's Theorem
5. To determine the Friction Factor for Pipes of Different Sizes
6. To determine the different Regimes of Flow by Reynolds's experiment
7. To study about Open Channel Flow over a Notch and to find Co-Efficient of Discharge of Rectangular Notch
8. To study about Open Channel Flow over a Notch and to find Co-Efficient of Discharge of V-Notch
9. Calibration of Venturi Meter
10. Calibration of Orifice Meter

Subject: **Machine Design & Industrial Drafting**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0303			Semester: **III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. Student to be made aware of computer aided drafting of the component and system.
2. Basic knowledge of design techniques and fundamentals of design procedure

COURSE CONTENT:
UNIT 1   **[15]**

DESIGN CONSIDERATION OF MACHINE PARTS
Definition and understanding of various types of design, Morphology of design, Design procedure, , Selection of materials, Properties and I.S. coding of various materials, factors of safety, Stress Concentration and methods of relieving stresses, Types of stresses-tensile, compressive, shear, bending, bearing, crushing, Eccentric axial stresses, principle stress, Residual stresses, Limits, fits, tolerances.

DESIGN OF FASTENERS
A) Design of Riveted Joints:

Types of riveted joints, design of double and triple riveted butt joints with equal and unequal cover plates, Design of Circumferential joint, Longitudinal Butt Joint, Eccentric loading.

B) Welded Joints

Types of welded joints, stresses in welded joints, Design for various loading conditions in torsion, shear, or direct load, eccentrically loaded welded joints, welding symbols.

C) Cotter & Knuckle Joints:

Design of Gibb and cotter, and knuckle joint, Design of Spigot and socket Joint, Design of Turn buckle

UNIT 2 [14]

DESIGN OF SHAFT

Design of solid and hollow shaft for transmission of torque, bending Moment and axial forces, Design of shaft for critical speed, design of shaft for rigidity and stiffness, flexible shafts.

KEYS AND COUPLINGS

Design of different types of keys, design of a muff and clamp coupling, Rigid coupling, Flange Coupling, Flexible coupling- Oldham, universal coupling

UNIT 3 [13]

POWER SCREWS

Types of power screw threads, design of screw with different types of threads used in practice, Design of nuts, Design of C clamp, Screw jack, toggle jack, design of coupler.

UNIT 4 [12]

LEVERS

General Procedure for design of levers, designs of lever for safety valve, design of bell crank lever, design of rocker arm for exhaust valves

INTRODUCTION TO CAD

Introduction to AutoCad, Commands, Methods For2D & 3D Drafting.

ASSEMBLY DRAWINGS

Drawings of assembled view for the part drawings of the following using Propionate dimensions. Cotter joint, Coupling, Knuckle joint Sheet

Text Books

1. P.C Sharma and D. K. Aggarwal "**Machine Design**", S.K. Kataria & Sons 2009

2. V. B. Bhandari "**Design of Machine Elements**", McGraw Hill Publication Publishing Co

Reference Books

1. S. G. Kulkarni, :**Machine Design - Solved Problems**, McGraw Hill Publication Publishing Company Ltd., New Delhi

2. William Orthein, :**Machine Component Design (Vol. I & II)**, M/s. Jaico Publishing

3. N.D. Bhatt, :**Machine Drawing**–Charator Publication

4. P.S. Gill, **Machine Drawing** -S.K. Kataria & Sons New Delhi

5. Joseph Edward Shigley and Charles R. Mischke, :**Mechanical Engineering Design**, McGraw Hill International Edition,

List of Experiments

1. Introduction to computer aided drafting tools.
2. Using drafting software, generate Assembly and Production drawings (emphasis should be to demonstrate guidelines of IS SP 46 2003).
3. Solve problems related to Eccentric Loading; Cotter and Knuckle Joints; Design and Analysis of Levers: Cranked, Bell Crank, Foot, Rocker arm. Also prepare 3D models and detailed drawings of Cotter and Knuckle Joints
4. Design of shafts, keys and Couplings. Also generate 3D models and detailed drawings of couplings designed
5. Study different types of threaded fasteners and rivets. Problems for design of joints using welding, riveting and fasteners.

Online Resources:
- http://nptel.ac.in/courses/112105124/

Subject: **Automobile Measurements and Metrology**								
Program**: B.Tech. Automobile Engineering**				Subject Code: AU0304			Semester**: III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To understand the concept of measurement
2. To Study application of Different measuring instrument.
3. To study new technologies in measurement

COURSE CONTENT:

UNIT 1   **[15]**

CONCEPT OF MEASUREMENT
General concept – Generalized measurement system-Units and standards-measuring instruments: sensitivity, stability, range, accuracy and precision-static and dynamic response-repeatability-systematic and random errors-correction, calibration -Introduction to Dimensional and Geometric Tolerancing -interchangeability,

LINEAR AND ANGULAR MEASUREMENT
Definition of metrology-Linear measuring instruments: Vernier, micrometer, Slip gauges and classification, - Tool Makers Microscope - interferometery, optical flats, - Comparators: limit gauges Mechanical, pneumatic and electrical comparators, applications. Angular measurements: -Sine bar, Sine center, bevel protractor and angle Decker..

UNIT 2   **[14]**

ANGULAR AND TAPER MEASUREMENTS
Introduction; Working principle & construction of Angular Measuring instruments like Protractors, Sine bars, Sine centre, Angle gauges, Spirit level, Clinometers, angle dekkor; Applications, Advantages & limitations of commonly used angular measuring instruments; Taper Measuring instruments: Measurement of taper shafts & holes.

SCREW THREAD MEASUREMENTS

Introduction & classification of Threads; Elements, Specification & forms of Screw Threads; Various Methods for measuring elements of External & Internal Screw Thread; Screw Thread Gauges; Errors in Threads.

GEAR MEASUREMENTS

Introduction & Classification of gears; Forms of gear teeth; Gear tooth terminology; Measurement and testing of spur gear: Various methods of measuring tooth thickness, tooth profile & pitch; Gear Errors.

UNIT 3 [13]

MEASUREMENT OF SURFACE FINISH

Introduction; Surface Texture; Methods of Measuring Surface finish- Comparison Methods & Direct Instrument Measurement; Sample Length; Numerical Evaluation of Surface Texture; Indication of Surface roughness Symbols used; Adverse effects of poor surface finish. Straightness, Flatness, Square ness, Parallelism and Machine Tool Tests

INTRODUCTION; MEASUREMENT OF STRAIGHTNESS, FLATNESS, SQUARE NESS AND PARALLELISM;

run out and concentricity; tool makers microscope; Interferometry & its use in checking flatness, surface contour, parallelism etc.; Interferometers & optical flats; Introduction to Machine tool testing;Various Alignment test on lathe, Milling Machine, Drilling Machine etc

TEMPERATURE MEASUREMENT

Introduction; Temperature and Temperature Scales; Methods of temperature Measurement; Expansion thermometers; Filled System thermometers; Electrical temperature measuring instrument; Pyrometers; Calibration of temperature measuring instruments.

UNIT 4 [12]

PRESSURE MEASUREMENT

Introduction; Pressure standards and methods of pressure measurement; Manometers; Elastic pressure transducers; Measurement of Vacuum; Force balance pressure gauges; Electrical pressure transducers; pressure switches; Calibration of pressure measuring instruments, Maintenance and repair of pressure measuring instrument; Trouble shooting.

LASER AND ADVANCES IN METROLOGY

Precision instruments based on laser-Principles- laser interferometer-application in measurements and machine tool metrology- Coordinate measuring machine (CMM): need, construction, types, applications.- computer aided inspection.

Text Books

1. Doeblin,"Measurement System Application &Design" McGraw Hill ,New Delhi, 2000
2. Jain R.K., "Engineering Metrology", Khanna Publishers, 2005 12
3. Donald Deckman, "Industrial Instrumentation", Wiley Eastern, 1985

Reference Books

1. Gupta S.C, "Engineering Metrology", Dhanpat rai Publications, 2000
2. Jayal A.K, "Instrumentation and Mechanical Measurements", Galgotia Publications 2000
3. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson Education, 2006

Online Reference: http://nptel.ac.in/courses/112106138/

List of Experiments

1. Precision Measuring Instruments
2. Linear Measurement
3. Angular Measurement
4. Micrometer Calibration
5. Surface Roughness Measurement
6. Gear Tooth Thickness Measurement
7. Pressure Measurement
8. Temperature Measurement
9. Flow Measurement
10. Strain Gauge Transducer

Subject: **Automobile Manufacturing Processes**								
Program**: B.Tech. Automobile Engineering**				Subject Code: AU0305			Semester: **III**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	0	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. The Automobile Manufacturing Processes course is to learn the basic processes available to make a part/product.
2. It will help the students to select the best manufacturing process based on quality/time/cost/ mechanical properties.

COURSE CONTENT

UNIT 1 [17]

INTRODUCTION
Importance of manufacturing, economic and technological definition of manufacturing, Classification of manufacturing processes, Selection of manufacturing process

FOUNDRY
Types of patterns, pattern materials and pattern allowances. Molding Materials - sand molding, metal molding, investment molding, shell molding. Composition of molding sand, additives, Binders, Properties of moulding sand and sand testing, Melting furnaces – cupola, resistance furnace, induction and arc furnace.

UNIT 2 [19]

CASTING AND MACHINING
Fundamental of metal casting, Sand casting, Shell-Mould casting, Mold casting (plaster and ceramic), Investment casting, Vacuum casting, Permanent mould casting, Slush casting, Pressure casting, Die casting, Centrifugal casting, Continuous casting, Squeeze casting, Casting alloys, Solidification of castings, design of risers and runners, chills and chaplets, Gating system design

UNIT 3 [16]

FORMING PROCESSES

Plastic deformation of metals: Variables in metal forming and their optimization. Dependence of stress strain diagram on Strain rate and temperature. Hot and cold working of metals, classification of metal forming processes. Rolling: Pressure and Forces in rolling, types of rolling mills, Rolling defects. Forging: Smith Forging, Drop and Press forging, M/c forging, Forging defects. Extrusions: Direct, Indirect, Impact and Hydrostatic extrusion and their applications, Extrusion of tubes Wire drawing methods and variables in wire –drawing. Brief introduction to sheet metal working: Bending, Forming and Deep drawing, shearing. Brief introduction to explosive forming, coating and deposition methods

UNIT 4 [20]

SUPER FINISHING PROCESSES

Introduction, Grinding, Lapping, Horning, Buffing, Barrel Tumbling, Burnishing, Powder coating, Polishing

METAL JOINING PROCESSES

Welding - Principle of welding, Classification of welding and allied processes, Arc welding, Gas welding and cutting, Resistance welding, Special welding processes, Advanced welding processes, Friction and Explosive welding, Welding defects and their remedies. **Brazing and soldering –** Principle of soldering and brazing, compositions of solder, Different equipments and Processes involved in brazing and soldering process.

Text Books

1. Manufacturing Technology Vol-II, By P.N. Rao, Tata McGraw Hill.

Reference Books

1. Production technology, by R.K. Jain, Khanna publishers.
2. Production Technology by P.C. Sharma S Chand & Co Ltd.
3. Manufacturing Engg. And Technology By S. Kalpakajain, PHI/Pearson.
4. Welding technology, by O.P.Khanna, Dhanpat Rai publishers.
5. Welding Technology – R.A. Little, TMH
6. Mechanical Metallurgy – Dieter, Mc-Graw Hill

Online Reference:
http://nptel.ac.in/courses/112107145/

List of Experiments

1. Fundamentals of metal forming technology
2. Study of forging and extrusion process
3. Study of press working operations
4. Introduction to metal forming processes
5. Study of pattern making
6. Study of casting processes
7. Introduction to plastic process
8. Study of super finishing processes
9. Study of brazing and soldering
10. Study of sheet-metal forming

Subject:Human Values and Professional Ethics								
Program:B.Tech. ALL				Subject Code:SH0307			Semester: III	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)-Theory	Continuous Internal Evaluation (CIE)-Practical	Total
1	0	0	0	24/60	0	16/40	0	100

Course Objectives:
  ➢ To create an awareness on Engineering Ethics and Human Values.
  ➢ To understand social responsibility of an engineer.
  ➢ To appreciate ethical dilemma while discharging duties in professional life.

Unit 1: Values and Self Development   [04]

Social Values and individual Attitudes, Work ethics, Indian vision of Humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

Unit 2: Personality and Behavior Development   [04]

Soul and scientific attitude. Goad and scientific attitude, positive thinking, integrity and discipline, punctuality, love and kindness. Avoiding fault, finding. Free from anger, Dignity of labor, Universal brotherhood and religious tolerance, True friendship, Happiness vs. suffering love for truth. Aware of self destructive habits, Association and cooperation, doing best, saving nature.

Unit 3: Character and Competence   [04]

Science vs. God, Holy books vs. Blind faith, Self management and good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of women, All religions and same message, Mind your mind, Self control, Honesty, Studying effectively.

Unit 4: Engineering Ethics   [04]

Senses of 'Engineering Ethics', variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, consensus and controversy, models of professional roles, theories about right action, self interest, customs and religions, uses of ethical theories, Valuing time, Co-operation and commitment, Code of ethics, Sample codes – IEEE, ASCE, ASME and CSI.

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

Text Books:

1. Chakraborty, S. K., Values and Ethics for Organization Theory and Practice, Oxford University Press, New Delhi, 2001

2. Gaur R. R., Sangal R., Bagaria G. P., *A foundation course in Value Education*, 2009.

3. Gaur R. R., Sangal R., Bagaria G. P*., Teacher's Manual*, 2009.

4. Mike Martin and RolandSchinzinger, *Ethics in Engineering*, Mc Graw Hill. New York, 1996.

Reference Books:

1. Govindrajan M., Natrajan S. and Senthil Kumar V. S., Engineering Ethics (including Human Values), Prentice hall of India Ltd., New Delhi, 2004.
2. Frankena, W. K., *Ethics*, Prentice Hall of India, New Delhi, 1990.
3. Dhar P. L., Gaur R. R., *Science and Humanism*, Commonwealth Publishers, 1990.
4. TripathyA. N., *Human Values*, New Age International Publishers, 2003.
5. Seebauer E. G. and Robert L. Berry, *Fundamentals of Ethics for Scientists andEngineers*, Oxford University Press, 2000.
6. Banerjee B. P., *Foundations of Ethics and Management*, Excel Books, 2005.
7. Bajpai B. L., *Indian Ethos and Modern Management*, New Royal Book Company, 2004.

4TH SEMESTER

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	TOTAL
1	SH0401	Complex Analysis and Numerical Methods	3	2	0	4	5	30	10	60	0	0	100
2	AU0401	Engineering Thermodynamics	4	2	0	5	6	30	10	60	0	0	100
3	AU0402	Vehicle Transport Management	3	0	0	3	3	30	10	60	0	0	100
4	AU0403	Strength of Materials	3	2	2	5	7	30	10	60	40	60	200
5	AU0404	Automobile Machining Processes	3	0	2	4	5	30	10	60	40	60	200
6	AU0405	Automobile Systems	4	0	2	5	6	30	10	60	40	60	200
7	CE0407	Cyber Security and IPR	1	0	0	0	1	-	-	-	-	-	100
TOTAL			21	6	6	26	33	180	60	360	120	180	1000

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –IV TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

Subject: **Complex Analysis and Numerical Methods**								
Program: **B.Tech. Automobile Engineering**				Subject Code: SH0401			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	0	4	24/60	0	16/40	0	100

Course objectives:

1. To provide an ability to understand, interpret and use the basic concepts: complex number, analytic function, harmonic function, Taylor and Laurent series, singularity, residue, conformal mapping, and meromorphic function.
2. To provide an ability to prove certain fundamental theorems about analytic functions, e.g. Cauchy's integral formula
3. To provide an ability to determine the images of curves under simple complex mappings.
4. To provide an ability to determine the stability of certain dynamical systems using complex functions.
5. To provide an ability to use conformal mapping to solve certain applied problems regarding heat conduction, electrical engineering and fluid mechanics.
6. To provide an ability to use Taylor and Laurent expansions to derive properties of analytic and meromorphic functions.

COURSE CONTENT

UNIT 1   **[15]**

COMPLEX ANALYTIC FUNCTIONS

Complex Numbers, Demoivere's Theorem, Roots of Complex Numbers, Elementary complex functions, Complex planes, Curves in complex planes, Concept of neighborhood in The complex plane, Analytic function, Cauchy- Riemann equations (Cartesian and polar forms – without proof) Harmonic functions, conformal mappings, some standard conformal transformations.

UNIT 2 [14]

INTERPOLATION
Finite differences and Interpolation
Finite differences Forward, Backward & Central difference operators and difference tables. Interpolation, Interpolation Formulae with equal intervals: Newton's forward, Newton's backward, Central difference interpolation by Stirling's formulae
Interpolation Formulae with unequal intervals
Lagrange's & Newton's divided difference interpolation
Numerical Integration
Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.
Numerical differentiation
Using Newton's forward and backward interpolation formula

UNIT 3 [13]

NUMERICAL METHOD
Basic Errors ,
Solution of Algebraic and Transcendental Equations
Bisection method, Regula-Falsi method, Newton-Raphson method, Convergence condition for these methods.
Numerical methods in Linear Algebra
 Gauss-Jacobi, Gauss-seidel method
Largest Eigen values and corresponding Eigen vectors
By power method
Numerical Solutions of ordinary differential equations
Taylor's Method, Euler's Method, Improved Euler Method (Heun's Method), Runge-Kutta method of order four

UNIT 4 [12]

COMPLEX INTEGRATION
Complex integration, Cauchy's integral theorem and Cauchy's integral formula (without proof) Singularities, Taylor's and Laurent's series, Cauchy-Residue theorem, Residues & Contour integration, Applications of residue to evaluate real integrals.

Text Books

1. Erwin Kreyszig: Advanced Engineering Mathematics (8th Ed.) , Wiley Eastern Ltd., New Delhi

Reference Books

1. R. V. Churchill and J. W. Brown: Complex variables and applications (7th Edition), McGraw-Hill (2003).
2. B. V. Ramana: Higher Engineering Mathematics, Mc Graw Hill, New Delhi.
3. Dr. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. R K Jain, S R K Iyengar: Advanced Engineering Mathematics. Third Edition, Narosa Publishing House
5. Murray Spiegel: Advanced Mathematics for Engineering & Science: (Schaum's Outline Series),Tata – McGraw Hill Publication
6. Merel C Potter, J L Goldberg: Advanced Engineering Mathematics (3rd Ed.), Oxford India Publication

Subject: **Engineering Thermodynamics**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0401			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
4	2	0	5	24/60	0	16/40	0	100

Course Objectives:

1. To study various energy interactions notably heat and work transfer based on certain laws of nature which are never seen to be violated.
2. To develop the idea of thermodynamics and topics like first law of thermodynamics, second law of thermodynamics, concept of entropy, properties of pure substances, gas power cycles, vapour power cycles, refrigeration etc.
3. To evaluate the thermal performance of different heat engines and refrigeration cycles through the calculation of their thermal efficiency or coefficient of performance.

Course content

UNIT 1 [17]

BASIC CONCEPTS & PROPERTIES OF PURE SUBSTANCE
Basic terminologies, pure substance, vapor liquid- solid phase in a pure substance, p-v, p-T, T-S diagram of pure substance, p-v-t surface, critical and triple point of pure substance, Mollier chart, sensible heat and latent heat.

FIRST LAW OF THERMODYNAMICS
First law for a closed system undergoing a cycle and change of state, Energy-A property of the system, Perpetual motion machine of the first kind, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger, throttling process, comparison of S.F.E.E. with Euler and Bernoulli Equation and unsteady flow process like filling and emptying process.

UNIT 2 [19]

SECOND LAW OF THERMODYNAMICS & ENTROPY
Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, Perpetual motion machine of the second kind, Carnot cycle, Carnot's theorem, corollary of Carnot theorem, thermodynamic temperature scale. Clausius theorem, the property of entropy, entropy change in a open system, reversible and irreversible process, entropy principle and applications, entropy generation in a open and closed system, Third law of thermodynamics, Entropy and disorder, concept of exergy.

AVAILABILITY & IRREVERSIBILITY
Available and unavailable energy, available energy referred to a cycle, quality of energy, availability in non-flow and steady flow systems, Exergy balance, Second law efficiency.

UNIT 3 [16]

THERMODYNAMIC RELATIONS
Maxwell's equation, T-ds equations, difference in heat capacities, ratio of heat capacities, Helmholtz and Gibbs function, Internal energy relations, Clausius- Claperyon equation, Joule-Thomson coefficient.

VAPOUR & GAS POWER CYCLES
Carnot cycle, Rankine cycle, comparison of carnot and rankine cycle, regenerative cycle, reheat cycle, Exergy analysis of vapor power cycles, calculation of cycle efficiencies, variables affecting efficiency of rankine cycle. Carnot, Sterling, Otto, diesel, dual, Atkinson and Brayton cycle. Comparison of otto, diesel and dual cycles, comparison between brayton and otto cycle, calculation of air standard efficiencies, mean effective pressure, Brayton Rankine combined cycle.

UNIT 4 [20]

COMBUSTION OF FUELS
Combustion of air, combustion equations, minimum air requirement, excess air and air fuel ratio, wet and dry analysis of products of combustion,conversion of volumetric analysis by mass, Determination of calorific value of fuel by Bomb calorimeter and Junkers gas calorimeter, Enthalpy of formation, Enthalpy of reaction, Adiabatic flame temperature.

PROPERTIES OF GASES AND MIXTURES

Avogadro's law, equation of state, ideal gas equation, Vander Waal'sequation, reduced properties, law of corresponding states, compressibility chart. Gibbs-Dalton law, volumetric analysis of gas mixture, apparent molecular weight and gas constant, specific heat of a gas mixture, adiabatic mixing of perfect gases, gas and vapour mixtures, Gibbs function of a mixture of inert ideal gases

Text Books

1. Engineering Thermodynamics by P.K. Nag, Tata McGraw-Hill , New Delhi

Reference Books

1. Fundamentals of Engineering Thermodynamics by R.Yadav, Central Publishing House, Allahabad
2. Thermodynamics – An Engineering Approach by Yunus Centel & Boles, Tata Mc Graw-Hill, New Delhi
3. Thermodynamics by J.P. Holman, Tata Mc Graw-Hill.
4. An introduction to Thermodynamics by YVC Rao, New Age publishers, New Delhi.
5. Thermodynamics – Theory & Application by Robert Balmer, Jaico publication Fundamentals of Thermodynamics by Sonntag, Borgnakke & Van wylen, John Wiley & sons (ASIA) PVT. LTD

Online Resources:

http://nptel.ac.in/courses/112105123/1

Subject: **Vehicle Transport Management**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0402			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To provide language training to the engineering students which will enable them to understand and acquire knowledge in technical subjects.
2. Understand the purpose of research institutes in India, which are working on advancements of automobiles rather than adopting the idea of reverse engineering.

Course content:
UNIT 1 [15]

INTRODUCTION
Introduction to various transport systems, Advantages of motor transport, Staff administration, Recruitment and Training, welfare, driver's health and safety, Basic principles of supervising, Organizing time and people, Driver and mechanic hiring, economical and safe driving tips for city and highway, understanding of traffic rules, Trip leasing, Vehicle operation and types of operations.

UNIT 2 [14]

TRANSPORT MANAGEMENT
Transport organization structure, operations, Planning Scheduling operation & control, Propaganda, publicity and passenger amenities Parcel traffic, General set up, transport industry, government / (STU) State Government Undertakings and private Bus transport organizations, Bus depot organization structure, Truck fleet operators' organization, Requirements and Problems on fleet management. Firebrigade fleet and Ambulance operations management. 108 Organizational activities and it's benefits for the society

SCHEDULING AND FARE STRUCTURE
Principal features of operating costs for transport vehicles, Fare structure, and Various types of fare collecting methods, Basic factors of bus scheduling, Problems on bus scheduling.

UNIT 3 [13]

PLANNING FOR NEW TRANSPORT ORGANIZATION
Geographical considerations, economic factors, vehicles used, planning of trips. Concept of BRTS operations. Organization of Transport Services: Records and fleet management, vehicles 8schedule, booking and reservation, statistical records, recording of goods transport Scheduling of goods transport, Management Information System (MIS) in passenger / goods transport operation. Storage & transportation of petroleum products, Advanced Techniques in Traffic Management, Traffic navigation, Global positioning system. Study of BRTS concept, sysrem and management. It's advantages and disadvantages in terms of mass transportation.

MOTOR VEHICLE ACT
Acts & definitions, Licensing of drivers and conductors, registration of vehicles, control of transport, RTO and other regulations, offences, penalties and procedures, types of form and procedures, licensing of taxies and buses, rules and regulations, testing and passing of vehicles. Description of goods carrier, delivery van, tanker, tipper, municipal, fire fighting and break down service vehicle. Taxation: Structure, method of laying taxation, goods vehicle taxation, passenger vehicle taxation, mode of payment, tax exemption, one / life time taxation. Service Life of vehicles. Toll tax reasons & operational management. Build Operate Transfer arrangement. Highway traffic rules, Traffic signs, National and international driving conditions / rules.

UNIT 4 [12]

ACCIDENT & PREVENTION
Vehicle accident, laws, injury, safety precautions, road transport regulations.
Insurance
Insurance & Finance Classes/types of insurance, accident claims and settlements, duty of driver in case of accident, hire purchase.

LAWS RELATED TO POLLUTION UNDER CONTROL (PUC)
Pollution Under control certification agency, Authority & procedure for PUC certification agency. Harmful exhaust gas constituents, permissible limits, Euro / Bharat Stage -I, II, III, IV norms and implementation, testing and measurements. Study of Odd-Even formula, high power to weight ratio & higher capacity diesel vehicles and other possible methods for reduction of atmospheric pollution and it's impact., EURO reforms.

Text books

1. "Motor Vehicle Act" - Govt. of India Publications.
2. Shrivastava S.K "Economics of Transport", S. Chand & Co. New Delhi. 1987.
3. Shrivastava. S. K, "Transport Development in India", S. Chand & Co. Pvt. Ltd., New Delhi.

Reference books

1. Santosh Sharma, "Productivity in Road Transport", 2nd Edition, Association of State Road Transport Undertakings, New Delhi.
2. Patankar. P. G, "Quality in Road Passenger Transport in India", CIRT, Pune, 1986.
3. Kulshrestha. D. K, "Management of State Road Transports in India", Mittal Publications, 1989.
4. Jegadish Gandhi. P, John Gunaseelan. G, "Indian Transport System: An Appraisal of Nationalised Bus Services", Mittal Publications, 1994.
5. Kulshrestha. D. K, "Transport Management in India", Mittal Publications, 1989.

Subject: Strength of Materials								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0403			Semester: **IV**	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	2	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

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

Course content

UNIT 1   **[15]**

SIMPLE STRESS AND STRAIN
Introduction, Stress and Strains for axial force system, Hooke's law, Analysis of stress in bars, Thermal Stress and Strains, state of simple shear, relationship between elastic constants. Numerical problems

MECHANICAL PROPERTIES OF MATERIALS
Stress-strain Diagrams, Obtaining yield stress by the offset method, proof stress, working stress, factor of safety, tangent modulus, secant modulus, stress concentration, residual stresses, fatigue.

COMPOUND STRESSES: INTRODUCTION
General 2-D state of stress, Principle stresses and Principle strains, graphical analysis of plane stress and plain strain problem –Mohr's circle Numerical Problems.

UNIT 2 [14]

SHEAR FORCE AND BENDING MOMENT DIAGRAMS
Introduction, bending moment and shear force diagrams for statically determinate systems, relationship between load intensity, SF and BM, numerical problems involving different statically determinate beams, frames, and support conditions.

STRESS IN BEAMS
1) **Direct stresses due to Bending**: Introduction, theory of pure bending, section modulus, beam of uniform Strength, analysis and design for strength and stiffness criteria, numerical problems.
2) **Shear Stresses due to Bending:** Introduction, shear stress in beams, shear stress distribution, economical section, numerical problems.

UNIT 3 [13]

TORSION OF CIRCULAR SHAFTS
Introduction, pure torsion formula, analysis of strength and stiffness criteria of solid and hollow circular shaft. Torsion combined with bending. Numerical problems

COLUMN AND STRUTS
Introduction, short and long columns, Euler's theory on columns (Assumptions and standard cases), effective length and slenderness ratio, Rankine's formula, Numerical problems

UNIT 4 [12]

DEFLECTION OF BEAMS
Introduction, Equation of elastic curve and sign convention, Macaulay's method (UDL, Triangular load, couple load acting between the supports) for determination of deflection, Numerical problems.

STRESSES IN THIN AND THICK CYLINDERS
Introduction, lame's equation. Numerical problems on thin cylindrical and spherical shells, thick cylinder and compound cylinders

Text Books

1. S.S.Rattan, Strength of Materials, McGraw Education (India) Private Limited, New Delhi.
2. William Nash, Strength of Materials, Schaum's Out Lines, McGraw Hill Publication, 2004
3. Ramamurtham S., Strength of material

Reference Books

1. Gere & Timoshenko, 'Mechanics of Materials', McGraw Hill, 1993
2. V D Kodgire, Material science and metallurgy, Everest Publishers, Pune Delhi.
3. Dym, C.L., and Shames, I.H., 'Solid Mechanics', McGraw Hill, Kogakusha, Tokyo, 1973.
4. Stephen Timoshenko, 'Strength of Materials', Vol I & II, CBS Publishers and Distributors, Third Edition.
5. Timoshenko's. And Young, D.H., Elements of Strength of Materials, T.Van Nostrand Co. Inc., Princeton, N.J.

Online Resources:

http://nptel.ac.in/courses/112107147/

List of Experiments

1. To study the Universal Testing Machine.

2. To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve.

3. To determine strength of wood on U.T.M (i) Along the Grain (ii) Across the Grain.

4. To determine shear strength of Mild Steel on U.T.M.

5. To observe Flexural Behavior of Timber specimen and to determine it's strength under transverse loading on U.T.M.

6. To study the Impact Testing Machine and test specimen of Izod and Charpy.

7. To determine Izod and Charpy Value of the given mild steel specimen.

8. To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material.

9. To study the Spring Testing Machine.

Subject: **Automobile Machining Processes**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0404			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. The purpose of this course is to introduce machine tools in their proper perspective and present the necessary to grasp the subject
2. To learn and apply the basic terminology associated with different fields of manufacturing.

Course content

UNIT 1 [15]

INTRODUCTION
Material removal processes, Manufacturing processes, Types of machine tools

METAL CUTTING AND MACHINE TOOLS
Types of metal cutting, cutting tool materials, chip formation, thermal aspects, tool wear and tool life, cutting fluids, classification of machine tools, motions in machine tools: working and auxiliary

METAL CUTTING LATHES
Classification of lathes, construction and principal units of engine lathes, type and size range of engine lathes, Operations carried on engine lathe , lathe accessories and attachments , description of other types of lathes, Capston and turret lathes, cutting speed, feed, depth of cut and machining time calculation for lathe, Alignment tests of lathes

UNIT 2 [14]

DRILLING MACHINES
Purpose and field of application of drilling machines upright drill processes, radial drilling machines, alignment tests of drilling machine

BORING MACHINE
Purpose and field of application of Horizontal boring machines, Vertical boring machines, Precision boring machines.

UNIT 3 [13]

MILLING MACHINES
Purpose and types of milling machines, general purpose milling machines, different types of milling operations, milling cutters, attachments extending the processing capabilities of general purpose milling machines, Cutting speed, feed depth of cut and machining time calculation, Alignment tests of milling machine

PLANERS, SHAPERS AND SLOTTERS
Classification: Attachments extending the processing capacities of each

UNIT 4 [12]

SAWING AND BROACHING, MACHINES
Metal sawing classification: reciprocating sawing machines, circular sawing machines, band sawing machines. Types of broaching machines, advantage and limitations of broaching

GRINDING MACHINES AND ABRASIVES
Classification of grinding machines, cylindrical grinders, internal grinders, Surface grinders, tool and cutter grinders, grinding wheels, surface finishing. Abrasives, manufacture of grinding wheels, cutting speed, feed depth of cut and machining time calculations in grinding

INTRODUCTION TO PRECISION MACHINING
Unconventional machining-need-classification-brief overview ,Ultrasonic Machining (USM) • Water-Jet Machining & Abrasive-Jet Machining • Chemical Machining • Electrochemical Machining (ECM)

Text Books

1.Prof. PN Rao, Manufacturing Technology (Metal cutting & Machine tools) Tata Mcgraw Hill Publication. New Delhi

Reference Books

1. Workshop Technology Vol. II by Hajra & Choudhari.
2. Manufacturing Processes by O.P. Khanna.
3. Workshop Technology Vol. I &II & III by Chapman.
4. Production Technology by R. K. Jain.
5. Processes and Materials of Manufacture; Lindberg Roy A.; Prentice-Hall India
6. Manufacturing Engineering and Technology; Kalpakjian; Addison-Wesley Publishing Co

Online References:

http://nptel.ac.in/courses/112104028/

List of Experiments

1. Introduction to basic machine tools.
2. Introduction to Lathe machine.
3. Various parts, mechanism, attachments and operations of lathe.
4. Drilling machines its classification & Operation
5. Boring machines its construction and operation
6. Milling machines its construction and operation
7. Principle, construction & operations of shaping, planning & slotting machine
8. Principle, construction & operations of sawing and broaching machine
9. Grinding machines its classification and operation
10. Gear cutting and indexing methods

Subject: **Automobile Systems**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0405			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	0	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. Develop an understanding on working of Automobile System.
2. Develop in-depth knowledge on various systems in Automobile System

Course content

UNIT 1 [17]

CHASSIS & BODY
Classification of vehicle, layout with reference to power plant, steering location and drive, chassis, construction and details (frames, sub-frames, defects in frame, frameless vehicles, vehicle dimensions), details of chassis & body materials, Integrated body construction, BIW type and corresponding design parameters, Vehicle interior system (dash board & seating system), Cosole design, Pillar trims (Type A, B, C), head roofs.

TRANSMISSION & DRIVELINE
Clutches, principle, types, Fluid coupling and torque convertors, problems on performance of automobile such as resistance to motion, tractive efforts, engine speed, power and acceleration requirements. Determination of gear box ratios for different vehicle applications, different types of gear boxes, Automatic transmission, Effect of driving thrust and torque-reaction, Hotchkiss drives, Torque tube drive, radius rods, Propeller shaft, Universal joints, Final drive- different types, two speed rear axle, Rear axle construction: full floating, three quarter floating and semi-floating arrangements, Differential: conventional type & Non-slip type, differential locks

UNIT 2 [19]

FRONT AXLE & STEERING

Front axle types, rigid axle and split axle, constructional details, materials, front wheel geometry viz., camber, castor, kingpin inclination, toe-in and toe-out, Wheel alignment and balancing, Condition for true rolling motion of road wheels during steering. Steering geometry. Ackermann and Davis steering. Construction details of steering linkages. Different types of steering gear box. Steering linkages layout for conventional and independent suspensions. Turning radius, instantaneous centre, wheel wobble and shimmy. Over-steer and under-steer. Power and power assisted steering.

UNIT 3 [16]

BRAKING SYSTEM

Type of brakes, Principles of shoe brakes. Constructional details – materials, braking torque developed by leading and trailing shoes. Disc brake, drum brake theory, constructional details, advantages, Brake actuating systems. Factors affecting brake performance, Parking & Exhaust brakes, power & power assisted brakes, Antilock Breaking System (ABS).

SUSPENSION SYSTEM

Types of suspension, factors influencing ride comfort, types of suspension springs (leaf & coil springs), independent suspension (front and rear). Rubber, pneumatic, hydro-elastic suspension, Shock absorbers, types of wheels, construction of wheel assembly, types of tyres and constructional details, Static and rolling properties of pneumatic tyres, tubeless tyres and aspect ratio of tubed tyres

UNIT 4 [20]

WHEELS & TYRES

Types of wheel rims, Tread patterns, Types of tyres, Cross ply, Radial & tubeless tyres, Specifications of tyres

PERFORMANCE OF VEHICLE

Vehicle motion, Resistances during motion, Power required for acceleration and constant velocity motions, Tractive efforts and draw bar pull, Power required and engine characteristics, Gear ratio requirement, Motion on gradient

Text Books

1. Automobile Engineering by Kripal Singh, Standard Publishers Distributors Delhi
2. Automobile Engineering" by R.B. Gupta, Satya Parkashan, New Delhi

Reference Books

1. Automotive Engineering by James D Halderman, Pearson
2. Automobile Engineering Vol-I & II by Dr. K.M. Gupta
3. P.M.Heldt, "Automotive Chassis", Chilton Co., New York, 1982
4. Dr. N. K. Giri, "Automobile Mechanics", Seventh reprint, Khanna Publishers, Delhi, 2005

List of Experiments

1. To study about vehicle layouts
2. To study about different types of clutch
3. To study about the performance of vehicle
4. To study about the different types of gear boxes
5. To study about rear axle, final drive and differential
6. To study about Automatic Transmission system
7. To study about different types of tires and wheels.
8. To study of different types of automobile brakes.
9. To study of steering systems
10. To study about different types of suspension system

Subject: Cyber Security and Intellectual Property Rights								
Program: **B.Tech.**				Subject Code: CE0407			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
1	0	0	0		0		0	

UNIT-I [3]

Introduction:

Information Security Overview, Cyber security, Cyber security objectives and policies, Differences between Information Security & Cyber security, Cyber security Principles, Introduction of Cyber crime, Classifications of Cybercrimes.

UNIT-II [3]

Security Threats and vulnerabilities:

Overview of Security threats, Hacking Techniques, Password Cracking, Insecure Network connections, Malicious Code, Programming Bugs, Cyber crime and Cyber terrorism, Information Warfare and Surveillance. Application security (Database, E-mail and Internet).

UNIT-III [3]

Overview of Security Management:

Overview of Security Management , Security Policy , Security Procedures and Guidelines , Risk Management , Security Laws**, System Security** (Desktop, email,web), **I**ntrusion Detection Systems, Security Technology-Firewall and VPNs ,Backup Security Measures.

UNIT-IV [3]

Cyber law- Intellectual property right:

Introduction, Objectives of Intellectual property law, Types of IPR, Advantages of IPR, IPR in India, Offences and Penalties.

Text Books

1. "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole, Sunit Belapur, Wiley India Publications, April, 2011

Reference Books

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security ", Pearson Education India.
2. .K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill.
5. CHANDER, HARISH**,"** Cyber Laws And It Protection **"** , PHI Learning Private Limited ,Delhi ,India

5TH SEMESTER

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					
								THEORY			PRACT		
								CIE					TOTAL
			L	T	P			MID	IE	ESE	CIE	ESE	
1	AU0501	Heat Transfer	3	2	2	5	7	30	10	60	40	60	200
2	AU0502	Automobile Engines	4	0	2	5	6	30	10	60	40	60	200
3	AU0503	Two & Three Wheeler Technology	4	0	2	5	6	30	10	60	40	60	200
4	AU0504	Automobile Electrical Systems	3	0	2	4	5	30	10	60	40	60	200
5	AU0505	Vehicle Body Engineering	3	0	0	3	3	30	10	60	00	00	100
6	AU0506	Alternate Fuels & Pollution Control	3	0	2	4	5	30	10	60	40	60	200
7	SH0507	Technical Communication and Soft Skill	1	0	0	0	1	-	-	-	-	-	100
TOTAL			21	2	10	26	33	180	60	360	200	300	1200

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –V TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

Subject: **Heat Transfer**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0501			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	2	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To get the basic knowledge of heat transfer.
2. To understand the application of heat transfer in automobile.
3. To study designing of components for effective heat transfer, such as fins for cooling.

COURSE CONTENT

UNIT 1 [15]

PRINCIPLES OF HEAT TRANSFER
Modes of heat transfer, Fourier's law, Newton's law of cooling, thermal radiation, Electrical analogy concept of overall heat transfer coefficient

HEAT TRANSFER BY CONDUCTION
General heat conduction equation in Cartesian coordinates and its transformation to cylindrical One-dimensional steady-state heat conduction from plane wall, cylindrical wall and composite wall. Critical thickness of insulation for cylinder and sphere. Heat flow through plane wall with variable thermal conductivity, Critical thickness of Insulation. One dimensional steady state heat conduction with uniform heat generation through plane wall; hollow cylinder and solid cylinder. Heat transfer from extended surfaces. Efficiency and effectiveness in various configuration; Thermal diffusivity, unsteady state heat conduction with negligible internal resistance

UNIT 2 [14]

HEAT TRANSFER BY CONVECTION
Fundamentals of convection, Mechanism of forced convective heat transfer with laminar and turbulent boundary layer, Hydrodynamic boundary layer, Thermal boundary layer. Dimensional and analytical analysis of the process; significance of non dimensional numbers empirical and theoretical co-relations for flat plate, pipe and bank of tubes. Heat transfer by free convection.

Momentum and energy equations, Effect of surface configuration; mechanism of process and heat transfer correlations.

HEAT TRANSFER WITH CHANGE OF PHASE
Phenomenon of boiling, nucleation, regimes of boiling, phenomenon of condensation, film wise and drop wise condensation on vertical plate, heat pipe.

UNIT 3 [13]

HEAT TRANSFER BY RADIATION
Physical mechanism, Surface emission properties, surface irradiation properties, concept of black body, Kirchhoff's law of radiation, Intensity of radiation and it's relation, radiosity, Lambert`s cosine law, Stefan Boltzmann law, Planck`s distribution law, Wien's displacement law, Emissivity, real surface behavior, gray surface behaviors,

RADIATION EXCHANGE BETWEEN SURFACES
Introduction, Shape Factor, Radiation heat exchange between Non black bodies, Radiation heat exchange between gray bodies, electrical network method for radiant heat exchange between gray and black surfaces, Radiation shields.

UNIT 4 [12]

DESIGN OF HEAT EXCHANGERS
Classification of heat exchanger, Analysis including LMTD, Effectiveness, NTU, fouling mechanism, growth and design to minimize fouling. Small types of heat exchangers, Plate-Fin heat exchangers, construction and configuration, advantages and Disadvantages Heat transfer features, pressure drop, laminar and turbulent flow and thermal performances. Air cooled heat exchanger, construction, fin requirements, pressure drops and overall heat transfer coefficients. Design criteria for air cooled engine: heat transfer & fin design. Heat exchanger test including geometrical similarity, thermal balance and flow test, endurance test.

AUTOMOBILE COOLING SYSTEM
Radiator construction, Design parameters for radiator & water pump design, hoses, Thermostat Valve, Radiators Cap, Radiator fan, Radiator Fan shroud, Surge Tank. Design parameters and Synchronization of vehicular Engine cooling system for dissipation of heat generated in Engine. Cooling system trouble diagnosis.

Text Books

1. Heat and mass transfer by D.S. Kumar, S.K.Kataria & Sons
2. Heat and Mass Transfer by R.Yadav "Central Publishing House

Reference Books

1. Heat Transfer by Sukhatme
2. Heat transfer by Gield
3. Heat transfer by kreith,TMH
4. Heat and Mass Transfer by R.K. Rajput, S. Chand & Company Ltd., New Delhi.
5. Heat Transfer – A Practical approach by – Yunus Cengel, Tata McGraw Hill
6. Automobile Technology by N.K.Giri, Khanna Publication
7. Heat and Mass Transfer by P.K.Nag, Tata McGraw Hill

List of Experiments

1. To study the fundamentals of heat transfer
2. Thermal conductivity of insulating powder
3. Heat transfer co-efficient for composite wall
4. Temperature distribution and the effectiveness of the fin
5. Heat transfer co-efficient by natural convection
6. Heat transfer co-efficient in force convection
7. Determination of Stefan Boltzmann constant
8. Emissivity measurement
9. Study of heat exchangers
10. Study of boiling and condensation

Subject: **Automobile Engines**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0502			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	0	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. Develop an understanding on working of Automobile engines.
2. Develop in-depth knowledge on various systems in Automobile engines.
3. Develop analytical skills for investigating and analyzing the performance of the different types of engines.

Course content

UNIT 1 [17]

ENGINE COMPONENENTS & CYCLES
Classification of engine types (including construction of two stroke and four stroke engines), Engine parts/aggregates and their functions & operations. Phenomena of scavenging, Analysis of Engine Cycles, Analysis of fuel-air cycle and actual cycles

FUEL SUPPLY SYSTEM IN SI ENGINE
Fuel supply system layout, Fuel feed pump, Filters, Carburetion, Types of carburetors, Mixture requirements, Idling, Cold starting, Economy, Power and acceleration, Chokes petrol injection, Multi-point fuel injection.

FUEL SUPPLY SYSTEM IN CI ENGINE
Fuel injection pump, fuel feed pump, injectors, nozzles, cold starting devices (glow plugs), types of governors, Common Rail Diesel Injection (CRDI) System

UNIT 2 [19]

PROCESS OF COMBUSTION IN SI ENGINES
Combustion in premixed and diffusion flames - Combustion process in IC engines. Stages of combustion - Flame propagation - Flame velocity and area of flame front - Rate of pressure rise - Cycle to cycle variation – Abnormal combustion - Theories of detonation - Effect of engine

operating variables on combustion. Combustion chambers - types, factors controlling combustion chamber design

PROCESS OF COMBUSTION IN CI ENGINES

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

UNIT 3 [16]

IGNITION SYSTEM

Requirements of Ignition system, Types of Ignition Systems, Modern Ignition System (Transistorized Coil Ignition System, Capacitive Discharge Ignition System)

ENGINE COOLING SYSTEMS

Types of cooling systems (water & air cooling), Types of cooling fans, Water pump, Radiators, Thermostat, Coolant/anti freeze solution

LUBRICATION SYSTEM

Functions & types of lubrication systems and it's components including Engine Lubrication circuit, Types of Lubricating pumps, Oil coolers, Types of oils, Lubricant properties and additives for lubricants, Big end & small end bearings

UNIT 4 [20]

INTAKE AND EXHAUST SYSTEM

Exhaust/Intake systems, Types of air cleaners, Supercharger, Turbo charger, Silencers, Catalytic convertor, Emission norms, Exhaust gas emission constituents and analysis

ENGINE PERFORMANCE AND TESTING

Study of various performance parameters, Valve timing, Friction losses, Ignition timing, Compression ratio, Inlet temperature etc., Measurement of power, Fuel consumption, Air-fuel ratio, Efficiency, Heat balance sheet, Engine troubleshooting.

Text Books
1. Internal Combustion Engines by V. Ganesan, Tata McGraw-Hill Education
2. Internal Combustion Engines by Domkundwar, Dhanpat Rai Publication

Reference Books

1. Automotive Engines by James D Halderman, Pearson
2. Automotive Engines by S Srinivasan, Tata McGraw-Hill Education

List of Experiments

1. Engine components and Engine operating cycles.
2. Performance test on Two stroke, Single cylinder Petrol engine
3. Performance test on Four stroke, Single cylinder Diesel engine
4. Performance test on Four stroke, Three cylinder Petrol engine
5. Morse test on four stroke, Three cylinder petrol engine
6. Experimental study of smoke meter
7. Air Pollution from IC Engines
8. Ignition systems
9. Lubrication systems
10. Fuel injection systems use in S.I.Engine and C.I.Engine
11. Cooling systems
12. Pollution Control Norms & Testing

Subject: **Two & Three Wheeler Technology**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0503			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	0	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To make the students to know and understand the constructional details
2. Study about operating characteristics and vehicle design aspects of Two & Three Wheelers.

Course content

UNIT 1 [17]

INTRODUCTION
Development, Classification & layouts of two wheelers (motorcycles, scooters, mopeds) and Three wheelers, applications & capacity – goods & passengers, study of technical specification of Two & Three wheelers.

UNIT 2 [19]

POWER UNIT
Selection of engine for two wheeler & three wheeler, Design considerations for two wheeler & three wheeler power plants, special systems requirements for lubrication, cooling, starting. Recent engine developments

TRANSMISSION SYSTEMS
Clutch – special requirements, different types used in two & three wheelers, need of primary reduction, belt and chain drive, selection of transmission - gear transmission, gear shift mechanism, belt transmission, automatic transmission (Continuous Variable Transmission - CVT, Epicyclic), final drive & differential for three wheeler, wheel drive.

UNIT 3 [16]

STEERING & SUSPENSION

Steering geometry, steering column construction, steering system for three wheelers, Suspension requirements, design considerations, trailing & leading link, swinging arm, springs & shock absorbers, SNS for suspension Brake.

WHEEL & TIRES

Design consideration of brake, types of brakes – disc, drum, braking mechanism – mechanical, hydraulic & servo, wheel types - spokes, disc, split, special tyre requirements for two & three wheelers.

UNIT 4 [20]

FRAMES & BODY

Types of frame, construction, loads, design consideration, materials, Types of three wheeler bodies, layout, RTO regulations, aerodynamic, aesthetic & ergonomics considerations for body work, side car.

MAINTENANCE

Preventive & brake down maintenance, factors affecting fuel economy & emission.

Text Books

1. Newton Steed, "The Motor Vehicle", McGraw Hill Book Co. Ltd., New Delhi
2. Siegfried Herrmann, "The Motor Vehicle", Asia Publishing House, Bombay.
3. "Two stroke Motor Cycles", Staff & Motor Cycles, London llefe Books.
4. "Two and three wheelers" By Dhruv U Panchal. Pearson Publications.

Reference Books

1. G.B.S. Narang, "Automobile Engineering", 5th Edition, Khanna Publishers, Delhi.
2. Irving,P.E., Motor cycle Engineering, Temple Press Book, London, 1992.
3. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.

List of Experiments

1. Dismantling & assembling of a two wheeler engine
2. Study of motorcycle & scooter carburetors & petrol injection system.
3. Dismantling & assembling of two wheeler gear box

4. Study of I) Kick starter mechanism ii) Moped cranking mechanism iii) Button Start mechanism
5. Study of three wheeler drive line & chassis
6. Rear & front brake overhauling & adjustments
7. Study of handle bar controls & adjustments
8. Dismantling & assembling of flywheel magneto & setting ignition timing
9. Study of wiring diagram & electrical systems
10. Dismantling & assembling of the suspension system

Subject: **Automobile Electrical Systems**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0504			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. The course aims to impart basic skills and understanding of automotive electrical systems, equipments and their working details.

Course content:

UNIT 1 [15]

AUTOMOBILE ELECTRICAL SYSTEMS AND ELECTRONICS SYSTEM
Storage, Distribution systems & Generation of electric energy, Lighting system, 12 Volt & 24 Volt systems. Insulation and earth (negative and positive earthing) system, types of cables used, color codes, cable connectors, wiring, fuse system, circuit breakers, Relays, Switches. Layout and Wiring diagram for 2, 3 and 4 wheeler vehicles, Buses and Commercial vehicles.

BATTERY SYSTEM
Various Types of Automotive batteries. Principles, Construction & working of lead acid battery, dry battery & Alkaline battery. Designations & Rating of Batteries. Performance tests: Battery Capacity, Efficiency, Gravimetric test and efficiency. Battery failures. Recharging: Electronic circuits, battery charging current, charging

UNIT 2 [14]

STARTING SYSTEM
Principle, Starting torque, engine resistance torque, and power required for starting of engine. Starter motor and its circuit. Types of drive mechanisms: bendix drive, pinion type, axial sliding armature starter. Slipping and overrunning of clutches, automatic switches for starting, cold starting devices: Glow plug & choke.

CHARGING SYSTEM

Need. Charging circuit, Types of charging system: D.C. dynamo, AC dynamo, flywheel magneto charging system and Alternator (more emphasis on Alternators). Charging system controlling & regulator system: Relay/cut-out, voltage and current regulator, compensated voltage and current regulator, electronic regulator, regulator characteristics. Drive for Charging system

UNIT 3   [13]

IGNITION SYSTEM

Requirements. Types of Ignition systems: Ballast Resistance, Ignition coil characteristics, Cam angle & contact angle gap, spark advance mechanism, spark plug, ignition timing, multi-cylinder distributor, Distributor (contact breaker ignition system), limitations of coil ignition system, electronic ignition systems. Voltage and current required for Spark. Spark Plug, characteristics, material, types, plug fouling.

LIGHTING SYSTEM

Lighting system of vehicle, head lamp, tail lamp, brake lamp, parking lamp etc, other types of lamps used. Reflector purpose and design, head lamp angle and position, fog lamp, side indicator lamp, warning lights and flashers, instrument panel lights, body interior lights. Safety indicator lights. Engine compartment & Rear boot lamps.

UNIT 4   [12]

HORNS

AC & DC horns, wind tone horn/air horns, electronic horn, reverse horn. Horn relay. Warning Buzzer. Sensors - Instrument Cluster panel, fuel gauges, oil temperature gauge, warning light sensors, coolant temperature gauge, speedometer, Odometer, tachometer, trip meter, oil level indicator, parking brake indictor, direction indicators.

ELECTRICAL EQUIPMENTS & ACCESSORIES

Windscreen wipers, windscreen washers, power windows, doors locks, Rear wind shield glass heating system. Rear view mirror Adjusting, Day light regulating system. Central Locking system. Convertible Mechanism

Text Books
1. Automobile Electrical and Electronics, by A. L. Statini, Delmar Publications
2. Automotive Electrical Equipments, by P. L. Kohli, Tata McGraw Hill Pub. Co. Ltd

Reference Books

1. Automobile Electrical & Electronic Equipments, by Young, Griffithe, The English Language Book Co., London.
2. Automotive mechanics by W. Crouse, TMH

List of Experiments

1. Characterization of Alternator and its Testing.
2. Characterization of Battery, Regulators & its testing.
3. Characterization of Starter Motor and its testing.
4. Characterization of Dynamo and its Testing.
5. To study about ignition systems.
6. To study about Multi Point Fuel Injection System.
7. To study about Sensors and actuators.
8. To study about Electrical Equipments & Accessories

Subject: **Vehicle Body Engineering**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0505			Semester: **V**	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)- Theory	Continuous Internal Evaluation (CIE)- Practical	Total
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To expose the fundamentals in various automotive body construction techniques.
2. To integrate the concepts of aerodynamics in body engineering for better style and low drag.

Course content

UNIT 1 [15]

VEHICLE AERODYNAMICS
Objectives ,Vehicle drag and types ,various types of forces and moments ,effects of forces and moments ,side wind, various body optimization techniques and Aerodynamic Aids for Optimization of drag ,wind tunnel testing of scale model, component balance to measure forces and moments. Case Study of all relevant point of views(Aerodynamics and body engineering)

UNIT 2 [14]

CAR BODY DETAILS
Types of car bodies Constructional details of a passenger car. Visibility: Regulation, Driver's visibility, Seat design, Methods of improving visibility. Safety: Safety aspects in design. Painting process of a passenger car body.

BUS BODY DETAILS
Classification of bus bodies – Based on distance traveled, Based on capacity of the bus and based on style & shape. Types of metal section used in the construction and regulations. Construction of conventional and integral type buses& comparison.

UNIT 3 [13]

COMMERCIAL VEHICLE DETAILS
Classification of commercial vehicle bodies. Construction of Tanker body and Tipper body. Dimensions of driver seat in relation to controls. Driver cabin design for compactness.

COMMERCIAL VEHICLE AERODYNAMICS

Effects of rounding sharp front body edges. Effects of various cabs on trailer body. Fore body pressure distribution. Effects of a cab to trailer body roof height. Commercial vehicles drag reduction devices.

UNIT 4 [12]

BODY MATERIALS

Metal sheets (Steel, Aluminum etc.), plastics, timber, GRP, FRP, Insulating materials, adhesives and sealants. Wind screen, Back light & window Glasses and regulations for glasses. Difference between toughened glass, sheet glass & laminated glass. Composite materials, properties of materials, corrosion, anti-corrosion methods, selection of paint and painting process, body trim items, body mechanisms.

BODY LOADS

Idealized structure, structural surface, shear panel method, symmetric and asymmetric vertical loads in a car, longitudinal load, different loading situations, chassis frame design, Construction of Doors, door apertures, windows. Spare wheel carrier construction and design for different types of vehicle and weight distribution criteria in relation to Spare wheel location. Sources of body noises testing and methods of elimination. Water leakage test.

Text books

1. Heinz Heisler, "Advanced Vehicle Technology", 2nd edition, Butterworth –Heinemann, 2002.
2. Wolf-Heinrich Hucho, "Aerodynamics of road vehicles", 4th edition, 2000.

Reference Books

1. John Fenton, "Vehicle Body layout and analysis", Mechanical Engineering Publication Ltd., 1984

Subject: **Automobile Fuels & Pollution Control**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0506			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. This course will provide knowledge about reasons for automobile pollutants and means to reduce them and provide opportunity to develop skills in measuring pollutions and maintain Emission control devices.

Course content

UNIT 1 [15]

INTRODUCTION
Working process of I.C. Engine. Study of various parameters related to properties of different types of fuel (Rating of fuel, Ignition quality, volatility, calculations of Air / Fuel ratio, Calorific Value) as input and output in terms of results (Fuel efficiency, Fuel requirement, Engine efficiency and Engine life). Sources of fossil fuel, scope of availability of fossil fuel in future

NEED FOR ALTERNATIVE FUELS AND POLLUTION CONTROL
Effects of constituents of Exhaust gas emission on environmental condition of earth (N_2 , CO_2, CO, NOx, SO_2, O_2) Pollution created by Exhaust gas emission in atmosphere. Green house effect, Factors affecting green house effect. Study of Global Carbon Budget, Carbon foot print and Carbon credit calculations. Emission norms as per Bharat Standard up to BS – IV and procedures for confirmation on production, various techniques and methods for pollution control:- Thermal Converters, Catalytic Converters, Chemical Methods, Ceramic Engine coatings, Evaporative emission Control; future sources of energy other than alternate fuels

UNIT 2 [14]

ALCOHOL
Sources of Methanol and Ethanol, methods of it's production. Properties of methanol & ethanol as engine fuels, Use of alcohols in S.I. and C.I. engines, performance of blending methanol with gasoline.Emulsification of alcohol and diesel.Dual fuel systems. Improvement / Change in emission characteristics with respect to % blending of Alcohol.

BIO DIESEL

Base materials used for production of Bio Diesel (Karanji oil, Neem oil, Sunflower oil, Soya bean oil, Mustard oil, Palm oil, Jatropha seeds). Process of separation of Bio Diesel. Properties Diesel blended with vegetable oil, and difference in performance of Engine.

UNIT 3 [13]

HYDROGEN

Hydrogen as a substitute fuel. Study Properties, Sources and methods of Production of Hydrogen, Storage and Transportation of hydrogen. Also, the economics of Application and Advantages of hydrogen (Liquid hydrogen) as fuel for IC engine/ hydrogen car. Layout of hydrogen car

FUEL CELLS

Concept of fuel cells based on usage of Hydrogen and Methanol. Power rating, and performance. Heat dissipation, Layout of fuel cell vehicle.

BIOGAS

Introduction to Biogas system, Process during gas formation, Factors affecting biogas formation. Usage of Biogas in SI engine & CI engine.

LPG &CNG

Properties of LPG & CNG as engine fuels, fuel metering systems, combustion characteristics, effect on performance, emission, cost and safety.

UNIT 4 [12]

SOLAR POWER

Solar cells for energy collection. Storage batteries, layout of solar powered automobiles. Advantages and limitations.

ELECTRIC & HYBRID VEHICLES

Layout of an electric vehicles, advantages & limitations. Systems components, electronic controlled systems, high energy and power density batteries. Types of hybrid vehicles.

VEGETABLE OILS

Various Vegetable oils for Engines – Esterification – Performance and emission characteristics

SYNTHETIC ALTERNATIVE FUELS

Di-Methyl Ether (DME), P-Series, Eco Friendly Plastic fuels (EPF)

Text Books

1. Pundir.B.P, "Engine Emissions", Narosa Publishing House, 2007.
2. Ganesan.V, Internal Combustion Engines, Tata McGraw Hill Co., 2004.
3. Ramalingam.K.K, "Automobile Engineering", Scitech Publications Pvt. Ltd., 2005

Reference Books

1. Amitosh De, "Automobile Engineering", Galgotia Publications Pvt. Ltd., 2004
2. Dr.Giri.N.K, "Automobile Mchanics", Khanna Publishers, 2006
3. Heywood. J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co.,1995.
4. Automobiles and Pollution SAE Transaction, 1995.

List of Experiments

1. Study of physical & chemical properties of fuels
2. Study of use of alternate liquid fuels for S.I. engines
3. Study of use of alternate liquid fuels for C.I. engines
4. Study of fuel cell powered vehicle
5. Study of use of alternate gaseous fuels for S.I. engines
6. Study of use of alternate gaseous fuels for C.I. engines
7. Study of solar powered vehicle.
8. Study of battery operated vehicles.
9. Layout preparation for Hybrid vehicles

Subject: **Technical Communication and Soft Skills**								
Program: **B.Tech. All Branches**				Subject Code: **SHO507**			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
1	0	0	0	60	0	40	0	100

Course Objectives:

- To enable students to interact with a degree of fluency and spontaneity that makes regular interaction with fluent English speakers quite possible without strain for either party.
- To understand with ease virtually everything heard or read.
- To express themselves spontaneously, very fluently and precisely, differentiating finer shades of meaning even in the most complex situations.
- To understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment).
- To communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters
- To understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in their field of specialization.

Course Content:

	Sr. No.	**Content**
Listening	1	**Listening: Cloze test**
	2	**Listening to Talks (BBC, TED) 1**
	3	**Listening to Talks 2**

Speaking	**4**	**Phonetics: Sounds & Symbols & Accent Patterns**	
	5	**Vocabulary Games: Intermediate Level**	
	6	**Vocabulary Games: Intermediate Level**	
	7	**Building Dialogues: Situational Conversation**	
	8	**Role Play**	
	9	**Group Discussion**	

Reading	**10**	**How to Read effectively**
	11	**Reading to Remember : SQ3R**

Writing	**12**	**Grammar Intermediate: Sentence Transformation**
	13	**Common Errors in English**
	14	**Précis Writing**
	15	**Effective Paragraph Writing**

6TH SEMESTER

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –VI TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE		ESE	CIE	ESE	
			L	T	P			MID	IE				
1	AU0601	Off Road Vehicles	3	0	0	3	3	30	10	60	00	00	100
2	AU0602	Automobile Component Design	3	2	2	5	7	30	10	60	40	60	200
3	AU0603	Automotive Hydraulics & Pneumatics Systems	3	2	2	5	7	30	10	60	40	60	200
4	AU0604	Vehicle Fault Diagnosis & Testing	3	0	4	5	7	30	10	60	40	60	200
5	AU0605	Automotive Safety, Ergonomics & Auxiliary systems (DE-I)	3	0	2	4	5	30	10	60	00	00	100
6	AU0615	Tires and Alignment Basics – MOOC (DE-I)	-			4	Offered by www.class-central.com						
7	AU0606	Automotive and Combustion Engine Technology (DE-II)	3	0	0	3	3	30	10	60	-	-	100
	AU0607	Automobile Materials (DE-II)											
	AU0608	Industrial Engineering (DE-II)											
	AU0609	Automotive Infotronics & Autotronics (DE-II)											
	AU0611	Vehicle Performance & Testing (DE-II)											
	AU0612	Automotive Quantitative Techniques (DE-II)											
	AU0613	Automobile Air Conditioning (DE-II)											
8	SH0607	Advanced Technical Communication and Soft Skill	1	-	-	-	1	-	-	-	-	-	100
TOTAL			19	4	10	29	33	180	60	360	120	180	1000

Subject: Off Road Vehicles								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0601			Semester: **VI**	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Classification and requirements of off road vehicles
2. Different types of equipment.
3. Tractors, Earth moving machines, Scrapers and graders, Shovels and Ditchers.
4. Classification and requirements of off road vehicles

Course content

UNIT 1 [15]

INTRODUCTION TO OFF ROAD VEHICLES
Land clearing machines Earth moving machines Scrapers and graders Shovels and ditchers' Power plants, chassis and transmission, multiaxle vehicles.

STUDY OF WORKING PRINCIPLES & DESIGN CONSIDERATIONS
Power system, transmission, final drive, lubrication, electrical, braking, steering, pneumatic & hydraulic control circuits.

UNIT 2 [14]

CONSTRUCTIONAL WORKING FEATURES AND INSTRUMENTATION
Transport equipment: Powered equipment, Tractors and Trollies, Trailers, Platform lift trucks, Fork lift trucks, containers and Supports. Hauling equipment: Types of dump trucks, On-high way vehicles, off high way vehicles. Hoisting equipment: Jacks, truck mounted crane, Crawler crane, Outriggers.

UNIT 3 [13]

TRACTORS

Tractors and tractors units; Tractors in earth moving ,applications of tractors, Rating of Tractors, Wheeled and Crawler tractor, Recent trends in tractor design, power shift transmission and final drive in caterpillar tractor. Motor grader, recent trends, control mechanism of a caterpillar motor grader.

EARTH MOVING MACHINES

Bulldozers, cable and hydraulic dozers. Crawler track, running and steering gears, scrapers, drag and self-Powered types - dump trucks and dumpers - loaders, single bucket, multi bucket and rotary types - power and Capacity of earth moving machines.

UNIT 4 [12]

SCARPER AND GRADERS

Scrapers, elevating graders, self-powered scrapers and graders. Shovels and Ditchers: Power shovel, revolving and stripper shovels - drag lines - ditchers - capacity of shovels. Land clearing machines: Bush cutter, stampers, tree dozer, rippers.

SHOVELS AND DITCHERS

Power shovel, revolving and stripper shovels - drag lines - ditchers - Capacity of shovels.

SPECIAL PURPOSE VEHICLES

All terrain vehicles, Defence Vehicles, Special Purpose Electric Vehicles, Solar Vehicles and Hybrid Vehicles. Types, architecture and parameters of design considerations.

Text book

1. Abrosimov. K. Bran Berg. A. and Katayer. K., "Road making Machinery", MIR Publishers, Moscow, 1971.

Reference Books

1. Wang. J. T., "Theory of Grand vehicles", John Wiley & Sons, New York, 1987.
2. Mahesh Varma, "Construction Equipment and its Planning and Applications, Metropolitan Books Co., Delhi, 2004.
3. "Off the Road Wheeled and Combined Traction Devices - Ashgate Publishing Co. Ltd. 1998
4. Peurifoy. R. L, Construction Planning Equipment and Methods, McGraw Hill Publishers, 1956.

Subject: : Automobile Component Design								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0602			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To make student get acquainted with to standardize the automobile part after designing the component like gear, gear box, piston, connecting rod, piston pin, crank shaft, valve mechanism, Cylinder liner, flywheel etc and to select the required bearing for same by considering the different design considerations.

Course content

UNIT 1 [15]

DESIGN CONSIDERATIONS
Manufacturing and assembly considerations. Design of components for casting, welding, forging, hot & cold working, machining etc. Design for creep (thermal considerations). Wear considerations in design.

DESIGN OF BEARINGS
Rolling Contact Bearing: Types of rolling contact bearings, static and dynamic load capacities, Equivalent bearing load, load life relationship, Bearing life, Load factor, Selection of bearings from manufacturer's catalogue. Lubrication and mountings/dismounting of bearings, Oil seals and packing

UNIT 2 [14]

DESIGN CONSIDERATION OF GEARS, MATERIAL SELECTION AND GEAR LUBRICATION
Spur Gears:
Force analysis, Number of teeth, Face width & Beam strength of gear tooth .Dynamic tooth load. Effective load on gear tooth. Estimation of module based on beam strength. Wear strength of gear tooth. Estimation of module based on wears strength. Spur gear design for maximum power transmission.

Helical Gears:

Virtual number of teeth, Tooth proportions, Force analysis, Beam strength& Wear strength of helical gears, Effective load on gear tooth, Design of helical Gears.

Bevel Gears:

Terminology of bevel gears, Force analysis, Beam strength of bevel gears, Wear strength of bevel gear, Effective load on gear tooth, Design of bevel gear.

UNIT 3 [13]

WORM GEARS

Force analysis, Friction in worm gear, Vector method, Strength rating of worm gears, Wear rating of worm gear.

DESIGN OF GEARBOX
Design considerations of gearbox, selection of proper gear ratios for an Automobile gearbox, Speed Chart Construction, Ray Diagram construction, Gear ratio selection, Arithmetic Progression, Geometrical Progression for gear ratio selection.

UNIT 4 [12]

DESIGN OF I.C. ENGINE COMPONENTS
PART-I
Engine power requirements, Selection of engine type, Stroke & Bore, compression ratio, clearance volume and swept volume, mean piston speeds.
Design of Piston & Piston pin: Materials used, design of piston crown, pin Dimensions. Connecting Rod - Forces, material, types, design Criteria, dimensions etc, Design of cylinder head: Stresses, materials, Combustion chamber design

PART-II

Design of I.C. Engine Components-II

Design of Crankshaft. Cylinder block dimension, Types of liner – Dry & Wet type liners. Valve mechanism Design: Valve, rocker arm, Valve spring design, Push Rod, cam shaft and cam follower etc. Design Consideration for Exhaust System of I.C.Engine.

Text Books

1. Design of machine element By V.B.Bhandari,Tata Macgraw Hill

2. Design of Machine Element By J.S.Soni ,Nirav & Roopal Prakashan
3. Mechanical System Design By S.P.Patil, Jaico Publication

Reference Books

1. Joseph E. Shigley & Larry D. Mitchell, "Mechanical Engineering Design", Fourth Edition, McGraw-Hill International Book Company
2. Machine Design by R.S.Khurmi & J.K.Gupta, S.Chand & Co.
3. Mechanical System Design By S.P.Patil,Jaico publication
4. Auto Design By R.B.Gupta,Satya Prakashan,New Delhi
5. Machine Design By Abdul Mubeen By Khanna Publisher
6. Design Data book for Engineers By PSG,Coimbtore

List of Practicals

1. Design Considerations for Automotive Components
2. Design of Rolling contact Bearings
3. Study and Design of Spur Gear
4. Study and Design of Helical Gear
5. Study and Design of Bevel Gear
6. Study and Design of Worm & Worm Gear
7. Design of Commercial Gearbox
8. Design of I.C. Engine Components
   i. Design of Cylinder
   ii. Design of Piston
   iii. Connecting rod
   iv. Crankshaft
9. Design of Valve operating Mechanism used in I.C.Engine
10. Design Of Intake & Exhaust Manifold in I.C.Engine.

Subject: Automotive Hydraulics & Pneumatics Systems								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0603			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. Develop an understanding on working of Automobile System.
2. Develop in-depth knowledge on various systems in Automobile System.
3. Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro-hydraulics, electro-pneumatics for a given application. Develop a circuit diagram.
4. Visualize how the hydraulic/pneumatic circuit will work to accomplish the function.

Course content

UNIT 1 [15]

INTRODUCTION TO FLUID POWER
Classification, application of various fluids in engineering, various Symbols used in hydraulic and pneumatic (ISO/JIC), transmission of power at static and dynamic states. Types of hydraulic fluids and their properties, effect of temperature on fluids.

HYDRAULIC SYSTEM ELEMENTS: CONTROL OF FLUID POWER ELEMENTS
Requirement of pressure control, direction control, flow control valves. Principles of pressure control valves, direction control valves, and pilot operated relief valve, pressure reducing valve, quick exhaust valve, sequence valves. Types of direction control valves – two way two position, four way two position, four way three position, open center, close center, tandem center, manual operated, solenoid, pilot operated direction control valves, check valves. Flow control valves: principle and their types, meter-in and meter-out circuit and flow through circuit. Actuators – linear and rotary, hydraulic motors, types of hydraulic cylinders and their mountings. Calculation of piston velocity, thrust under static and dynamic operation & Application, consideration of friction and inertia loads.

UNIT 2 [14]

TYPICAL AUTOMOTIVE APPLICATIONS

Hydraulic tipping mechanism, power steering, fork lift hydraulic gear, hydro-pneumatic suspension (Air suspension), Clutch actuating System, Brakes – Hydraulic AND Pneumatic.

PNEUMATIC SYSTEMS

Application of pneumatics, physical principles, basic requirement of pneumatic system.Comparison with hydraulic systems. Elements of Pneumatics, Air compressors, Pneumatic control valves, Pneumatic actuators – types and the mountings, Air motors – types

MAINTENANCE AND TROUBLE SHOOTING OF HYDRAULIC & PNEUMATIC CIRCUITS

Maintenance Schedule, Trouble – Possible causes & Remedies

UNIT 3 [13]

HYDRAULIC CIRCUIT AND WORKING

Basic hydraulic circuit, impulse operation, speed control, Hydraulic motor circuit, sequencing of motion, time delay circuits and their applications, and other hydraulic circuits.

UNIT 4 [12]

PNEUMATIC CIRCUITS AND WORKING

Basic pneumatic circuit, impulse operation, speed control, pneumatic motor circuit, sequencing of motion, time delay circuits and their applications, and other pneumatic circuits.

Text Books

1. Fluid Power with applications – A. Esposito- PHI
2. Hydraulic and Pneumatic Controls – R Srinivasan – Tata McGraw Hill

Reference Books

1. Hydraulic & pneumatics- Andrew Parr-Jaico Publishing House.
2. Basic fluid power- by D.A. Pease-PHI
3. Hydraulic and Pneumatic Controls: Understanding made Easy, K.Shanmuga Sundaram, S.Chand & Co Book publishers, New Delhi
4. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar, McGraw-Hill

List of Experiments

1. Symbols used in hydraulics and pneumatics
2. To and fro motion of the double acting cylinder.
3   Three different speed of piston in one stroke.
4. Sequential operation of the two linear actuators using sequence valve
5. Determine effect of Bleed Off and Regenerative Circuit on the movement of actuator.
6. Speed control of the linear actuator with Meter In and Meter out Circuits.
7. To and fro motion of the double acting cylinder for Pneumatics.
8. AND operation using twin pressure valve and to study OR operation with shuttle Valve.
9. Pneumatic circuit using flow control valve and time delay valve.
10. Cascading of two cylinder and three cylinders

Subject: **Vehicle Fault Diagnosis & Testing**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0604			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	4	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To have a complete understanding and hands-on experience of the vehicle maintenance procedures
2. Students should acquire skills in handling situations where the vehicle is likely to fail.

Course content

UNIT 1   [15]

VEHICULAR MAINTENANCE PRACTICES IMPORTANCE & TYPES OF MAINTENANCE SCHEDULES
(Daily, weekly and monthly), Scheduled Maintenance Charts, Breakdown, Preventive, Predictive maintenance practices.

SERVICE STATION OPERATIONS
Service station**,** functions and operations, activities, depot and workshop layouts. Study of Workshop documents & records (job cards, bill, satisfaction voucher, history sheet, manufacturer's service coupon book, warranty policy etc.) Study of Workshop Manual, Parts Catalogue and Parts price list. Billing procedure. Customer complaint Handling & consumer cases in case of any dispute.

TOOLS & EQUIPMENTS VARIOUS TOOLS AND EQUIPMENT
Garage measuring instruments and testing, calibration, repair equipments: their function, usage and testing procedures.

UNIT 2   [14]

ENGINE MAINTENANCE
Repairs & Overhauling Cylinder Block bore – measurement, Cylinder boring & honing, Cylinder liners fitting, Cylinder head - facing, valve seat lapping, Study Valve timing & Fuel injection pump timing procedure and timing gear train. Rocker arm gap adjustment / setting procedure, engine tune up.

MAINTENANCE OF FUEL SYSTEMS
Cooling Systems & Lubrication System Petrol Engine - Carburetor- tuning and setting of MPFI engines, Diesel engine - Fuel injection pumps and fuel injector's calibration, Cleaning of water cooling system, water pump & radiator maintenance, maintenance of lubricating system

UNIT 3 [13]

CHASSIS MAINTENANCE REPAIRING OF GEAR BOX AND SHIFTING MECHANISM
Final drive and differential maintenance, differential back lash adjustment, Wheels and tire maintenance, re-treading of tyres, wheel balancing, Steering system linkages, Wheel alignment: toe in, toe out, caster and camber. Hydraulic brakes circuit- brake adjustment, bleeding of brakes, Study of Air Brakes circuit & system components, Chassis greasing, wheel bearing greasing, Bearing Preload adjustment, Suspension system – lubrication, Adjustment of clutch pedal free play, repair/replacement of clutch parts, Repair & maintenance of Propeller shaft "U" joints and Centre bearing

UNIT 4 [12]

ELECTRICAL SYSTEM MAINTENANCE - SERVICING & REPAIR
Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

MISCELLANEOUS SYSTEMS
Servicing & Repair Air Conditioning Systems, Body repairing and denting

Text Books

1. Vehicle Maintenance & Garage Practices by Doshi, Panchal & Maniar, PHI India
2. Automotive mechanics by Crouse, TMH

Reference Books

1. Fleet Management, John Doke, McGraw-Hill Co., 1984
2. Advanced Engine Performance Diagnosis, James D Halderman, PHI, 1998
3. Automobile Systems, Anil Chikara
4. Automechanics, Joseph Heitner, East West Press
5. Advance Vehicle Technology, Heinz Heisler, Butterworth Heinemann Publication
6. Advance Automotive Fault Diagnosis, Tom Denton, Butterworth Heinemann Publication
7. Automotive Technology, Service & Maintenance, Don Knowles, Cengage Learning

List of Experiments

1. Study of modern workshop layout
2. Study of different types of job cards & maintenance schedule chart.
3. Study of measuring, gauging & service equipments
4. Demonstration on tire inflator and hydraulic hoist.
5. Demonstration on tire changer and car washer unit.
6. Performance on wheel balancer.
7. Performance on wheel aligner.
8. Cleaning and testing of petrol injector
9. Cleaning and testing of different types of nozzles.
10. Bleeding of hydraulic brakes
11. Performing the tappet clearance and use of feeler gauge.
12. Study of different workshop documents & records

Subject: **Automobile Safety, Ergonomics and Auxiliary Systems (DE-I)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0605			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To provide an understanding to the automotive safety and comfort systems and its future prospects.

Course content

UNIT 1 [15]

DESIGN OF AUTOMOTIVE BODY AND SAFETY
Introduction to automotive safety systems - Design of the body for safety – engine location - concept of crumble zone - safety sandwich construction – deformation behavior of vehicle body - speed and acceleration characteristics of passenger compartment on impact.

UNIT 2 [14]

SAFETY SYSTEMS
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT 3 [13]

CRASH WORTHINESS
Definition – Requirements – Tests – component, sled and full-scale barrier impacts-Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety

COLLISION WARNING AND AVOIDANCE
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.
COMFORT SYSTEMS
NVH (noise, vibration and harshness) of chassis, engines and power train, ride quality and sound quality; heating, ventilation and air conditioning systems. Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

Text books

1. Vivek D. "Ergonomics in the Automotive Design Process" Bhise publisher CRC press, Taylor and Francis group.

Reference Books

1. Ronald K Jurgen, "Automotive Electronics Handbook" - Second edition- McGraw-Hill Inc., - 1999.
2. Bosch, "Automotive Handbook", 5th edition - SAE Publication - 2000.
3. Jullian Happian, "Smith An Introduction to Modern Vehicle Design", SAE, 2002.
4. Johnson W and Mamalis A.G, "Crashworthiness of Vehicles", MEP, London.
5. Richard Bishop, "Intelligent Vehicle Technology and Trends" – 2005.
6. George A. Peters, Barbara J. Peters, "Automotive Vehicle Safety" – 2002.

List Of Experiments

1. Study of safety parameters in passenger vehicle.
2. Study of behavior of vehicle body during different operating conditions.
3. Design and safety analysis of roll cage for off-road car.
4. Design and safety analysis of roll cage for Formula Car.
5. Ergonomics study of a car.
6. Ergonomics study of commercial vehicle.
7. Study of various advanced system designed developed to avoid collision.
8. Study of noise level of different vehicles.
9. Study of various crash tests to be carried out on a vehicle.
10. Case study on different vehicle models and comparison in terms of safety and ergonomics.

Subject: **Automotive and Combustion Engine Technology (DE-II)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0606			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To describe basic concepts of combustion process in diesel engine.
2. To describe basic concepts of combustion process in spark ignition engine.
3. To describe basic concepts of combustion process in HCCI engine.
4. To describe basic concepts of combustion process in GDI engine.

Course content

UNIT 1   [15]

OVERVIEW OF GASOLINE DIRECT INJECTION ENGINES
Introduction, overview of direct injection gasoline engines, potential and technologies for high efficiency direct injection gasoline engine, high pressure fuel injection system, exhaust emissions and after treatment devices

UNIT 2   [14]

STRATIFIED CHARGE COMBUSTION IN DIRECT INJECTION GASOLINE ENGINES
Introduction, thermodynamics and combustion process, production engines with stratified gasoline direct injection

UNIT 3   [13]

TURBOCHARGED DIRECT INJECTION SPARK IGNITION ENGINE
Introduction, historical background: turbocharging for high specific output, problems and challenges associated with turbocharging spark ignition engines, advantages of combining direct injection and turbocharging in spark ignition engines, challenges of applying direct injection to a turbocharged spark ignition engine

UNIT 4 [12]

DIRECT INJECTION GASOLINE ENGINES WITH AUTO IGNITION COMBUSTION
Introduction, principle of auto ignition combustion in the gasoline engines, approaches to auto ignition combustion operation in gasoline engines, operation and control of direct injection gasoline engines with auto ignition combustion.

HOMOGENOUS CHARGE COMPRESSION IGNITION (HCCI) ENGINES
Introduction, HCCI combustion fundamentals, Gasoline HCCI engine, Diesel HCCI combustion engines, operational limits and emissions.

Text Books

1. Advanced Direct Injection Combustion Engine Technologies and Development Vol.1, H Zhao,Elsevier.
2. HCCI and CAI engines for the automotive industry, , H Zhao,Elsevier.

Reference Books

1. Internal combustion engine ,V Ganesan, Tata McGraw-Hill Education, 2002

Subject: **Automobile Materials (DE-II)**			
Program: **B.Tech. Automobile Engineering**	Subject Code: AU0607		Semester: **VI**

Teaching Scheme				Examination Evaluation Scheme				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To develop the knowledge of Automotive engineering materials and Selection
2. To develop the knowledge of materials and their applications in automotive
3. Applications.
4. To introduce the concepts of heat treatment and surface modification techniques
5. To introduce knowledge in advanced metallic and non metallic materials

Course content

UNIT 1   [15]

REVIEW OF MECHANICAL AND CHEMICAL BEHAVIOR OF MATERIALS
Structure of crystalline solids, imperfections in solids, Plastic deformation Strengthening mechanisms Griffith's theory of failure modes – Damping properties of materials fracture toughness Initiation and propagation of fatigue cracks Creep mechanisms environmentally induced degradation and preventive solutions

ENGINEERING ALLOYS
Cast iron, steels, alloy steels - significance of iron – iron carbide equilibrium diagram in design steels and cast irons, stainless steels –, types, specific applications, heat treatment, effect of alloying elements Aluminum, Magnesium and Ti wrought and cast alloys used in automotive applications –Types, specifications, heat treatment

UNIT 2   [14]

AUTOMOTIVE COMPONENTS & MATERIAL SELECTION
Organized process of Selection of Materials for different components. Materials for Power train components like cylinder block ,head& liner, piston &piston rings, gudgeon pin, connecting rod,

bearings, crankshaft, flywheel, camshaft, valves, valves seats, springs, gear train, chain &belt drives. Materials for Automobile components like body –in –white, crash worthiness, suspension systems, cabin interiors. Functional requirements, manufacturing processes & failure modes for each.

NON METALLIC MATERIALS

Elastomers and Engineering Plastics, FRP Composite materials, ceramics, laminated &heat treated glass, adhesive bonding, An over view of Manufacturing processing, their characteristics features, types and applications

UNIT 3 [13]

SURFACE MODIFICATION OF MATERIALS

Mechanical surface treatment and coating ‑ Case hardening and hard facing ‑ thermal spraying – vapour deposition ‑ iron implantation ‑ Diffusion coating ‑ Electroplating and Electro ‑ less ‑ Conversion coating ‑ Ceramic and organic coatings – laser based surface modification Diamond coating.

INTRODUCTION TO COMPOSITE MATERIALS

Definitions: Composite material, Fiber, Matrix. Types of fibers and Raw Fiber Properties, Types of Matrix, Prepegs, Fillers and other Additives

UNIT 4 [12]

MODERN MATERIALS AND ALLOYS

Light weight materials & implications on vehicle design,, Micro alloyed, high strength low alloy steel – High strength Steels (HSS), Advanced High Strength Steels (AHSS), Ultra high strength Steels (UHSS), developments in Aluminum and Magnesium alloys, Advanced forming & joining processes like - Hydro forming, Warm forming, Laser welding techniques, Induction heating, etc; carbon fiber composites, Natural fibers, refractory metals, SMART Materials - shape memory alloys (SMA), Piezo-electric materials, MEMS, Metallic glass ‑ Quasi crystal and Nano crystalline materials, metal foams.

BASICS OF COMPOSITES

Mechanical Behavior of Composite Materials. Lamina, Laminate: The basic building block of a composite material

Text Books

1. Callister W.D. (2006) "Material Science and Engineering- An introduction", Wiley – Eastern
   can be indicated as a text book.
2. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited, 9th Edition 2009, can be included as a text book
3. Mechanics of Composite Materials and Structures-Madhujit Mukhopadhyay, Universities Press

Reference Books

1. Hiroshi Yamagata "The Science and Technology of Materials in Automotive Engines"
2. Thomas H. Courtney, (2000) "Mechanical Behavior of Materials", McGraw Hill.
3. Flinn R. A. and Trojan P. K., (1999)"Engineering Materials and their Applications", Jaico.
4. KENNETH BUDINSKI – (1988) "Surface Engineering for wear resistance", Prentice Hall.
5. Avner S.H., (2006) "Introduction to physical metallurgy" –Tata McGraw Hill.

Subject: **Industrial Engineering (DE-II)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0608			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Students learn to design and conduct experiments, as well as to analyze and interpret data
2. Students learn to function on multidisciplinary teams
3. Students learn to identify, formulate, and solve engineering problems

Course content

UNIT 1   [15]

LOCATION SELECTION
Nature of Location Decision, Importance of Plant Location, Dynamic Nature of Plant Location, Choice of site for selection, State regulations on location, Government policies on decentralization. Industrial Estates, Economic Survey of Site selection, SEZ, Comparison of location

PLANT LAYOUT
Principles of Plant layout and Types, factors affecting layout, methods, factors governing flow pattern, travel chart, analytical tools of plant layout, layout of manufacturing shop, repair shop and services sectors.

UNIT 2   [14]

PRODUCTION PLANNING AND CONTROL: INTRODUCTION
Types of production systems and their characteristics functions and objectives of P.P.C., product design and development including standardization and simplification,

SALES FORECASTING AND HUMAN RESAOURCES MANAGEMENT
Concept, techniques, application, production planning and process planning,
Sequencing, loading and scheduling, techniques and their selection, line of balance, assembly line balancing, dispatching, progress control, Wage sheet, HR laws, Designing of Human resources values.

INSPECTION AND STATISTICAL QUALITY CONTROL

Inspection – functions, types, objectives and benefits, quality control – principles, Concepts of quality circles, Total quality management, Quality assurance, Quality audit, ISO, and six sigma SQC Concept, variable and attributes, normal distribution curves and its property charts for variable and attributes and their applications and interpretation (analysis) process capability, Acceptance sampling, sampling plans, OC curves and AOQ curves

UNIT 3 [13]

PRODUCTIVITY AND WORK STUDY

Definition of productivity, application and advantages of productivity improvement tools, reasons for increase and decreases in productivity. Areas of application of work study in industry. Reaction of management and labour to work study.

Method Study: Objectives and procedure for methods analysis, Recording techniques, Micro motion and macro-motion study: Principles of motion economy, Normal work areas and work place design.

WORK MEASUREMENT

Objectives, Work measurement techniques -time study, work sampling, pre-determined motion time standards (PMTS) Determination of time standards. Observed time, basic time, normal time, rating factors, allowances, and standard time. introduction to ergonomics

UNIT 4 [12]

JOB EVALUATION AND WAGE PLAN

Objective, Methods of job evaluation, job evaluation procedure, merit rating (performance appraisal), method of merit rating, wage and wage incentive plans

INDUSTRIAL LEGISLATION

Need for Industrial legislation, Factories act 1948, Industrial dispute act 1947, The Indian trade unions act 1926, Industrial employment act 1946, Payment of wage act 1936, Workmen compensation act 1923, Payment of bonus act 1965, Employees provident fund scheme 1952

Text Books

1. Industrial Engineering and Production Management – By M. Mahajan, Dhanpat Rai & Co.

2. Industrial Engineering and Production Management Martand Telsang S Chand & company.
3. Industrial Engineering and Production Management by Banga and Sharma, Khanna publishers.

Reference Books

1. Production System, Planning, Analysis and Control – By J.L. Riggs 3rd ed. Wiley
2. Industrial Engineering and Organization Management by S K Sharma, Savita Sharma, KATSON Books.
3. Industrial Engineering and Management by Dr. B.Kumar Khanna Publishers

Subject: **Automotive Infotronics & Autotronics (DE-II)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0609			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Understand the basics of Automotive Infotronics & Autotronics.
2. Know the working of sensors and actuators used in vehicle control.
3. Understand the working of electronic fuel supply system. and the working electronic steering system. Describe the details of anti-lock braking system.
4. Understand the computer based automotive instrumentation system.

Course content

UNIT 1   [15]

DRIVER ASSISTANCE SYSTEMS
Introduction, driver support systems – driver information, driver perception, driver convenience, driver monitoring. Vehicle support systems – general vehicle control, collision avoidance, vehicle status monitoring.

TELEMATICS
Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition, driver assistance systems.

UNIT 2   [14]

SAFETY SYSTEMS AND SECURITY SYSTEMS
Airbags, seat belt tightening system, collision warning systems, child lock, anti - lock braking systems. anti - spin regulation, traction control systems. Anti theft technologies, smart card system, number plate coding.

UNIT 3 [13]

ADAPTIVE CONTROL SYSTEMS AND COMFORT SYSTEMS
Adaptive cruise control, adaptive noise control, active roll control system, cylinder cut- off technology. Active suspension systems, requirement and characteristics, different types, power steering, collapsible and tilt able steering column, power windows.

UNIT 4 [12]

BASIC OF AUTOTRONICS
Importance of Autotronics-definition of mechatronics- architecture of mechatranics –system-measurement, open loop and closed loop control system. - signal conditioning-interfacing-analog and digital signals- conversion of analog to digital conversion.-difference between conventional and mechatronics system.

SENSORS AND ACTUATORS
Sensors –variable resistance sensor, pickup coil type sensor, Hall Effect switch, piezoelectric knock sensor, throttle position sensor, MAP sensor, MAF sensor and Actuators.

Text Books

1. Ljubo Vlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
2. Robert Bosch, "Automotive Hand Book", 5th Edition, SAE, 2000.
3. Ronald K Jurgen, "Navigation and Intelligent Transportation Systems – Progress in Technology", Automotive Electronics Series, SAE, USA, 1998.
4. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn,1998.

Reference Books

1. Bechhold, "Understanding Automotive Electronics", SAE, 1998.

Subject: **Vehicle Performance &Testing (DE-1 b)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0611			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To make students aware about regulations and regulating bodies of automobile engineering and engine testing
2. Various testing and simulation methods learning
3. Prevailing safety and emission norms and standards for automobiles(Globally and India).

Course content

UNIT 1   **[15]**

INTRODUCTION
Need of vehicle testing and homologation, Vehicle testing organizations, Hierarchy of testing: Individual component approval, System level approval and Whole vehicle approval. Type Approval & Conformity of Production tests.

ENGINE ,FUEL SYSTEMS AND EMISSIONS TESTING
Laboratory testing of basic engine parameters: Measurement of BHP, IHP, Engine testing on dynamometers, different types of dynamometershydraulic, eddy current etc., engine analyzers- for petrol and diesel engines, FIP calibrating and testing, Emission test for CO, HC, NOx, CO2, PM, etc. using exhaust gas analyzers, their types. Orsat apparatus, infrared gas analyzers

UNIT 2   **[14]**

NOISE VIBRATION AND HARSHNESS TESTING
Review of vibration fundamentals, vibration control, fundamentals of acoustics, human response to sound, automotive noise criteria, Standard noise measurement methods, Noise inside and outside the vehicle, sources of vehicle noise- intake and exhaust noise, combustion noise, mechanical noise, noise from auxiliaries, wind noises, transmission noises, brake squeal, structure noise, noise control methods. Pass by Noise testing method.

VEHICLE PERFORMANCE TESTING

Methods for evaluating vehicle performance- energy consumption in conventional automobiles, performance, emission and fuel economy, Operation of full load and part load conditions, effect of vehicle condition, tyre and road condition and traffic condition and driving habits on fuel economy, Gradability test, Turning circle diameter test, Steering Impact test, Steering effort test.

UNIT 3   [13]

ROAD AND TRACK TESTING
Initial inspection, PDI, engine running in and durability, intensive driving, maximum speed and acceleration, brake testing on the road, hill climbing, handling and ride characteristics, safety, mechanism of corrosion, three chamber corrosion testing, wind tunnel testing, road testing, test tracks.

VEHICLE TESTING ON CHASSIS DYNAMOMETERS
Two wheel & four wheel dynamometers, vehicle testing lanes - side slip testers, wheel alignment testing, wheel balancing, brake test, head light alignment and light intensity testing.

UNIT 4   [12]

ACTIVE AND PASSIVE SAFETY TESTING
Wheel rim testing for cornering and radial fatigue, Fire resistance test, bumper test, crash test, side impact test, rollover test, safety belt test, Airbag test, Safety belt anchorages, Seat anchorages & head restraints, Occupant protection Impact test, Side door intrusion test.

AUTOMOBILE TESTING STANDARDS
Introduction, overview and study of testing standards like; AIS testing standards, Euro Standards, SAE standards. ISO26262 standards for functional safety of electrical and/or electronic systems in automobiles. Understanding of some AIS Standards: AIS-008 (Installation requirements of lighting and light-signaling devices for motor vehicles having more than three wheels, trailer and semi-Trailer excluding agricultural tractor and special purpose vehicles), AIS-018:2001 (Automotive Vehicles - Speed limitation Devices – Specifications), AIS-037 (Procedure for Type Approval and establishing conformity of production for safety of critical components), AIS- 093 (Code of practice for construction and approval of truck cabs & truck bodies), AIS-003 (Automotive Vehicles - Starting Gradeability - Method of Measurement and Requirements), AIS-038 (Battery Operated Vehicles – Requirements for Construction and Functional Safety).

Text Books

1. Raymond M. Brach and R. Matthew Brach, "Vehicle Accident Analysis and Reconstruction Methods", SAE International, 2011
2. J. G. Giles – Vehicle operation and performance, Wildlife Publications, London, 1969.

Reference Books

1. W. H. Crouse and L. Anglin – Motor vehicle inspection, McGraw Hill Book Co. 1978.
2. Dr. N.K.Giri- Automotive technology – Khanna publishers, 2009
3. Ulrich Seiffert and Lothar Wech, "Automotive Safety Handbook", SAE International, 2007
4. ISO Standards, ICS: 43.020, 43.040, 43.100

Subject: **Automotive Quantitative Techniques (DE-1 b)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0612			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To study Role of Quantitative techniques in Business and Automotive Industry.
2. To study Quantitative techniques which provide the decision making a systematic and powerful means of analysis based on quantitative data.
3. It is a scientific method employed for problem solving and decision making by the management.

Course content

UNIT 1   [15]

LINEAR PROGRAMMING
Automotive Quantitative approach for decision making, LPP (linear programming problems) – Mathematical formulation and their solution using graphical approach and simplex algorithm, Duality Sensitivity analysis.

TRANSPORTATION
Solving the problem, MODI method to Optimize Transportation Problems. Cases of unbalanced problems, Degeneracy, Maximization objective, Multiple solutions, Prohibited routes.

UNIT 2   [14]

INVENTORY CONTROL
Techniques of selective control, Economic order quantity (EOQ) models, Gradual checking of stock without shortages, Price breaks and planned stock outs, Deciding optimum safety stock and reorder level.

PERT/CPM
Networking with one estimate of time, Networks with three estimates of time, Time-cost trade-off, PERT/cost, Resource allocation, Resource leveling.

UNIT 3   [13]

QUEUING THEORY
Elements of a queuing system, Single Queuing Models with Poisson arrival and exponential services rates, Queuing Model – Infinite and finite population.

REPLACEMENT ANALYSIS
Replacement of capital assets – discrete cases (a) when time value of money is not considered and (b) when time value of money is considered, Replacement of items assets that fail suddenly.

UNIT 4   [12]

STATISTICAL DECISION THEORY
Components of a Problem, Three Types of Problems in Decision Making Under Different Environment, Methods Used for Decision-Making with Uncertainty, Expected Monetary Value, Expected Regret, Expected Value of Perfect Information

SIMULATION
Steps in the Simulation Process, Application of Simulation, Application of Simulation to the Problem of Financial Planning, Steps in the Hertz Simulation Model, Monte Carlo Simulation

DECISION TREE
Meaning of Decision Tree, Steps Involved in Drawing a Decision Tree, Roll-back Technique.

Text Books

1. Quantitative Techniques: Theory and Problems by Vishal Pandey, P. C. Tulsian Publisher: Pearson India

Reference Books

2. Quantitative Approaches to Management by Levin, R.I., D.S. Rubin and J.P. Stingson, 1986, McGraw – Hill.
3. Quantitative Techniques in Management by Vohra N.D. 3rd Edition, The McGraw Hill companies, 2006.
4. Quantitative Analysis for Business Decisions by Bierman H. Jr, C.P. Bonini and W.H. Hausman, 7th Edition, Homewood, Ill., Irwin 1983

Subject: **Automobile Air Conditioning (DE-1 b)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0613			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives

1. To get the fundamental knowledge of Air conditioning.
2. To study the operation of the basic refrigeration cycle; diagnose and repair air distribution systems; demonstrate proper procedures for handling refrigerant; and describe the operation of air conditioning and heating controls.
3. Utilizing appropriate safety procedures with Air conditioner maintenance & service

Course content

UNIT 1   [15]

INTRODUCTION
Methods of refrigeration; vapour compression refrigeration system; vapour absorption refrigeration system; applications of refrigeration & air conditioning; Automobile air conditioning; air conditioning for passengers; isolated vehicles, transport vehicles; applications related with very low temperatures.

REFRIGERANT
Classification, properties, selection criteria, commonly used refrigerants, alternative refrigerants, eco-friendly refrigerants, applications of refrigerants, refrigerants used in automobile air conditioning

UNIT 2   [14]

PSYCHROMETRY
Application of psychrometric processes of summer and winter air conditioning (applied psychrometry); review of refrigeration and air conditioning load calculations, factors forming the load on refrigeration & air conditioning systems; cooling & heating load calculations; load calculations for automobiles, effect of air conditioning load on engine performance; Human comfort; Comfort chart

UNIT 3 [13]

AIR CONDITIONING SYSTEMS

Classification, layouts, central / unitary air conditioning systems, components like compressors, evaporators, condensers, expansion devices, fan blowers, heating systems, Automotive heaters, Control used in Refrigeration system, Air conditioning protection, Engine protection, Distribution duct system, sizing, supply / return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their
impact on load calculations

UNIT 4 [12]

AIR CONDITIONING SERVICE
Air conditioner maintenance & service; servicing heater system, removing & replacing components; trouble shooting of air conditioning system; compressor service; methods of dehydration; charging & testing; Air Conditioning Control : Common control such as thermostats, humidistat, control dampers, pressure cut outs, relay

Text Books

1. Refrigeration and Air conditioning, Arora and Domkundwar

Reference Books

1. Heating & Air Conditioning Systems Mitchell Information Services.
2. Refrigeration and Air conditioning, Stoecker, McGraw Hill
3. Paul Lung, "Automotive Air Conditioning", C.B.S. Publisher & Distributor, Delhi.
4. Harris, "Modern Air Conditioning".
5. ASHRAE Handbook –1985 Fundamentals
6. William H. Crouse & Donald L. Anglin, "Automotive Air Conditioning", McGrawHill, Inc.1990.
7. Michel Information Services, Inc., Mitchell Automatic Heating & Air ConditioningSystems, Prentice Hall, Inc. 1989.
8. Paul Weisler, "Automotive Air Conditioning", Reston Publishing Co.Inc. 1990

	Subject: **Advanced Technical Communication and Soft Skills**			

Program: **B.Tech. All Branches**			Subject Code: **SH0607**		Semester: **VI**	

Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
1	0	0	0	60	0	40	0	100

	Sr. No.	**Content**
Speaking	1	**Vocabulary Games: Advanced Level**
	2	**Role Play 1**
	3	**Role Play 2**
	4	**Role Play 3**
	5	**Selected speeches & Songs: Declamation 1**
	6	**Selected speeches & Songs: Declamation 1**
	7	**Report Presentation Seminar**
	8	**Report Presentation Seminar**
	9	**Report Presentation Seminar**
	10	**Interview Skills (Mock Interview Sessions 2)**

Writing	11	**Writing Reports**
	12	**Making Proposals**
	13	**Resume Building**
	14	**Letter, Email application**

Reference Books:

Fred Luthans, Organizational Behaviour, McGraw Hill

Lesikar and petit, Report writing for Business

M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill

Wallace and masters, Personal Development for Life and Work, Thomson Learning

Hartman Lemay, Presentation Success, Thomson Learning

Malcolm Goodale, Professional Presentations

Farhathullah, T. M. Communication skills for Technical Students

Michael Muckian, John Woods, The Business letters Handbook

Herta A. Murphy, Effective Business Communication

Lehman, Dufrene, Sinha BCOM, Cengage Learning

Web resources/ MOOCs:

Introduction to English Language & Literature Mod-1 Lec-1
https://www.youtube.com/watch?v=xC3M9EqduyI
The English Language Mod-1 Lec-
https://www.youtube.com/watch?v=HsR4jFszFdw#action=share
International English Mod-1 Lec-4
https://www.youtube.com/watch?v=FT4cQkXCc8g
Effortless EnglishRule-1 English Phrases:https://www.youtube.com/watch?v=r5z-lilm-gg

Pronunciation Training Techniques: https://www.youtube.com/watch?v=wB8mr4iViy0

Make Body Language Your Superpower:
https://www.youtube.com/watch?v=wB8mr4iViy0

English Job Interviews | Best Answers to Questions:
https://www.youtube.com/watch?v=wB8mr4iViy0

7TH SEMESTER

B-TECH AUTOMOBILE ENGINEERING, SEMESTER –VII TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	AU0701	Automobile Systems Design	3	2	2	5	7	30	10	60	40	60	200
2	AU0702	Vehicle Dynamics	3	0	2	4	5	30	10	60	40	60	200
3	AU0703	Computer Integrated Manufacturing	3	0	2	4	5	30	10	60	40	60	200
4	AU0704	Modern Quality Tools	4	2	0	5	6	30	10	60	40	60	100
5	AU0705	Electric and hybrid vehicles	3	0	2	4	5	30	10	60	00	00	200
6	AU0706	Fuel Cells & Applications (DE-III)	03	00	00	03	03	30	10	60	00	00	100
	AU0707	Automobile Computer Aided Design(DE-III)											
	AU0708	Advanced Automotive Technology(DE-III)											
	AU0709	Nano technology (DE-III)											
	AU0710	Noise Vibration & Harshness (DE-III)											
	AU0711	Automotive Instrumentation and Testing (DE-III)											
	AU0712	Tribology (DE-III)											
	AU0714	Production Technology (DE-III)											
8	CV0707	Disaster Management	1	0	0	0	1	-	-	-	-	-	100
TOTAL			20	4	08	29	32	180	60	360	160	240	1100

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

Subject: **Automobile Systems Design**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0701			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	2	2	5	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To make student get acquainted with to standardize the automobile part after designing the system component like clutch, propeller shaft, axle, steering linkages, braking parts, suspension system etc. within the space limitations and optimize it.

Course content

UNIT 1

DESIGN OF CLUTCH SYSTEM
Design of various clutch system components (Single plate, multiple plates, centrifugal clutch, lining material) and Pressure Plate Assembly components. Hydraulic Clutch system components (Master Cylinder, Slave cylinder, reservoir clutch fluid – its properties, hydraulic pipes. Clutch Pedal & Clutch hand lever design. Clutch cable Design / selection considerations.

DESIGN OF PROPELLER SHAFT
Design of Propeller shafts for bending, torsion, & rigidity criteria, failure theories. Design of Universal joint and Slip joint. Propeller shaft Assembly testing for balancing.

UNIT 2

AXLE DESIGN
Front Axle beam, Steering Knuckle, King pin. Rear Axle (drive Axle) tube, Design of fully floating, half floating axle and dead axle. Design of Final drive and differential: Design of spiral bevel and hypoid type of final drive/differential.

DESIGN OF BRAKING SYSTEMS
Internal expanding shoe brake, friction lining material, drum brake arrangements, disc brake arrangement. Mechanical, hydraulic and air brake system and their components, hydraulic brake fluids, vacuum servo assisted braking, parking brake systems, anti-lock braking system, engine

exhaust brake, regenerative brake system, fail-safe- brake, brake efficiency & testing, Weight transfer, braking ratios.

UNIT 3

DESIGN OF SUSPENSION SYSTEM

Types of suspension springs based on applications. Material of spring, Stress deflection Equation for helical springs, Wahl Correction Factor, Design of helical springs for Independent Suspension. Buckling of Compression springs, Tension springs, Springs in Series & in parallel, Design Considerations of Belleville springs, Elastomeric springs, Air (Pneumatic) springs, Design of leaf spring for automobile suspension system, Design of coil spring for front independent suspension system. Types of different suspension springs with their requirements, constructional details and characteristics of leaf spring, coils spring and torsion bar springs, Independent suspension, rubber suspension, pneumatic suspension, hydro elastic suspension, use of anti-roll bar and stabilizer bar, shock absorbers- need, operating principles different types.

DESIGN OF STEERING SYSTEM

Steering mechanism and Linkage design for various types of Steering gear box arrangements and Design criterion for Mechanical & Power steering types. Steering geometry for Ackerman's steering.

UNIT 4

FINITE ELEMENT ANALYSIS

Review of stress-strain relation and generalized Hooke's Law, Plane stress and Plane strain conditions; Concept of Total Potential Energy; Basic procedure for solving a problem using Finite Element Analysis.

1-D Analysis: Concept of Shape function and natural coordinates, strain -displacement matrix, derivation of stiffness matrix for structural problems, properties of stiffness matrix. 1-D structural problems with elimination and penalty approaches, 1-D thermal and fluid problems.

Trusses and Beams: Formulation of stiffness matrix, simple truss problems to find displacement, reaction and stresses in truss members. Structural analysis using Euler-Bernoulli beam element.

Higher Order Element: CST element stiffness matrix formulation, shape functions and applications of Quad and axisymmetric elements

Text Books

1. Machine Design by R S Khurmi J.K.Gupta, S chand & Co.
2. Automotive Chassis by P.M.Heldt , Chilton Co., NY (1992)
3. Machine Design by Pandya and Shah, Charotar Publishing House.

Reference Books

1. Elements of Motor Vehicles Design by DTB donkins, TMH
2. Automobile Chassis Design and calculations by P.Lukin, Mir Publishers
3. Auto design Problems by K.M.Agrawal, Satyaprakashan.
4. Automotive Mechanics by N.K.GIri, Khanna Publishers
5. Machine Design by Sadhusingh, Khanna Publishers
6. Automobile Chassis Design by Dean Averns, Lllife Books Ltd (1992)
7. Automobile Engg. Vol - I & II by Kirpal Singh, Standard Pub.
8. Automobile Engg. Vol - I & II by K.M.Gupta, Umesh Pub.
9. Auto Design by R.B. Gupta, Satya Prakashan
10. "Mechanical Engineering Design", Fourth Edition, by Joseph E. Shigley & Larry.

List of Experiments

1. Introduction and Design Considerations
2. Study of Clutch System Design
3. Study of Propeller Shaft Design
4. Study of Axle Design
5. Study of Brake Design
6. Study of Suspension Design
7. Study of Steering Design
8. Study of Vehicle performance testing and Validation of Design
9. Major Problem (Clutch System)
10. Major Problem (Suspension System)

Subject: **Vehicle Dynamics**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0702			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. To understand the principle and performance of vehicle in various modes such as longitudinal, vertical and lateral directions.
2. At the end of the course the student will be able to identify the various forces and loads and performance under acceleration, ride and braking.

Course content

UNIT 1

PERFORMANCE CHARACTERISTICS OF VEHICLE
SAE Vehicle axis system, Forces & moments affecting vehicle, Earth Fixed coordinate system, Dynamic axle loads, Equations of motion, transmission characteristics, vehicle performance, power limited and traction limited acceleration, braking performance, Brake proportioning, braking efficiency.

AERODYNAMICS
Mechanics of Air Flow Around a Vehicle, Pressure Distribution on a Vehicle, Aerodynamic Forces, Drag Components, Aerodynamics Aids.

UNIT 2

TIRE MECHANICS
Tire Construction, Size and Load Rating, Terminology and Axis System, Tractive Properties, Cornering Properties, Camber Thrust, Aligning Moment, Combined Braking and Cornering, Conicity and Ply Steer, Slip, Skid, Rolling Resistance, Elastic Band Model for longitudinal slip, Simple model for lateral slip, Combined longitudinal/lateral slip (friction ellipse), Taut string model for lateral slip, Magic Tire Formula

SUSPENSIONS

Suspension Kinematics, Suspension types, Solid Axles, Independent Suspensions, Anti-Squat and Anti-Pitch Suspension Geometry, Anti-Dive Suspension Geometry, Roll Center Analysis, Suspension Dynamics, Multi-body vibration, Body and Wheel hop modes, Invariant points

UNIT 3

THE STEERING SYSTEM

The Steering Linkages, Steering System Forces and Moments, Steering System Models, Steering Geometry, Steady Handling (2 DOF steadystate model), Understeer and Oversteer, Effect of Tire Camber and Vehicle Roll (3 DOF steady-state model), Transient Handling and Directional Stability (2 DOF unsteady model), Effect of Vehicle Roll on Transient Handling (3 DOF unsteady model), Steady-State and Transient Handling of Articulated Vehicles.

ROLLOVER

Quasi-Static Rollover of a Rigid Vehicle, Quasi-Static Rollover of a Suspended Vehicle, Transient Rollover

UNIT 4

MOTORCYCLE DYNAMICS

Kinematic structure of motorcycle, geometry of motorcycles, importance of trail, Resistance forces acting on motorcycle (tyre rolling resistance, aerodynamic resistance forces, resistant force caused by slope), Location & height of motor cycle's centre of gravity (C.G), Moments of inertia on Motorcycle. Introduction to Front & Rear suspensions of Motorcycle.

Text Books

1. Hans Pacejka, Tire and Vehicle Dynamics, Elsevier, 2012.
2. Thomas D Gillespie, "Fundamentals of Vehicle dynamics", SAE USA 1992.

Reference Books

1. Rajesh Rajamani, Vehicle Dynamics & control, Springer.
2. R.V. Dukkipati, Vehicle dynamics, Narsova Publications.
3. Wong J Y, "Theory of Ground Vehicles", John Wiley & Sons, New York, 1978.
4. Milliken W F and Milliken D L, Race car Vehicle Dynamics, SAE.
5. Garrett T K, Newton K and Steeds W, "Motor Vehicle", Butter Worths & Co., Publishers Ltd., New Delhi, 2001.
6. Heinz Heister, "Vehicle and Engine Technology", SAE Second Edition, 1999.
7. Vittore Cossalter, Motorcycle Dynamics, 2nd Edition, Publisher: LULU.com
8. R N Jazar, Vehicle Dynamics: Theory and Application, Springer**.**

List of Experiments

1. Experimental study of mechanism for air flow over different geometry of vehicles.
2. Experimental studies of measurements of drag and lift coefficient for different geometry vehicle using wind tunnel apparatus.
3. To study Anti-lock Brake System (ABS) used in automobile vehicles.
4. To study Cruise Control and Adaptive Cruise Control (ACC) used in automobile vehicles.
5. To study advanced cornering and parking system used in automobile vehicles.
6. To study automatic wheel alignment and balancing system

Online Resources:
http://nptel.ac.in/courses/107106080/

Subject: **Computer Integrated Manufacturing**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0703			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. Recognize The Importance of Cim In Today Technology And Its Impact On Market Competition.
2. Automate Tasks For Preparing Most Appropriate Manufacturing And Assembly Processes And Their Sequences.
3. Understand Robot Programming..
4. Analyze The Engineering And Economical Aspects Of Automatic Storage And Retrival System

Course content

UNIT 1

COMPUTER AIDED MANUFACTURING
CAM Concepts, Objectives & scope, Nature & Type of manufacturing system, Evolution, Benefits of CAM, Role of management in CAM, Concepts of Computer Integrated Manufacturing, Impact of CIM on personnel, Role of manufacturing engineers, CIM Wheel to understand basic functions.

NC/CNC MACHINE TOOLS
NC and CNC Technology: Types, Classification, Specification and components, Construction Details, Controllers, Sensors and Actuators, CNC hardware: Re circulating ball screw, anti friction slides, step/servo motors. Axis designation, NC/CNC tooling. Fundamentals of Part programming, Types of format, Part Programming for drilling, lathe and milling machine operations, subroutines, do loops, canned Cycles, parametric sub routines.

UNIT 2

PROGRAMMABLE LOGIC CONTROLLERS
Relay Device components, Programmable controller architecture, programming a programmable controller, tools for PLC logic design

GROUP TECHNOLOGY AND CAPP

Introduction, part families, part classification and coding systems: OPITZ, PFA, FFA, Cell design, rank order clustering, composite part concepts, Benefits of group technology. Approaches to Process Planning, Different CAPP system, application and benefits

UNIT 3

FLEXIBLE MANUFACTURING SYSTEM

Introduction & Component of FMS, Needs of FMS, general FMS consideration, Objectives, Types of flexibility and FMS, FMS lay out and advantages. Automated material handling system: Types and Application, Automated Storage and Retrieval System, Automated Guided Vehicles, Cellular manufacturing, Tool Management, Tool supply system, Tool Monitoring System, Flexible Fixturing, Flexible Assembly Systems.

UNIT 4

ROBOT TECHNOLOGY

Introduction: Robot Anatomy, Laws of Robot, Human System and Robotics, Coordinate system, Specifications of Robot. Power sources, actuators and Transducers, Robotic Sensors, Grippers, Robot Safety, Robot Programming and Robot Applications, Economic Considerations of Robotics system, Robot Kinematics and Dynamics, Robot Arm Dynamics. Concepts of Computer Vision and Machine Intelligence.

INTEGRATED PRODUCTION MANAGEMENT SYSTEM

Introduction, PPC fundamentals, Problems with PPC, MRP-I, MRP-II. Just in Time philosophy: JIT & GT applied to FMS, concepts of Expert System in Manufacturing and Management Information System

Text Books

1. Computer Aided Manufacturing by Tien Chien Chang, Pearson Education
2. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Groover, Pearson Education
3. Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited.

Reference Books

1. Flexible Manufacturing Cells and System -William. W. Luggen Hall, England Cliffs, Newjersy
2. P. Radhakrishnan, " Computer Numerical Control ", New Central Book Agency, 1992.
3. Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India.

List of Practical

1. To study about CIM cases
2. To study about NC in Machine Tool
3. To perform practical on Manual part programming for Turning
4. To perform practical on Manual part programming for Milling
5. To perform practical on Manual part programming for Parametric subroutine
6. To perform practical on APT Programme for Turning, Drilling & Milling
7. To study about Grouping of given parts for G. T.
8. To study about Flexible Manufacturing System
9. To study about Robot Technology
10. To study about Computer aided Production & Operation Management
11. To study about Web survey for CIM Advances
12. Subject seminar

Online Resources:

http://nptel.ac.in/courses/112102101/

Subject: **Modern Quality Tools**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0704			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
4	2	0	5	24/60	0	16/40	0	100

Course Objectives:

1. To understand the various practices of Quality Management followed in Automobile Industries.
2. To understand the tools & techniques for continuous process improvement
3. To learn the importance of ISO/TS 16949 and Quality systems, Audit systems

Course content

UNIT 1

INTRODUCTION
Principles of TQM by Deming, Crosby and Juran, SWOT Analysis,
Quality management in automobile industries, Quality & ISO/TS 16949, Difference with ISO 9001, Importance of Quality Management, QC Tools, Six Sigma, 5S, Ishikawa(Cause and effect Diagram)

COST OF QUALITY
Characteristics of Quality cost, Micro analysis of Quality cost, Cost of quality – prevention / appraisal / failure; Optimum Cost Relationship with Quality. Measurement of Quality

UNIT 2

QUALITY TOOLS
Seven Quality management tools, Continuous Improvement Strategies: Deming wheel, Zero defects Concept, Bench marking.. **Preventive Techniques**: Failure Mode Effect Analysis (FMEA). Poka Yoke,, Quality Ambiance: 5S, Time Management.

ISO/TS 16949 REQUIREMENT
Management responsibility, Quality Systems, Contract review, Design control, Document and data control, Purchasing, Product identification & traceability, Inspection and testing, Control of non
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conforming product, Corrective and preventive actions, Control of records, Internal audit, Training.

IMPLEMENTING ISO/TS 16949

Coherence check, Cultural analysis, System analysis, Process analysis, System Integration, Third party assessment

UNIT 3

AUTOMOTIVE CORE TOOLS
Advance product quality planning, Production part approval process, statically process control, Measurement system analysis, Failure Mode effect and analysis

SUPPLY CHAIN MANAGEMENT
What is SCM, Importance of SCM, Objectives of SCM, Application of Supply chain Management, Implementation Procedure.

UNIT 4

LEAN MANUFACTURING
Value Stream Mapping, JIT, Kaizen, TPM, Kanban; Six Sigma, Lean Six Sigma

Text Books

1. Hansen, B.L. and Ghare, P.M. "Quality control and application", Prentice-Hall of Indian Private Limited.
2. 8. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

Reference Books

1. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
2. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Mitra, A. "Fundamentals of quality control and improvement", Pearson Education.
4. Logothetis, N. "Managing for Total Quality: From Deming to Taguchi and SPC", Prentice-Hall of India Private Limited.
5. Feigenbaum, A. "Total Quality Control", Mc Graw Hill.
6. Mitra, A. "Fundamentals of quality control and improvement", Pearson Education.
7. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003

Subject: **Electric and Hybrid Vehicles (DE-III)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0705			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	0	2	4	24/60	24/60	16/40	16/40	200

Course Objectives:

1. This course introduces the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2. This course goes deeper into the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used, energy storage devices, etc. Each topic will be developed in logical progression with up-to-date information.

Course content

UNIT-1

INTRODUCTION TO HYBRID ELECTRIC VEHICLES
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

CONVENTIONAL VEHICLES
Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

HYBRID ELECTRIC DRIVE-TRAINS
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT-2

ELECTRIC DRIVE-TRAINS
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 hybrid and 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-3

ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

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

UNIT-4

ENERGY MANAGEMENT STRATEGIES

Introduction to energy management strategies used 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 Book

1. Iqbal Hussein, Electric & Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

Reference Books

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric & Fuel Cell Vehicles: Fundamentals, Theory & Design, CRC Press, 2004.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

List of Practical

1.   Introduction to Hybrid Electrical Vehicles.
2.   Study of Power Sources for Hybrid Vehicles.
3.   Study of Basic Classification of Hybrid Vehicles
4   Study of Two Wheeled Hybrid Vehicles
5.   Study of Hybrid Vehicles in Different Vehicles.
6.   Study of Various Engine Types in Hybrid Vehicles.
7.   Study of Hybrid Vehicle Power Train Configurations
8   Study of Environmental Impact of Hybrid Vehicles
9.   Study of Electric Components Used In Hybrid Vehicles
10   Case Study on Hybrid Cars

Subject: **Fuel Cells & Applications** (DE-IV)								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0706			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Understand fundamental concept and working of various fuel cells, their relative advantages / disadvantages and hydrogen generation/storage technologies

Course content

UNIT-1

HYDROGEN – FUNDAMENTALS
Hydrogen as a source of energy, physical and chemical properties, salient characteristics, relevant issues and concerns

UNIT-2

HYDROGEN STORAGE AND APPLICATIONS
Production of hydrogen, steam reforming, water electrolysis, gasification and woody biomass conversion, biological hydrogen production, photo dissociation, direct thermal or catalytic splitting of water, hydrogen storage options, compressed gas, liquid hydrogen, hydride, chemical storage, safety and management of hydrogen, applications of hydrogen

UNIT-3

FUEL CELLS- TYPES
Brief history, principle, working, thermodynamics and kinetics of fuel cell process, types of fuel cells; AFC, PAFC, SOFC, MCFC, DMFC, PEMFC – relative merits and demerits, performance evaluation of fuel cell, comparison of battery Vs fuel cell

UNIT-4

FUEL CELLS -APPLICATION AND ECONOMICS

Fuel cell usage for domestic power systems, large scale power generation, automobile, space applications, economic and environmental analysis on usage of fuel cell, future trends of fuel cells

Text book

1. Iqbal Hussein, Electric & Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

Reference Books

1. Viswanathan, B and M Aulice Scibioh, Fuel Cells – Principles and Applications, Universities Press
2. Rebecca L. and Busby, Hydrogen and Fuel Cells: A Comprehensive Guide, Penn Well Corporation, Oklahoma
3. Bent Sorensen (Sorensen), Hydrogen and Fuel Cells: Emerging Technologies and Applications, Elsevier Academic Press, UK
4. Kordesch, K and G.Simader, Fuel Cell and Their Applications, Wiley-Vch, Germany
5. Hart, A.B and G.J.Womack, Fuel Cells: Theory and Application, Prentice Hall, NewYork Ltd., London
6. Jeremy Rifkin, The Hydrogen Economy, Penguin Group, USA

Subject: **Automobile Computer Aided Design (DE-IV)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0707			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Understand and appreciate use of computer in product development.
2. Apply algorithms of graphical entity generation.
3. Understand mathematical aspects of geometrical modelling.
4. Understand and use finite element methods for analysis of simple components.

Course content:
UNIT 1
INTRODUCTION
A typical product cycle, CAD tools for the design process of product cycle, CAD / CAM system evaluation criteria, Input / Output devices; Graphics Displays: Refresh display, DVST, Raster display, pixel value and lookup table, estimation of graphical memory, LCD, LED fundamentals. Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System. Line and Curve generation algorithm: DDA, Bresenham's algorithms. Graphics exchange standards and Database management systems.

UNIT 2
Curves and Surfaces
Parametric representation of lines: Locating a point on a line, parallel lines, perpendicular lines, distance of a point, Intersection of lines. Parametric representation of circle, Ellipse, parabola and hyperbola. Synthetic Curves: Concept of continuity, Cubic Spline: equation, properties and blending. Bezier Curve: equations, properties; Properties and advantages of B-Splines and NURBS.

UNIT 3
Mathematical representation of solids
Geometry and Topology, Comparison of wireframe, surface and solid models, Properties of solid model, properties of representation schemes, Concept of Half-spaces, Boolean operations.

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Schemes: B-rep, CSG, Sweep representation, ASM, Primitive instancing, Cell Decomposition and Octree encoding.

Geometric Transformations
Homogeneous representation; Translation, Scaling, Reflection, Rotation, Shearing in 2D and 3D; Orthographic and perspective projections. Window to View-port transformation.

UNIT 4
Finite Element Analysis
Review of stress-strain relation and generalized Hooke's Law, Plane stress and Plane strain conditions; Concept of Total Potential Energy; Basic procedure for solving a problem using Finite Element Analysis. 1-D Analysis: Concept of Shape function and natural coordinates, strain - displacement matrix, derivation of stiffness matrix for structural problems, properties of stiffness matrix. 1-D structural problems with elimination and penalty approaches, 1-D thermal and fluid problems. Trusses and Beams: Formulation of stiffness matrix, simple truss problems to find displacement, reaction and stresses in truss members. Structural analysis using Euler-Bernoulli beam element. Higher Order Element: CST element stiffness matrix formulation, shape functions and applications of Quad and axis symmetric elements.

Reference Books:

1. CAD / CAM: Theory and Practice,Ibrahim Zied,McGraw-Hill.
2. Computer Graphics,Hearn E J and Baker M P, Pearson.
3. Introduction to Finite Elements in Engineering, Chandrupatla T A and Belegundu A D, PHI.
4. A First Course in the Finite Element Method,Logan D,Cengage.

Subject: **Advanced Automotive Technology (DE-IV)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0708			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To learn and understand the programming, data acquisition hardware and implementing small automotive related projects in virtual instrumentation.

Course content

UNIT 1

INTRODUCTION
A brief introduction of Modern Engine Technology and Modern Car body technology.

ELECTRONICS CONTROL UNIT (ENGINE)
Electronics Control Unit, Control of Air/Fuel Ration, Control of idle speed, Crank angle sensor, Lambda sensor, MAP sensor, On-Board Diagnostics Tool**,** Sensors and actuators for automobile industries.

UNIT 2

VEHICLE SAFETY
Anti lock braking systems- Traction Control system- Electro-hydraulic brakes- Occupant safety systems- Airbags, seat belt tightening system, collision warning systems, child Lock – Power windows- Power Sunroof- Seat and steering Column- Biometric systems- Driver-assistance systems- Adaptive cruise control.

DRIVE TRAIN
Modern Engine Technology like DTS- i, DTS – Fi, DTS – Si, VVT, Camless Engine, GDi, CRDI

UNIT 3

VEHICLE SAFETY AND COMFORT SYSTEM
Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding. Locking system- Central locking system- acoustic signaling devices Active

suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, Climate control management system.

UNIT 4

VEHICLE INFORMATION AND COMUNICATION

Instrumentation- Vehicle Information system- Trip Recorders- Parking systems- Analog and digital signal transmission- Automotive sound systems- Mobile and data radio- Mobile Information services- navigation system- Traffic telematics- Multimedia systems OBD-I Engine diagnostic system- OBD-II Engine Control systems- SAE DTC Standards- Scan Tools- Strategy based diagnosis – Engine and vehicle performance problems.

INTELLIGENT TRANSPORTATION SYSTEM

Traffic routing system - Automated highway systems - Lane warning system – Driver Information System, driver assistance systems - Driver conditioning warning - Route Guidance and Navigation Systems- Hybrid / Electric and Future Cars.

Text books

1. Nadovich, C., "Synthetic Instruments Concepts and Applications". Elsevier,2005
2. Bitter, R., Mohiuddin, T. and Nawricki, M., "Labview Advanced programming Techniques",
   CRC Press, 2nd Edition, 2007.

Reference books

1. Robert N.Brandy, "Automotive Electronics and Computer Systems", Prentice Hall, 2001.

Subject: **Nano technology (DE-IV)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0709			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Get knowledge of Nanotechnology
2. Understand difference between properties Nanomaterial and conversional materials
3. Understand the application of Nanomaterials
4. Understand the mean of Nanoelectronics
5. Understand the optical properties of Nanomaterials.

Course content

UNIT 1

NANOTECHNOLOGY
Background, what is nanotechnology, types of nanotechnology and nano-machines, top down and bottom up techniques, Molecular nanotechnology, atomic manipulation-nanodots, self-assembly, Dip pen nanolithography, Simple details of characterization tools- SEM, TEM, STM,AFM

UNIT 2

NANOMATERIALS
What are Nanomaterials? Preparation of Nanomaterials-Plasma arcing, Chemical Vapor Deposition, Sol-gels techniques, ElectrodepositioN, Ball Milling, Natural Nanomaterials, Applications of Nanomaterials-Insulation materials, Machine tools, Phosphors, Batteries, High power magnets Medical implants

NEW FORMS OF CARBON
Carbon tubes-types of nanotubes, formation of nanotubes, Assemblies, purification of Carbon nanotubes, Properties of nanotubes, applications of nanotubes

UNIT 3

OPTICS, PHOTONICS AND SOLAR ENERGY

Light and nanotechnology, Interaction of light and nanotechnology, Nanoholes and photons, Solar cells, Nanoparticles and nanostructures; Optically useful nanostructured polymers, Photonic Crystals.

NANOELECTRONICS

Introduction, Tools of Micro- and Nanofabrication-optical and electron beam lithography, Molecular beam lithography, Quantum electronic devices, Molecular electronics, Simple ideas about quantum computers

UNIT 4

APPLICATIONS

MEMs, robots, Nanomachines, Nanodevices, New Computing System, Optic-electronic devices, Environmental applications, Nanomedicine, Biological Nano-Technological future.

Reference Books

1. Nanotechnology-Basic Science and Emerging Technologies Mick Wilson, Kamali Kannangra Geoff Smith, Michelle Simons and Burkhard Raguse, Overseas Press.
2. Nanotechnology-AGentle Introduction to the Next Big Idea Mark Ratner and Daniel Ratner, Prentice Hall
3. Nanotechnology: RebeccaLJohnson, Lerner Publications.
4. Introduction to Nanotechnogy: Charles P. Poole Jr., Chapman and Hall/CR
5. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2002
6. A.Nabok, "Organic and Inorganic Nanostructures", Artech House, 2005
7. C.Dupas, P.Houdy, M.Lahmani, Nanoscience: "Nanotechnologies and Nanophysics", Springer-Verlag Berlin Heidelberg, 2007

Program: **B.Tech. Automobile Engineering**	Subject Code: AU0710	Semester: **VII**

Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE)-Theory	Continuous Internal Evaluation (CIE)-Practical	Total
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Understanding the importance of Noise, Vibrations & Harshness related sources and mandatory requirements in Vehicular applications.
2. Parameters affecting design criteria, construction & architecture, as well as operational systems for reduction of NVH.
3. Subjectively evaluate vehicle performance characteristics for functional requirements including mandatory - safety parameters. In order to better prepare today's automotive engineer for this course, to help in understanding fundamental principles and automotive system applications, along with associated improvements implemented in different models of vehicles.

Course content

UNIT 1
 INTRODUCTION TO NOISE VIBRATION & HARSHNESS
Definition of Noise, Vibrations & Harshness in reference to Vehicular application. Study principles of Rolling, Pitch & Yaw velocity and moments.

FUNDAMENTALS OF NOISE AND VIBRATIONS
Basic Concepts of Vibrations: Simple Harmonic Motion, Frequency of Vibrations, Period, Natural Frequency, Resonant Frequency, Amplitude of vibrations. Un-Damped & Damped Vibrations. Types of Vibrations: Free & Forced Vibrations induced for Single degree of freedom & Multi degrees of freedom. Basic Concepts of Noise: Fundamentals of Acoustics. General Types of sound wave propagations- wave equation, specific acoustic impedance, Plane wave & Spherical waves. Structure borne sound and air borne sound. Interior noise sources and levels of noise. Anatomy of human ear and mechanism of hearing. Sound intensity, summation of pure tones (decibel addition), subtraction & averaging. Octave and Octave bands.

UNIT 2

CHARACTERISTICS & SOURCES OF VIBRATIONS
Power Train: Engine, Clutch, Transmission, Propeller shaft, Differential, Drive shaft, Trans axle. Power train mounts. Suspension: Different types of suspensions, Dampers, Rubber & Rubber embedded Metallic bushes. Passive and Active suspensions. Road roughness & irregularities, Tyres & Wheels. Low frequency vibrations: due to body structure, Seat mounting, seat materials and Steering assembly components.

VIBRATIONS MEASUREMENT TECHNICS AND CONTROL
Vibration measuring Instruments: Vibration pick-up, Types of Transducers, Vibrometer etc. for measurement of Frequency of vibrations, Period, Amplitude, Velocity and acceleration parameters. Methods of Control and vibrations isolation: Different Types of Dampers, Vibrations absorber / isolator (including viscous damping, sandwich construction).

UNIT 3

SOURCES OF NOISE, NOISE MEASUREMENT TECHNICS AND CONTROL
Noise specifications and mandatory standards regulations. Brake Squeal noise, Pass-by Noise, wind noise, squeak noise and rattle, interior noise (including noise emitted by running of accessories, indicators and all buzzers). Power train, Engine Air Intake & Exhaust noise, Engine accessories, cooling system and vehicle body protrusion noise, under body protrusion noise. Noise due to Tyre-Road friction and slip characteristics. Noise Measuring Instruments: Microphone, Sound intensity probes. Noise Control: Damping treatment methods, Control through isolations and noise absorbing materials and structure. Active and semi-active control of noise. Study of anechoic chamber.

HARSHNESS
Definition. Its effect and acceptable degree of Harshness. Perception of Ride comfort i.e. psychological effects of Noise & Vibrations. Study of NVH - Legislations applicable for vehicles in India.

UNIT 4
SAFETY
Passive safety Active safety. Study of Safety Regulations for vehicular application. Introduction to software applications (Capabilities & Limitations of different software's) for analysis of NVH.

Text Books

1. Vehicle Noise, Vibration, and Sound Quality by Gang Sheng Chen, SAE International Publications.
2. Fundamentals of Noise and Vibration, by Norton M.P, Cambrige University Press
3. Mechanical Vibrations & Noise Control, by Dr. Sadhu Singh, Khanna Publishers.

4. Mechanical Vibrations by G.K.Grover, Published by Nem Chand & Bros, Roorkee, India.
5. Mechanical Vibrations, by S.S.Rao, Pearson.
6. Theory of Vibration with Applications, by W.T.Thomson & M.D.Dahleh, Pearson Education.
7. Dynamic Vibration Absorbers, by Borris and Kornev, John Wiley Publications

Subject: **Automotive Instrumentation and Testing (DE-IV)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0711			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Explain the types of measuring systems and their characteristics. The thorough knowledge in Automobile measuring instruments develops the ability to design and judge the use of particular instruments in their industrial exposure.
2. Knowledge in Various experimental techniques develops the design skills of students. Students can understand the I.S. code for engine testing which will be useful for them in practical field in automotive industries.

Course content

UNIT 1

INSTRUMENTATION
Introduction, characteristics and calibration.

VEHICLE WIND TUNNEL TEST
Test requirements –ground boundary simulation-wind tunnel selection and Reynolds number capability, model requirements, model details, model mounting, test procedure.

UNIT 2

VEHICLES RIDE VIBRATION AND BODY TEST
Vibration measurement instrument – accelerometer and signal conditioning, graphical presentation. Dynamic simulation sled testing, methodology, vehicle acceleration measurement and documentation. Dolly roll over test, dolly role over fixture, photographic / video coverage, instrumentation. Vehicle roof strength test – test procedure and test measurements. Door system crush test –procedure and measurements.

FUEL CONSUMPTION TEST

Type I & II, test route selection, vehicle test speeds, cargo weights, driver selection, test data form, calculations. Test on rough terrain, pot holes with laden and unladen conditions.

UNIT 3

VEHICLE SUSPENSION AND STABILITY FOR DIRECTIONAL CONTROL
Measurement of dimensional and geometric characteristics, measurement of centre of gravity position, measurement of moments and products of inertia, measurement of suspension kinematic characteristics, measurement of suspension elastic and coulomb friction characteristics, measurement of shock absorber characteristics.

STEERING CONTROL SYSTEM DIRECTIONAL CONTROL TEST
Analysis of constant radius test, constant steer angle test, constant speed variable radius test, constant speed variable steer angle test, response gain test.

UNIT 4

WHEELS AND BRAKING PERFORMANCE TEST
Dynamic cornering fatigue, dynamic radial fatigue tests – procedure, bending moment and radial load calculations. Impact test – road hazard impact test for wheel and tyre assemblies, test procedures, failure criteria and performance criteria. Bumpers - types of tests, pendulum test, fixed collision barrier test, procedure, performance criteria. Air and hydraulic brake test, air brake actuator, valves test, performance requirements. Parking brake – drawbar pull test, grade holding test.

ENERGY CONSUMPTION TEST
Engine cooling fan, air conditioning and brake compressors, hydraulic pumps power consumption. Antilock brake systems energy consumption.

Text Books

1. W.H.Crouse & D.L.Anglin, "Automotive Mechanics"' Tata McGraw Hill Publishing Company, 2004.
2. Rangan, Mani and Sharma, "Instruementation", Tata McGraw Hill Publishers, New Delhi, 2004.
3. SAE Hand book, vol. 3, SAE Publications, 2000.
4. Stockel M. W, "Auto Mechanics Fudamentals", Good Heart-Wilcox Co., Inc., 2000.
5. Jain.R.K., "Mechanical and Industrial Measurements", Khanna Publishers, Delhi, 1999.

Reference Books
1. Tim Gilles, "Automotive Service"' Delmar Publishers, 1998.

Subject: **Tribology (DE-IV)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0712			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. To teach the students about the friction and wear phenomena, different types of bearings and lubrication,
2. To get knowledge about tribo-testing and standards
3. To sensitize the student on the inevitability of tribological considerations in the design of automotive components, which are invariably subjected to extreme conditions

Course content:

UNIT 1

 INTRODUCTION
 Introduction of Tribology, Tribological components,Tribo testing, matching and Selection tribometry and standards

FRICTION AND WEAR
Nature of metal surfaces, Surface properties, Surface parameters and measurements. Friction, Sliding friction, Rolling friction characteristics of common metals and non-metals, Friction under extreme environments. Engine friction, Losses and engine design parameters. Economic role of wear, type of wear, wear mechanism, Factors affecting wear, Selection of materials for different wear situations, Measurement of wear, Tribometers and Tribometry. Engine wear, mechanisms, wear resistance material and coatings and failure mode analysis.

UNIT 2

 HYDRO DYNAMIC BEARINGS AND LUBRICATION
 Theory of hydrodynamic lubrication, Generalized Reynolds Equation, slider bearings, Fixed and pivoted shoe bearings, Hydrodynamic journals bearings, short and finite bearing, Thrust bearings, Sintered bearing, Non- Circular bearings and multi side surface bearings.

UNIT 3

LUBRICANTS AND MONITORING

Lubricants, Type of lubricants, Properties and testing, service classification of lubricants, Additives,Lubrication of tribological components, Lubrication systems, Lubricant monitoring, SOAP, Ferrography and other rapid testing methods for lubricants contamination.

HYDROSTATIC (EXTERNALLY – PRESSURIZED) BEARINGS & LUBRICATION:
Hydrostatic bearing, basic concepts Bearing pad coefficients. Restrictors, Capillary, orifice and flow control valve, bearing characteristic number and performance coefficients, flat, Conical and spherical pad thrust bearing, Multirecess journal and thrust bearings, Air and gas lubricated bearings.

UNIT 4

ELASTO HYDRO DYNAMICS AND GREASE LUBRICATION (RHEOLOGY):
Lubrication of Ball and roller bearings, cams and gears, selection and life estimation, fatigue and diagnostics. Non- Newtonian fluids, characteristics, Thixotopic, materials and Bingham solids, grease lubrication and stability. Trilogy in Extreme environments Tribology of components in extreme environments like vacuum, Pressure and Temperature

Text Books

1. Bowden, F.P. & Tabor, D., "Friction and Lubrication of solids", Oxford University press., 1986.
2. Ernest Rabinowiez, :"Friction and wear of materials" Inter science Publishers, 1995.
3. Neale, M.J., Tribology – :Hand Book", Butterworth, 1995.

Reference Books

1. Fuller D.D., : "Theory and practice of Lubrication for engineers", John Wiley sons, 1984.
2. Gross, W.A.,: "Gas film lubrication", Wiley, 1980.

Subject: **Production Technology (DE-IV)**								
Program: **B.Tech. Automobile Engineering**				Subject Code: AU0714			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
3	0	0	3	24/60	0	16/40	0	100

Course Objectives:

1. Students will be able to apply basics of metal machining processes very well. They can have enough knowledge of different forces acting while cutting with tool life and wear. They can interpret and utilize the economics of machining.
2. Learning of the technology of Gear and threads manufacturing which is grassroots knowledge of any manufacturing industries. They are able understand the usefulness of Jig & Fixtures, Presses & Press work, Types of Dies and various forces acting during cutting. They also understand non conventional machining processes its importance, application advantages and economy aspect in production technology.

Course content

UNIT 1

THEORY OF METAL CUTTING
Principles of metal machining, cutting tools and
tool materials, tool signature, mechanics of chip removal, cutting forces and parameters effecting it, cutting fluids, tool wear, tool life, economics of machining. Multi point cutting tools, temperature measurement at tool-work interface and its effects

UNIT 2

GEAR AND THREADS MANUFACTURING
Different types of Threads manufacturing methods, and tools involved, Different gear forming and generating methods with their special features, Gears finishing processes.

JIGS & FIXTURES
Definition, its usefulness in mass production, design principles,
locating systems and types of locators & clamps, jig bushes, design of jigs and fixtures
for various machining operations.

UNIT 3

PRESSES AND PRESS WORK

Classification Of Presses, Classification Of Dies, Cutting Actions In Dies, Clearance, Cutting Forces, Center Of Pressure Design Of Press Tools, Methods Of Mounting Of Punches, Scrap Reduction, Strip Layout.

CONTROLS IN MACHINE TOOLS

Machine tool drives, Machine tool structures, Machine tool spindles, Special purpose machines , Capstan and turret lathes, single spindle and multi spindle automats, bar type and chucking type machines, Design of cam for single spindle automat Transfer Machines.

UNIT 4

NON-CONVENTIONAL MACHINING

EDM, IBM, ECM, ECG, CM, AJM, wire cut EDM, ,USM, LBM process principle, process parameters and their applications

Text Books

1. Fundamentals of machining and machine tools, by Boothroyd -CRC publication
2. Metal Cutting principles, by M C Shaw, Oxford University press
3. Production Technology - H.M.T. By HMT

Reference Books

1. Tool Design by Donaldson, Tata McGraw Hill Pub.
2. Metal cutting Principles by Trent McGraw Hill Pub.
3. Workshop Technology Vol.II by Raghuvanshi , Dhanpat rai Pub.
4. Production Technology by R.K.Jain, Khanna Pub.

Subject: **Disaster Management**								
Program: **B.Tech. Civil Engineering**				Subject Code:CV0712			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
1	-	0	0	24/60	0	16/40	0	100

Course Objectives:

1. To explain students the conceptual applications and principles of management to mitigate various disasters.

Course Outcome:

1. Understand disasters, disaster preparedness and mitigation measures.
2. Understand role of IT, remote sensing, GIS in risk reduction.
3. Understand disaster management acts and guidelines along with the role of various stack-holders during disasters.

COURSE CONTENTS:

UNIT-I [03]

Introduction
Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention,mitigation)

UNIT-II [04]

Disasters classification

Natural disasters (floods, drought, cyclones, volcanoes, earthquakes,tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrialpollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard andvulnerability profile of India, mountain and coastal areas, ecological fragility

UNIT-III   [06]

Disaster Impacts

Disaster Impacts (environmental, physical, social, ecological, economic, political, etc.); health,psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; globaland national disaster trends; climate-change and urban disasters. Disaster Risk Reduction

Disaster management cycle

Phases; prevention, mitigation, preparedness, relief andrecovery; structural and non-structural measures; risk analysis, vulnerability and capacityassessment; early warning systems, Post-disaster environmental response (water, sanitation,food safety, waste management, disease control); Roles and responsibilities ofgovernment,community, local institutions, NGOs and otherstakeholders; Policies and legislation for disasterrisk reduction, DRR programmes in India and the activities of National DisasterManagementAuthority.

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UNIT-IV   [02]

Applications of Science and Technology for Disaster Management and Mitigation

Geo-informatics in Disaster Management (RS, GIS and GPS), Disaster Communication System (Early Warning and Its Dissemination), Land use planning and development regulations, Disaster safe designs and Development Regulations, Disaster safe designs and Construction structural and Non structural Mitigation of Disasters. Science and Technology Institutions for Disaster Management in India.

Text Books:

1. Ghosh G.K., 2006, Disaster management, APH Publishing Corporation.

Reference Books:

2. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.

3. Singh B. K., 2008, Handbook of Disaster Management: techniques and guidelines, Rajat Publications

Web resources:

1. http://nidm.gov.in/PDF/Disaster_about.pdf

2. https://www.slideshare.net/Jyothi19587/disaster-ppt

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3. https://www.slideshare.net/SayefAmin1/natural-disaster-its-causes-effects

4. https://www.slideshare.net/rahulp4/man-made-disasters-23947076

5. https://www.slideshare.net/urveshprajapati3990/disaster-management-in-india-56546805

6. www.ndmindia.nic.in/presentation/Presentation%20by%20JS%20(DM)%20(1).ppt

7. https://www.geospatialworld.net/article/information-technology-and-natural-disaster-management-in-india/

8. http://www.bvicam.ac.in/news/NRSC%202007/pdfs/papers/st_230_03_02_07.pdf

9. http://eagri.tnau.ac.in/eagri50/ENVS302/pdf/lec13.pdf

10. http://nptel.ac.in/courses/105105104/pdf/m16l39.pdf

11. https://www.unisdr.org/we/inform/events/50220

MOOCs:

1. https://www.mooc-list.com/tags/disaster-management

8TH SEMESTER

SR NO	CODE	SUBJECTS	TEACHING SCHEME			CREDITS	HOURS	EXAMINATION SCHEME					TOTAL
								THEORY			PRACT		
								CIE					
			L	T	P			MID	IE	ESE	CIE	ESE	
1	AU0801	Project	00	00	40	20	40	00	00	00	40	60	100
TOTAL			**00**	**00**	**40**	**20**	**40**	**00**	**00**	**00**	**40**	**60**	**100**

Table title: **B-TECH AUTOMOBILE ENGINEERING, SEMESTER –VIII TEACHING & EXAMINATION SCHEME WITH EFFECT FROM JULY 2017**

Approved Vide Agenda Item No. 03 of Minutes of Meeting of Academic Council held on 11 July 17

Subject: **Project**								
Program: **B.Tech. Automobile Engineering**			Subject Code: AU0801				Semester: **VIII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**Total**
00	00	40	20	00	60	00	40	100