REGULATION 2015

B.TECH – AUTOMOBILE ENGINEERING

CURRICULUM AND SYLLABUS

I-SEMESTER					
THEORY/PRACTICAL					
Sub Code	**Subject**	**L**	**T**	**P**	**C**
BEN101	English – I	3	1	0	3
BMA101	Engineering Mathematics – I	3	1	0	3
BPH101	Engineering Physics – I	3	0	0	3
BCH101	Engineering Chemistry – I	3	0	0	3
BCS101	Fundamentals of Computing and Programming	3	0	0	3
BBA101	Personality Development (Civil, Mechanical and Bio branches)	1	1	0	2
BBT 102	Biology for Engineers (Civil & Mechanical branches)	2	0	0	2
BCE101	Basic Civil Engineering (Mechanical & Bio Engineering Branches)	2	0	0	2
BME102	Engineering Graphics – E (Civil, Mechanical & Aeronautical Engineering)	2	3	0	4
BCM1L1	Basic Civil and Mechanical Engineering Practices Laboratory (Civil, Mechanical and Bio Branches)	0	0	3	1
	NCC/NSS/Yoga (Optional) to be conducted during weekends				
	E- Civil, Mechanical, Aeronautical Branches				
	Total No. of Credits				26

II-SEMESTER					
THEORY/PRACTICAL					
Sub Code	**Subject**	**L**	**T**	**P**	**C**
BEN201	English – II	3	1	0	3
BMA201	Engineering Mathematics – II	3	1	0	3
BPH201	Engineering physics – II	3	0	0	3
BCH201	Engineering Chemistry – II	3	0	0	3
BFI201#	Foreign/Indian Language	3	0	0	3
BME202	Engineering Mechanics(Civil & Mechanical Branches)	3	1	0	3
BEE201*	Basics Electrical and Electronics Engineering (Civil, Mechanical & Bio Engineering Branches)	2	0	0	2
BCS2L2	Computer Practices Lab (Civil, Mech & Bio)	0	0	3	1
BEE2L1	Basic Electrical and Electronics Engineering Practices	0	0	3	1
BPC2L1	Physics and Chemistry Laboratory	0	0	3/3	1
	NCC/NSS/Yoga (Optional) to be conducted during weekends				
	# Any one of the following courses: BFR201 – French, BGM201 – German, BJP201- Japanese, BKR201 – Korean, BCN201 – Chinese, BTM201 - Tamil				
	*Laboratory Classes on alternate weeks for Physics and Chemistry. The lab examinations will be held only in the second semester (including the first semester experiments also)				
	Total No. of Credits				23

III Semester					
THEORY					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
BMA 301	Mathematics – III	3	1	0	4
BAM 301	Solid Mechanics	3	1	0	4
BAM 302	Automotive petrol engines	3	0	0	3
BAM 303	Thermodynamics & Thermal Engineering	3	1	0	4
BAM 304	Engineering Fluid Mechanics	3	1	0	4
BAM 305	Measurement & Metrology	3	0	0	3
BAM 306	Production Technology	3	0	0	3
PRACTICAL					
BAM 3L1	Automotive Parts and Assembly Drawing	0	0	4	2
BCE3L2	Fluid Mechanics and Strength of Materials Lab	0	0	4	2
Total No. of Credits					**29**

IV Semester					
THEORY					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
BAM401	Theory of Machines	3	1	0	4
BAM402	Automotive Chassis	3	1	0	4
BAM403	Automotive Diesel Engines	3	0	0	3
BAM404	Automotive Electrical Systems	3	0	0	3
BCE406	Environmental Studies	3	0	0	3
BMA402	Numerical Methods	3	1	0	4
PRACTICAL					
BAM4L1	Automotive Engine Components Laboratory	0	0	3	1
BAM4L2	Engine Testing and Emission Measurement Lab	0	0	3	1
BAM4L3	Automotive Electrical Lab	0	0	3	1
BAM4S1	Technical Seminar- I	0	0	0	1
Total No. of Credits					**25**

V Semester					
THEORY					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
BAM501	Computer Control of Vehicle Systems	3	0	0	3
BAM502	Automotive Pollution and Control	3	0	0	3
BAM503	Automotive Transmission	3	1	0	4
BEI504	Electronics & Instrumentation	3	0	0	3

BAM505	Engineering Design for Automobile Engineers	3	1	0	4
BAM506	Alternate Fuels and Energy Systems	3	0	0	3
	Elective-I	3	0	0	3
PRACTICAL					
BME5L1	Automotive Chassis Components Laboratory	0	0	3	1
BEC5L1	Machine Shop Practice	0	0	3	1
BAM5S1	Automotive Electronics a`nd Microprocessor Lab	0	0	3	1
BAM5S1	Technical Seminar –II	0	0	3	1
Total No. of Credits					**27**

VI Semester					
THEORY					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
BAM601	Computer Integrated Manufacturing Systems	3	0	0	3
BAM602	Electronic Engine Management System	3	0	0	3
BAM603	Instrumentation and Experimental Techniques	3	1	0	4
BAM604	Automotive Aerodynamics	3	1	0	4
BAM605	Vehicle Dynamics	3	1	0	4
	Elective-II	3	0	0	3
PRACTICAL					
BAM6L1	Autotronics Lab	0	0	3	1
BAM6L2	Vehicle Dynamics Lab	0	0	3	1
BAM6P1	Design and Fabrication Project	0	0	4	2
Total No. of Credits					**25**

VII Semester					
THEORY					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
BAM701	Industrial Engineering	3	1	0	3
BAM702	Vehicle Body Engineering	3	1	0	4
BAM703	Vehicle Design	3	1	0	4
BAM704	Vehicle Maintenance	3	0	0	3
	Elective-III	3	0	0	3
	Elective-IV	3	0	0	3
PRACTICAL					
BAM7L1	Vehicle Maintenance Lab	0	0	3	1
BME7L2	CAD/CAM Lab	0	0	3	1
BAM7P1	Project phase-I	0	0	4	2
BAM7V1	Inplant Training [End of 6th Semester 15 Days]	0	0	0	1
Total No. of Credits					**25**

VIII Semester					
THEORY					
Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**
	Elective-V	3	0	0	3
	Elective-VI	3	0	0	3
	Elective-VII	3	0	0	3
PRACTICAL					
BAM8P1	Project Work	0	0	18	6
Total No. of Credits					**15**
TOTAL CREDITS FOR THE PROGRAMME					**195**

LIST OF ELECTIVES					
BAM001	Computer Simulation of IC Engine Processes	3	0	0	3
BAM002	Finite Element Methods	3	0	0	3
BAM003	Two and Three Wheelers	3	0	0	3
BAM004	Simulation of Vehicle Systems	3	0	0	3
BAM005	Tyre Technology	3	0	0	3
BAM006	Noise vibration and Harshness	3	0	0	3
BAM007	Rubber Technology for Automobiles	3	0	0	3
BAM008	Modern Manufacturing Process	3	0	0	3
BAM009	Robotics for Automobile Engineers	3	0	0	3
BAM010	Product Design	3	0	0	3
BAM011	Operation Research For Automobile Engineers	3	0	0	3
BAM012	Transport management and Motor Industry	3	0	0	3
BAM013	Quality Control and Reliability Engineering	3	0	0	3
BAM014	Advanced Theory of IC Engines	3	0	0	3
BAM015	Automotive Safety	3	0	0	3
BAM016	Vehicle Air Conditioning System	3	0	0	3
BAM017	Special Type of Vehicles	3	0	0	3
BAM018	Hybrid Electric and Fuel cell vehicles	3	0	0	3

BEN 101 **ENGLISH - I** **L T P C**
3 1 0 3

Aim: To make the students learn the basics of communication in order to talk fluently, confidently and vividly.

Objective: To make them master the techniques of professional communication so that they become employable after completing the course.

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.
CO5: They will get a clear idea abt LSRW(Listening, Speaking , Reading , Writing)

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W				S			S				
CO2		S				S						S
CO3			M					M				
CO4										S	S	
CO5						W		S				

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9 + 3**

Parts of speech - Active and passive voices - Subject verb agreement. - Writing about School life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

UNIT II **9+3**

Cause and effect relations – Punctuations –Differences between verbal and nonverbal communication -E - mail communication – Homophones - Etiquettes of E mail communication. Interpreting graphic representation - Flow chart and Bar chart.

UNIT III **9+3**

Degrees of comparison – Positive, Comparative, Superlative - wh question

Physics, and chemistry, workshop and Survey report for introducing new product in the market.

UNIT IV **9+3**

Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a review-Preparing minutes of the meeting , Agenda , official circulars.

UNIT V **9+3**

Accident reports (due to flood and fire) - Hints development - Imperatives - Marking the stress Connectives , prepositional relatives.

Total: 60 Periods

Text Book

1. Department of humanities and social sciences division, Anna university, oxford university press, 2013.

Reference:

1. S.P.Danavel, English and Communication for Students of Science and engineering, Orient Blackswan, Chennai, 2011.
2. Rizvi, M.Asharaf, Effective Technical Communication, New Delhi, Tata McGraw Hill Publishibg Company, 2007.
3. MuraliKrishna and SunithaMoishra, Communication Skills for Engineers . Pearson, New Delhi, 2011..

BMA 101 **ENGINEERING MATHEMATICS – I** **L T P C**
3 1 0 3

Course Aim: To equip students with adequate knowledge of Mathematics to formulate problems in engineering environment and solve them analytically.

Course Objectives:

At the end of this course, students shall be able to

i) Apply matrix operations to solve the relevant real life problems in engineering.
ii) Formulate a mathematical model for three dimensional objects and solve the concerning problems.
iii) Find area and volume based on a function with one or more variables.

Course outcome:

CO1: Apply matrix operations to solve the relevant real life problems in engineering.
CO2: Formulate a mathematical model for three dimensional objects and solve the concerning problems.
CO3: Find area and volume based on a function with one or more variables.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-1 Matrices **9+3**

Characteristic equations- Eigen values and eigen vectors of the real matrix- Properties- Cayley-Hamilton theorem(Excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form- Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II Three Dimensional Analytical Geometry **9+3**

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

UNIT-III Differential Calculus **9+3**

Curavuture in Cartesian coordinates- Centre and radius of curvature- Circle of curvature- Evolutes- Envelopes- Applications of Evolutes and Envelopes.

UNIT-1V Functions of Several Variables **9+3**

Partial derivatives- **Euler's theorem for homogeneous functions**- Total derivatives- Differentiation of implicit functions- Jacobians- **Taylor's expansion**- Maxima and Minima- Method of Lagrangian multipliers.

UNIT-V Multiple Integrals **9+3**

Double integration- Cartesian and Polar coordinates- Change of order of integration- Change of variables between Cartesian and Polar coordinates- Triple integration in Cartesian coordinates-Area as double integral- Volume as triple integral.

Total : 60 Periods

TEXT BOOK:

1. Ravish R.Singh and Mukkul Bhatt, **"Engineering** Mathematics-**I" First Reprint, Tata McGraw Hill Pub Co.,** New Delhi. 2011.

2. **Grewal.B.S, "Higher Engineering Mathematics", 40**th Edition, Khanna Publications, Delhi. 2007.

REFERENCES:

1. Ramana**.B.V. "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,** 2007.
2. **Glyn James, "Advanced Engineering Mathematics", 7**th Edition, Pearson Education, 2007.
3. Erwin Kreyszig, **"Advanced Engineering Mathematics",** 8th Edition, John Wi;ey and Sons,New York, 2003.
4. **Murray R.Spiegel, "Advanced Calculus", Schaum's Outline Series,** First Edn, McGraw Hill Intl Book Co., New Delhi, , 1981.

BPH 101 **ENGINEERING PHYSICS – I** **L T P C**
3 0 0 3

Objectives

- To make a bridge between the physics in school and engineering courses.
- To impart a sound knowledge on the basic concepts of modern sciences like engineering applications of ultrasonics, lasers, fundamentals of crystal physics and utility of solar energy.

COURSE OUTCOMES

CO1 - To Know about Ultrasonic and its application in NDT.
CO2 - To know the principle of Laser and its application in Engineering and medicine.
CO3 - Acquire Knowledge on Quantum Physics.
CO4 – Properties of Electro Magnetic Theory.
CO5 – To understand the impact of Crystal Physics.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S						M					
CO2		W	S		M				M			M
CO3												
CO4	S		M	W							S	
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-I Ultrasonics **9**

Introduction – Production- Magnetostriction Effect- Magnetostriction Generator- Piezoelectric Effect- Piezo electric generator- Detection of ultrasonic waves- Properties- Cavitation- Acoustic grating -Industrial applications-Drilling, Welding, Soldering, Cleaning and SONAR- Velocity measurement- - Non-Destructive Testing (NDT) – Pulse-Echo System through transmission and reflection modes- A, B And C Scan Display methods- Important medical applications- Sonogram--problem.

UNIT-II LASER **9**

Introduction- Principle of spontaneous emission and stimulated emission- **Einstien's A &B Coefficients**-Derivation-Condition for producing aaser beam- Population inversion-Pumping- Resonance cavity- Types Of Lasers- ND-YAG- He-Ne- Co2 Lasers-Industrial applications- Heat treatment- Welding-Cutting-Medical applications-Laser surgery-Advantages & disadvantages-problem.

UNIT-III Quantum Physics **9**

Drawbacks with classical physics- Blackbody radiation: Max Planck theory and concept of energy quantization, **deduction of Wien's displacement law, Raleigh**-Jeans law **–** Matter waves- de Broglie wave length-photoelectric effect **–** Schrödinger equation (time-independent, and time-dependent equations)- wave functions and energy spectrum-application to particle in box-problem.

UNIT – IV Electromagnetic Theory **9**

Electric charges-**Coulomb's law of inverse squares**- Electric field and its calculations-field lines-**Gauss's law**-applications of Gauss law. Magnetism - Magnetic field-Magnetic field lines- Magnetic flux- Motion of charged particles in magnetic field-Magnetic field of a moving charge. Electromagnetic wave- speed of electromagnetic wave and its quantitative deduction-group velocity- energy in electromagnetic waves-electromagnetic waves in matters-problems.

Unit-V Crystal Physics **9**

Lattice- Unit Cell- Bravais Lattice- Lattice Plane- Miller Indices- d-Spacing in cubic lattices- Calculation of number of atoms per unit cell- Atomic radius- Coordination number- Packing Factor- SC,BCC, FCC, HCP Structures- Polymorphism and Allotropy-Crystal defects- point, line and surface defects- Burger**'s v**ector-problems.

Total: 45 Periods

Text Books

1. Sears.F.W., Zemansky.M.W., **Young.H.D,;'University Physics; Narosa Publishing House.**
2. Avadhanulu. M.N.; Engineering Physics-Vol-1; S.Chand And Company Ltd, 2010.

Reference Books

1. **Rajendran.V, And Marikani . A, 'Engineering Physics' Tata Mcgrow ?Hil Publications Ltd, 3**rd Edition, New Delhi (2004).
2. **Sears., Zemansky.,, Young.;'College Physics; Addison Wesley Publishing Company.**
3. **Mukundan. A, Usha.S., Lakshmi.V; 'Engineering Physics' Scitech Publications (India) Pvt.Ltd., Chennai, 2006.**
4. Resnick, R., and Halliday, D. and Walker, J.; Fundamental of Physics; John Wiley and Sons.

BCH 101 **ENGINEERING CHEMISTRY – I** **L T P C**
3 0 0 3

Course Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Objectives:

i) To make the student to be conversant with the principles, water characterization and treatment for portable and industrial purposes.
ii) To impart knowledge on the essential aspects of Principles of polymer chemistry and engineering applications of polymers
iii) To impart knowledge on the essential aspects of Principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
iv) To make the students understand the Principles of corrosion and corrosion control.
v) To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices.

Course outcomes:

CO1 – Having a knowledge of Water characterization and treatment of portable and Industrial purposes.

C**O2** – Having the thinking of Principles of polymer chemistry and engineering applications of polymers.

CO3 – Having a deep knowledge about the Principles of electrochemistry

CO4 – With a true wisdom about Corrosion

CO5 - Having a sound knowledge in the Field of the Conventional and non-Conventional energy.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M		M					M
CO3		M		S						M	S	
CO4	S		M	W							S	
CO5		W	W								M	

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Water Technology **9**

Introduction-Characteristics : Hardness of water – types - temporary and permanent hardness - estimation by EDTA method Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination –Domestic water treatment – disinfection methods (Chlorination, ozonation , UV treatment) Boiler feed water – requirements – disadvantages of using hard water in boilers Internal conditioning (Calgon Conditioning method) – External conditioning – Demineralization process – Desalination and Reverse osmosis.

UNIT II Polymers **9**

Introduction-Polymers- definition – polymerization – degree of polymerisation - types of polymerisation – Addition polymerisation and Condensation polymerization – Mechanism of Polymerisation - free radical polymerization mechanism only, Plastics: Classification – thermoplastics and thermosetting plastics – difference between thermoplastics and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET, Rubber :Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber-Synthetic rubbers – butyl rubber and SBR

UNIT III Electro chemistry **9**

Introduction CELLS: types of Electrochemical cells , Electrolytic cells – Reversible and irreversible cells EMF – measurement of emf – Single electrode potential – Nernst equation Reference electrodes : Standard Hydrogen electrode -Calomel electrode Ion selective electrode :Glass electrode and measurement of pH using Glass electrode Electrochemical series – significance Titrations :Potentiometer titrations (redox - Fe^{2+} vs dichromate titrations) Conductometric titrations (acid-base – HCI vs, NaOH titrations).

UNIT IV Corrosion and Corrosion Control **9**

Introduction: Chemical corrosion Definition - Chemical Corrosion - Electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – mechanism of Chemical and Electrochemical corrosion factors influencing corrosion Corrosion control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints – constituents of the paint and their functions Metallic coatings – electroplating of Gold and electroless plating of Nickel.

UNIT V Non-Conventional Energy Sources and Storage Devices **9**

Introduction : Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain Reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for power generation (block diagram only) – breeder reactor Solar energy conversion – solar cells – wind energy Fuel cells – hydrogen – oxygen fuel cell Batteries :Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries :Lead–acid storage battery –working –uses Nickel–cadmium battery - working –uses Solid – state battery : Lithium battery

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S. Dara "A text book of engineering chemistry" S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai, (2007).

REFERENCES:

1. B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008)

BCS 101 FUNDAMENTALS OF COMPUTING AND PROGRAMMING L T P C
3 0 0 3

Course Objectives:

1. To enable the student to learn the major components of a computer system.
2. To know the correct and efficient way of solving problem.
3. To learn to use office automation tools.
4. To learn and write program in "C**".**

Course Outcome:

CO1: Student will understand the major components of computer systems.
CO2: Will know the correct and efficient way of solving problems.
CO3: Will learn the use of automation tools.
CO4: Will learn and write program in "C".

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S						M					
CO2		W	S		M							M
CO3		W		S						S		
CO4	M		M	W								

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I: Introduction to Computer **9**

Introduction-Characteristics of computer-Evolution of Computers-Computer Generations - Classification of Computers-Basic Computer Organization-Number system. Computer Software: Types of Software—System software-Application software-Software Development Steps

UNIT II: Problem Solving and Office Automation 9

Planning the Computer Program – Purpose – Algorithm – Flowcharts– Pseudo code Introduction to Office Packages: MS Word , Spread Sheet, Power Point, MS Access, Outlook.

UNIT III: Introduction to C **9**

Overview of C-Constants-Variables-Keywords-Data types-Operators and Expressions - Managing Input and Output statements-Decision making-Branching and Looping statements.

UNIT IV: Arrays and Structures **9**

Overview of C-Constants, Variables and Data types-Operators and Expressions - Managing Input and Output operators-Decision making-Branching and Looping.

UNIT V: Introduction to C++ **9**

Overview of C++ - Applications of C++-Classes and objects-OOPS concepts - Constructor and Destructor- A simple C++ program –Friend classes and Friend Function.

Total: 45 Periods

Text books:

1. Ashok, N.Kamthane,"Computer Programming", Pearson Education (2012).
2. Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling Kindersley
   (India Pvt Ltd).,Pearson Education in South Asia,(2011).
3. Yashavant P. Kanetkar, "Let us C",13th Edition,BPB Publications(2013).
4. Yashavant P. Kanetkar,"Let us C++"10th Edition, BPB Publications (2013).

References:

1. Pradeep K.Sinha, Priti Sinha "Foundations of Computing", BPB Publications (2013).
2. Byron Gottfried, "Programming with C", 2nd edition, (Indian Adapted Edition), TMH publication.
3. PradipDey,ManasGhosh,Fundamentals of Computing and Programming in 'C' First Edition ,Oxford University Press(2009)
4. The C++ Programming Language ,4thEdition,BjarneStroustrop,Addison-Wesley Publishing Company(2013)

BBA101/BBA102 PERSONALITY DEVELOPMENT L T P C
1 1 0 2

Aim: The students should be able to act with confidence, be clear about their own personality, character and future goals.

Instructional Objectives:

- To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.
- To impart training for positive thinking, this will keep the students in a good stead to face the challenges.
- To bring out creativity and other latent talents with proper goal setting so that self- esteem gets enhanced.
- To develop an individual style and sharpen the skills in the area of leadership, decision making, time management and conflict management.
- To sharpen the employability skills of the professional undergraduate students and aid them in landing in the desired job.

Course Outcomes:

CO1: Will understand the concept of personality.

CO2: Will get positive thinking and become capable of facing challenges.

CO3: Will develop a individual style.

CO4: Employability will be sharpen

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								S	S	S		
CO2		W	W		M			S	M	S	M	M
CO3		M		W				S	S	S		
CO4			M	W				S	S	S	M	

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Introduction to Personality Development **9**

The concept personality- Dimensions of theories of Freud & Erickson- personality – significant of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analyses.

UNIT II Attitude & Motivation **9**

Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages –Negative attitude - Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self-motivation- Factors leading to de-motivation

Unit III Self-esteem **9**

Term self-esteem - Symptoms - Advantages - Do's **and Don'ts to develop positive self**-esteem – Low self-esteem - Symptoms - Personality having low self esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

Unit IV Other Aspects of Personality Development **9**

Body language - Problem-solving - Conflict and Stress Management - Decision-making skills -Leadership and qualities of a successful leader - Character-building -Team-work - Time management -Work ethics –Good manners and etiquette.

Unit V Employability Quotient **9**

Resume building- The art of participating in Group Discussion – Acing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Total: 45 Periods

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata Mc Graw Hill.
2. Stephen P. Robbins and Timothy A. Judge(2014), *Organizational Behavior 16 th Edition:* Prentice Hall.

Reference Books:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988.
2. Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004

BBT102 BIOLOGY FOR ENGINEERS L T P C
2 0 0 2

Course Aim: To provide a basic understanding of biological mechanisms and their applications from the perspective of engineers

Course Objectives:
The Students will be able to

- To understand the fundamentals of living things, their classification, cell structure and biochemical constituents
- To apply the concept of plant, animal and microbial systems and growth in real life situations
- To comprehend genetics and the immune system
- To know the cause, symptoms, diagnosis and treatment of common diseases
- To give a basic knowledge of the applications of biological systems in relevant industries

Course Outcomes:

CO1: Student will understand the fundamentals of living things and their Classification.
CO2: Able to apply biological concept in real life situation.
CO3: Will have the basic knowledge in application of biological system in relevant industries.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M		M					M
CO3		M		S								

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-I Introduction to Life **7**

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic and eukaryotic cell-Introduction to biomolecules: definition-general classification and important functions of carbohydrates-lipids-proteins-nucleic acids vitamins and enzymes-genes and chromosome.

UNIT-II Biodiversity **6**

Plant System: basic concepts of plant growth-nutrition-photosynthesis and nitrogen fixation-Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions-Microbial System: history-types of microbes-economic importance and control of microbes.

UNIT-III Genetics and Immune System **8**

Evolution: theories of evolution-**Mendel's** cell division–mitosis and meiosis-evidence of e **laws of inheritance**-variation and speciation- nucleic acids as a genetic material-central dogma immunity-antigens-antibody-immune response.

UNIT-IV Human Diseases **4**

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertention, influenza, AIDS and Hepatitis

UNIT-V Biology and its Industrial Application **8**

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-drug discovery-biological neural networks-bioremediation-biofertilizer-biocontrol-biofilters-biosensors-biopolymers-bioenergy-biomaterials-biochips-basic biomedical instrumentation

Total: 45 Periods

Text Books:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

Reference Books

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

BCE 101/BCE 201 BASIC CIVIL ENGINEERING L T P C
2 0 0 2

Course Objectives: At the end of this course, students shall be able to

- To expose students with the basics of Civil Engineering
- To understand the components of a building
- To Learn Engineering aspects related to dams, water supply, and sewage disposal

Course objective:

CO1: Students will be exposed to basics of civil engineering.
CO2 : Will understand the components of buildings.
CO3 : Will learn the engineering aspects to dams , water supply and sewage disposal.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M				M			M
CO3		M		S								

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT- I Civil Engineering Materials **8**

Introduction – Civil Engineering – Materials – Stones – Bricks – Sand – Cement – Plain Concrete – Reinforced Cement Concrete – Steel Sections – Timber – Plywood – Paints – Varnishes (simple examples only)

UNIT- II Surveying **5**

Surveying – objectives – classification – principles of survey-Measurement of distances – Chain survey – Determination of areas – Use of compass – Use of leveling Instrument – (simple examples only)

UNIT- IIIFoundation for Building **5**

Bearing Capacity of Soil – Foundation – Functions – Requirement of good foundations – Types of foundations – Merits & Demerits.

UNIT- IV Superstructure **7**

Stone Masonry – Brick Masonry – Columns – Lintels – Beams – Roofing – Flooring – Plastering
– White Washing (Simple examples only)

UNIT- VMiscellaneous Topics **5**

Types of Bridges –Dam- purpose – selection of site - Types of Dams – Water Treatment & Supply sources – standards of drinking- distribution system. – Sewage Treatment (simple examples only)

TOTAL : 30 PERIODS

Text Books:

1. Raju .K.V.B, Ravichandran .P.T, "Basics of Civil Engineering", Ayyappa Publications, Chennai, 2012.
2. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, (1st ed. 2005).
3. Dr.M.S Palanisamy, "Basic Civil Engineering" (3rd ed. 2000), TUG Publishers, New Delhi/Tata Mc Graw Hill Publication Co., New Delhi

Reference Books:

1. Rangwala .S.C," Engineering Material"s, Charotar Publishing House, Anand, 41st Edition: 2014.
2. National Building Code of India, Part V, "Building Materials", 2005
3. Ramesh Babu "A Textbook on Basic Civil Engineering" (1998). Anuradha Agencies, Kumbakonam.
4. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd.

BME 101 ENGINEERING GRAPHICS- E L T P C
2 0 3 4

Aim

To develop graphical skills in students for communication of concepts, design ideas of engineering products and expose them to existing standards related to technical drawings.

Objectives

- To visualize and produce two dimensional graphic representation of three dimensional objects and buildings.
- To comprehend and visualize 3D views of objects.
- To understand and generate the different curves used in engineering applications.
- To introduce the fundamental of CAD Graphics used in design.
- To visualize interior portions of object and also to draw the surfaces necessary for producing prisms, pyramids, cone, tray, duct etc.,

Course Outcomes:

CO1: Student Ability of visualization will increase.

CO2: Student will understand and develop different engineering curves.

CO3: student will understand the application of computer in graphics.

CO4: Will understand the surface necessary for producing different solids

CO5: Understand the importance of graphical representations of engineering components.

CO5: They will get a clear idea abt LSRW(Listening, Speaking , Reading , Writing)

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								W			
CO2		W	S		M					W		
CO3		M		S				S				
CO4	S		M	W								S
CO5		W	W						M			

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-I Basic Curves, Projection of points and Straight lines **6+6**

Conics-construction of ellipse, parabola and hyperbola by eccentricity method-construction of cycloids- construction of involutes of square and circle-Drawing of tangent and normal to the above curves-Scales-Basic drawing conventions and standards-Orthographic projection principles- Principal planes-First angle projection-Projection of points. Projection of straight lines (only first angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces.

UNIT-II Projections of Planes and solids **6+6**

Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes. Projection of simple solids like prisms, pyramids, cylinder, cone, tetrahedran and truncated solids when the axis is inclined to one of the principal planes/ both principal planes by rotating object method and auxiliary plane method.

UNIT-III Orthographic Projections, Isometric projections & Free hand sketching **6+6**

Orthographic projection of Simple parts from 3D diagram-Principles of isometric projection and isometric view-isometric scale- Isometric projections of simple solids and truncated solids-Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems Free hand sketching of orthographic & Isometric projection

UNIT-IV Projection of Sectioned solids and development of surfaces **6+6**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids- Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT-V Perspective projection, building drawing and Computer aided drafting **6+6**

Perspective projection of simple solids-Prisms, Pyramids and cylinders by visual ray method. Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings. Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages.

Total: 60 Periods

Text Books:

1. N.D.Bhatt and V.M.Panchal, "Engineering drawing", charotar publishing house, 50th edition, 2010.
2. K.V.Natarajan "A Text book of Engineering Graphics",Dhanalakshmi Publishers, Chennai, 2009.

References:

1. K.R.Gopalakrishna, “Engineering drawing”,(Vol-I & II combined) Subhas stores, Bangalore,2007.
2. K.Venugopal and V. PrabhuRaja, “Engineering Graphics”,New age International Private limited,2008.
3. Luzzader, Warren.J., and Duff, John.M.,, “Fundamentals of Engineering Drawing with an introduction to Interactive computer graphics for design and production”, Eastern economy edition,Prentice Hall of India Pvt Ltd,New Delhi,2005.

Special points applicable to University Examinations on Engineering Graphics

1) There will be five questions, each of either or type covering all units of the syllabus.

2) All questions will carry equal marks of 20 each making a total of 100.

BCM1L1/ BCM2L1

BASIC CIVIL & MECHANICALENGINEERING PRACTICES LABORATORY L T P C

0 0 2 1

Aim

To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.

Objectives

1. To provide hands on exercises in common plumbing and carpentry works associated with residential and industrial buildings.
2. To expose the students regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furnitures.
3. To provide hands on exercise on basic welding, machining and sheet metal works.
4. To provide exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,
5. To expose the students regarding the construction and working of centrifugal pump, air-conditioner and lathe.

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
d) Hands-on-exercise: Basic pipe connectionof PVC pipes &G.I. Pipes – Mixed pipe material connection – Pipe connections with different joining components.
e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Hand tools and Power tools:

a) Study of the joints in roofs, doors, windows and furniture.
b) Hands-on-exercise:Wood work, joints by sawing, planning and cutting.
c) Preparation of half joints, Mortise and Tenon joints.

II MECHANICAL ENGINEERING PRACTICE

Welding: Preparation of butt joints, lap joints and tee joints by arc welding.

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:
b) Model making – Trays, funnels, etc.
c) Different type of joints.
d) Preparation of air-conditioning ducts.

Machine assembly practice:

a) Assembling, dismantling and Study of centrifugal pump
b) Assembling, dismantling and Study of air conditioner
c) Assembling, dismantling and Study of lathe.

Moulding: Moulding operations like mould preparation for gear and step cone pulley etc.,

Fitting: Fitting Exercises – Preparation of square fitting and vee – fitting models.

Demonstration:

a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
b) Gas welding.

REFERENCES:

1. K. Jeyachandran, S. Nararajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory" , Anuradha Publications, (2007).

2. T.Jeyapoovan, M. Saravanapandian & S. Pranitha, "Engineering Practices Lab Manual",Vikas Publishing House Pvt. Ltd. (2006)

3. H. S. Bawa, "Workshop Practice",Tata McGraw – Hill Publishing Company Limited, (2007).

4. A. Rajendra Prasad & P. M. M. S Sarma, "Workshop Practice", Sree Sai Publication, (2002).

5. P. Kannaiah & K.L. Narayana, "Manual on Workshop Practice", Scitech Publication, (1999).

BEN 201 **ENGLISH II** **L T P C**
3 1 0 3

Aim: To make the students learn the basics of communication in order to talk fluently , confidently and vividly.

Objective: To make them master the techniques of professional communication so that they become employable after completing the course

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex.
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.
CO5: They will get a clear idea abt LSRW(Listening, Speaking , Reading , Writing)

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S							M				S
CO2		W	S		M						W	
CO3		M		S				S		S		
CO4	S		M	W								S
CO5		W	W			M				M		

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Orientation **9 + 3**

Numerical adjectives - Meanings in context - Same words used as different parts of speech - Paragraph writing - Non- verbal communication - Regular and Irregular verbs.

UNIT II Oral Skill **9 + 3**

Listening to audio cassettes - C.Ds , News bulletin - Special Lectures, Discourse - Note taking - Sentence patterns - SV, SVO, SVC, SVOC, SVOCA - and Giving Instructions - Reading Comprehension answering questions. Inferring meaning.

UNIT III Thinking Skill **9+3**

Self- introduction describing –Group Discussion – Debate –Role play- Telephone- Things-etiquette- Recommendation and Sequencing jumbled sentences to make a suggestions-paragraph-advertisement and notice, Designing or drafting posters, writing formal and informal invitations and replies.

UNIT IV Writing Skill **9 + 3**

Definitions - Compound nouns - Abbreviations and acronyms - business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies): (b) letters to the editor(giving suggestions on an issue) .

UNIT V Formal Information **9 + 3**

Editing – Prepositions - Articles - Permission letter for undergoing practical training , Essay writing - Application for a job , letter to the principal authorities regarding admissions, other issues, requirement or suitability of course etc.

Total: 60 Periods

TEXT BOOK:

1. Meenakshi Raman, SangeethaSharma , Technical English for Communication: Principle and Practice, OUP, 2009.

REFERENCE BOOKS:

1. Sumanth , English for engineers, Vijay Nicole , Imprints pvt ltd.2013.
2. Meenakshi Raman and SangeethaSharma , Technical Communication Principles and Practice, Oxford University Press, 2009.
3. Sangeetha Sharma, Binodmishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New Delhi, 2010.

BMA 201 - ENGINEERING MATHEMATICS – II **L T P C**
3 1 0 3

Course Aim: To impart adequate knowledge of Mathematics to the students so as to formulate problems in engineering environment and solve them using mathematical tools.

Course Objectives:

- At the end of this course, students shall be able toSolve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.
- Deal with applications in a variety of fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.
- Find intensity of degree of relationship between two variables and also bring out regression equations.

Course outcome:

CO1: Apply matrix operations to solve the relevant real life problems in engineering.
CO2: Formulate a mathematical model for three dimensional objects and solve the concerning problems.
CO3: Find area and volume based on a function with one or more variables.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											W
CO2		W	S		M		M			M		
CO3		M		S				W				S

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Ordinary Differential Equation **9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – **Cauchy's** and L**egendre's linear equations** - simultaneous first order linear equations with constant coefficients.

UNIT II Vector Calculus **9+3**

Gradient,divergence and curl –Directional derivatives – Irrotational and solenoidal vector fields – vector integration– Green's theorem in a plane , Gauss divergence theorem and Stoke's theorem **(**without proofs) – simple applications involving cubes and rectangular parallelepipeds.

UNIT III Analytic Functions **9+3**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) – Harmonic and orthogonal properties of analytic functions – Harmonic conjugate – construction of analytic functions – conformal mapping : W= Z+C,CZ , 1/Z and bilinear transformation.

UNIT IV Complex Integration **9+3**

Complex integration – Statement and application of Cauchy's integral theorem and Cauchy's integral formula –Taylor and Laurent expansions – Singular points – Residues – Residue theorem –Application of Residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding ploes on boundaries).

UNIT V Statistics **9+3**

Mean, Median, Mode – Moments – Skewness and Kurtosis – Correlation – Rank Correlation – Regression –Chi square test for contingency tables.

Total: 60 Periods

TEXT BOOK :

1. 1 . R.M.Kannan and B.Vijayakumar "Engineering Mathematics – II "2nd Edition , SRB Publication , Chennai 2007.
2. Bali.N.P and Manish Goyal , " Engineering Mathematics " , 3rd Edition , Laxmi Publications (p) Lltd, 2008 .
3. Grewal .B/S "Higher Engineering Mathematics" , 40th Editon , Khanna Publications , Delhi , 2007 .

REFERENCES :

1. Ramana.B.V , " Higher Engineering Mathematics " , Tata McGraw Hill Publishing Company , New Delhi, 2007.

2. Gupta SC, and VK.Kapoor, "Fundamentals Mathematical Statistics", 11th edition, Sultan Chand Sons, , New Delhi, 2014.

BPH 201 **ENGINEERING PHYSICS – II** **L T P C**
3 0 0 3

Objectives

- To expose the students to multiple areas of science of engineering materials which have direct relevance to different Engineering applications

- To understand the concepts and applications of conducting, Semiconducting, magnetic & dielectric materials as well as their optical properties.

Course outcomes

CO1 - To Know about properties and advancements of conducting materials .

CO2 - To Know the principle and properties semiconducting materials.
CO3 - Acquire Knowledge on magnetic and dielectric materials
CO4 – To Know about the creation of new materials with novel properties
CO5 – To Understand the impact of light in technical uses

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S										M	
CO2		W	S		M							
CO3		M		S			S					M
CO4	S		M	W					M			
CO5		W	W							W		

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I Conducting Materials **9**

Classical Free Electron Theory of Metals- Drawback of Classical Theory – Wiedemann Franz Law-Density of States- Fermi-Dirac Statistics- Calculation of Fermi Energy and Its Importance - High Resistivity Alloys – Super Conductors – Properties and Applications – Magnetic Levitation, SQUIID, Cryotron.

UNIT – II Semiconducting Materials **9**

Elemental and Compound Semiconductors and Their Properties- Carrier Concentrations (Electrons and Holes) In Intrinsic Semiconductors - Carrier Concentrations in N- Type and P- Type Semiconductors – Variation of Fermi Level and Carrier Concentration With Temperature - Variation of Conductivity With Temperature – Band Gap Determination – Hall Effect – Experimental Arrangement - Application.

UNIT-III Magnetic and Dielectric Materials **9**

Different Type of Magnetic Material And Their Properties – Hard And Soft Magnetic Material – Domain Theory Of Ferromagnetism – Hysteresis – Energy Product of Magnetic Materials – Ferrites and Their Applications – Various Polarization Mechanisms In Dielectric – Frequency and Temperature Dependence – Internal Field and Detection of Classius – Mosotti Equation – Dielectric Loss- Dielectric Breakdown.

UNIT- IV New Engineering Material **9**

Shape memory Alloys- Types- General Characteristics- Applications – Metallic Glasses- Properties-Applications –transformer as a Core Material – Nano Phase Materials – Properties – Production – Ball
Milling Technique – Sol- Gel Method – Chemical Vapour Deposition - Applications.

UNIT-V Optical Materials and Optical Fibers **9**

Light Interaction With Solids- Classification of Optical Material – Optical Properties of Metals, Insulator And Semiconductors – Traps – Colour Centers – Luminescence – phosphorescence – LED – LCD – Construction and Working – Advantages and Disadvantages – Applications. Principle and Propagation of Light In Optical Fibers - Numerical Aperture And Acceptance Angle- Types Optical Fibers (Material, Refractive Index, Mode based) - Double Crucible Technique of Fiber Drawing.

Total: 45Periods

TEXT BOOKS

1. **"**Science **of engineering materials", by Dr. A.Mukunthan and S.Usha –** SciTech publications (india) Pvt Ltd; chennai, (2007).
2. Charless Kittel **'introduction to solid state physics', john wiley & sons, 7**th edition, singpore (2007).

REFERENCE BOOKS

1. Material science by r.suresh, v. jayakumar – lakshmi publications; arapakkam (2006).
2. Material science by Dr. P. K. Palanisamy – Scietech publications (india) Pvt Ltd, chennai (2006).
3. Rajendran V and Marikani a, 'material science' tata mcgraw hill publications Ltd, 3rd edition , new delhi (2004).
4. M.Arumugam, 'material science', anuradha publications, kumbakonam (2006).

BCH 201 ENGINEERING CHEMISTRY – II L T P C
3 0 0 3

Course Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Objectives:

- To make the students to have a sound knowledge with industrial applications of surface chemistry
- To impart knowledge about the Industrial importance of Phase rule and alloys
- To make the students to be conversant with Analytical techniques and their importance
- To have an idea and knowledge about the Chemistry of Fuels and
- To make them study to have a deep knowledge in Chemistry of engineering materials

Course outcomes:

CO1 – Having a knowledge of industrial applications of Surface Chemistry
CO2 – Having the thinking of industrial importance of Phase rule and alloys
CO3– Having a deep knowledge with Analytical techniques and their importance.
CO4 – With a true wisdom about Chemistry of Engineering materials.
CO5 - Having a well-versed knowledge of the Chemistry of Fuels and Combustion.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M					M		
CO3		M		S			S		W			
CO4	S		M	W								W
CO5		W	W					W				

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I - Surface Chemistry **9**

Introduction **:** Adsorption , absorption , desorption , adsorbent , adsorbate and sorption **–** (definition only) Differences between adsorption and absorption Adsorption of gases on

solids – factors affecting adsorption of gases on solids – Adsorption isotherms – Frendlich adsorption isotherm and Langmuir adsorption isotherm Role of adsorbents in catalysis, Ion-exchange adsorption and pollution abatement.

UNIT II - Phase Rule and Alloys **9**

Introduction **:**Statement of Phase Rule and explanation of terms involved – one component system – water system – Construction of phase diagram by thermal analysis - Condensed phase rule [Definition only] Two Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic composition – Pattinsons Process of desilverisation of Lead Alloys : Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing – hardening – tempering normalizing – carburizing - nitriding . Non- ferrous alloys: Brass and Bronze

UNIT III - Analytical Techniques **9**

Introduction: Type of Spectroscopy - Atomic spectroscopy – molecular spectroscopy - Explanation IR spectroscopy – principles – instrumentation (block diagram only) – applications - finger print region UV-visible spectroscopy –– principle – instrumentation (block diagram only) – Beer-Lambert's law- – estimation of iron by colorimetry – Atomic absorption spectroscopy- principle - instrumentation (block diagram only) - estimation of Nickel by Atomic absorption spectroscopy Flame photometry– principles – instrumentation (block diagram only) - estimation of sodium ion by Flame photometry

UNIT IV - Fuels **9**

Introduction **:** Calorific value – types of Calorific value - gross calorific value – net calorific value Analysis of Coal –- Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto-Hoffmann method Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed catalytic cracking method-Octane number and Cetane number (definition only) Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG (definition and composition only) Flue gas analysis – importance - Orsat apparatus

UNIT V Engineering Materials **9**

Introduction : Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractories : alumina bricks and Magnesite bricks, Abrasives – natural and synthetic abrasives Natural type : Siliceous - quartz ; Non –siliceous – diamond Synthetic Abrasives : silicon carbide and boron carbide. Lubricants : Liquid lubricants - Properties – viscosity index, flash and fire points, cloud and pour points, oilyness) Solid lubricants – graphite and molybdenum sulphide

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).

2. S.S.Dara “A text book of Engineering Chemistry” S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).

REFERENCES:

1. B.Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma “Engineering Chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).

BFR 101 / 201 FRENCH **L T P C**
3 0 0 3

Importance of the Course:

1. Learning a language is almost akin to a journey of discovery. It not only opens up a whole new **dimension but also contributes significantly to the development of an individual's** intelligence.

2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.

3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.

Course Objective

The Basic Course in French is designed to :

1. Introduce the basics of the language to beginners

2. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

Synchronies I consists of 13 lessons with each lesson presenting a dialogue and giving the know-how, grammatical and lexical notions as well as activities required for communication. In addition, Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context has been used.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I: **9**

At the airport: Savoir– faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs 'to be', 'to call oneself', subject pronouns, interrogation

UNIT – II **9**

At the University: Savoir-faire: enquiring after one's welfare, taking leave, expressing appreciation -Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular 'er' verbs, 'to have', 'to learn', negation, irregular verbs

UNIT – III **9**

At the café: Savoir –faire: speaking about one's likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

UNIT – IV **9**

At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & nplural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs

UNIT – V

A concert: Savoir –faire: inviting, accepting, expressing one's inability to accept an invitation

UNIT – VI

Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, **At Nalli's** Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, exclamative adjectives, imperative tense

Total: 45 hours

REFERENCES:

- Course Material: Synchronie I – Méthode de Français

- Madanagobalane -Samita Publications, Chennai, 2007

M 101/ 201 GERMAN **L T P C**
3 0 0 3

Course Aim: To equip students with some basic knowledge of German to get oriented to the new problems in global environment and address them.

Course Objectives: At the end of this course, students shall be able to obtain good knowledge of the language, to read, write and speak German, whereby the emphasis is laid on speech. At the end of the first course, the students are in the position to communicate in a basic manner. An example of their skills would be:

- **Ordering food in a restaurant**
- **Expressing their likes and dislikes**
- **Going** for shopping
- **Booking a room in a hotel**
- **Or even making complaints where** ever necessary.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

Course structure:

A. German Language (speaking, reading, writing, grammar and test)
B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
C. The German Way (introduction, doing business, conversation, meetings, dining)
D. Germany (Culture, Climate)

UNIT I **9**

Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers) Greetings, ordering, requesting, saying thank you - Grammar **– the article "the", conjugation** of
verbs

UNIT II **9**

Shopping - Grammar **–** adjectives, endings before nouns, practice. Self introduction

UNIT III **9**

Addresses, Occupations, Studies - Grammar - 'to be', the definite/indefinite articles, individual Training

UNIT IV **9**

Leisure Time, Sports, Hobbies - Grammar **–** position of a verb in a main clause , oral practice

UNIT V **9**

At a Restaurant, Food and Drink - Grammar **–** the personal pronoun in the Nominative and Accusative, Narrating an event

TOTAL 45 hours

Resources:

- Sprachkurs Deutsch 1 (Verlag Diesterweg), New Delhi Learning Centre

BJP 101/201 **JAPANESE** **L T P C**

3 0 0 3

Course Objective:

The student will be able

- To have a basic knowledge of Japanese language, Japanese culture and heritage
- To impart knowledge Japanese lifestyle.
- To give sufficient exposure to develop basic conversational skills.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

Introduction-history and origin of Japanese language-Japan and its cultural heritage-Self introduction-counting numbers (1-100)-time-conversation with the use of audio devices, grammar– usage of particles wa, no, mo and ka

UNIT II **9**

Greetings, seasons, days of the week and months of the year-numbers (up to 99,999)-grammar– usage of kore, sore, are, kono, sono, ano, koko and kochira, arimasu and imasu-i-ending and na-ending adjectives-use of audio and drills for practice

UNIT III **9**

Asking the price–associated vocabulary-usage of particles ni, ga and ne- use of audio and drills for practice-Introduction to basic Kanji characters- use of audio and drills for practice

UNIT IV **9**

Family relationships- colours-Kanji (numbers) and festivals of Japan-religion-Japanese art and culture-ikebana, origami-introduction to hiragana- use of audio and drills for practice

UNIT V **9**

Vocobulary associated with directions-asking way-particles – e, de, mo, koko, soko, asoko, doko, nani, mae, ushiro, ue, shita- use of audio and drills for practice-introduction to katakana

Total: 45 Periods

Text books

1. Japanese hiragana and katakana for beginners, Timothy G. Stout, 2011
2. Genki I: An integrated course in elementary Japanese, Eri Banno and Yuko Ikeda, 2011

Reference Books

1. Japanese Reader collection Volume I, Yumi Boutwell and Clay Boutwell, Kotoba books, 2013
2. Living language Japanese Complete edition begineers through advanced course, Living language, 2012

BKR 101/201 **KOREAN** **L T P C**
3 0 0 3

Course Objective:

Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension but also contributes significantly to the development of an individual's intelligence. Language gives us access and insights into another culture.

It is a fundamental truth that cultures define themselves through languages. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit. To give students some proficiency in the foreign languages like Korean

Course Outcome:

Upon completion of the course, students should be able to manage conversation, reading and writing on the topics related to:

- Holiday and travel
- Shopping
- Feelings, advice and introductions
- Hobbies and job requirements
- Plans and preparations
- Appointments and requests
- Ordering for food, rooms and houses

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

Asking/giving reasons for studying Korean, making plans for the holiday, writing letters, describing past travel experiences and future travel plans, shopping in a grocery store, shopping in electronics store, storytelling Grammar: would like to (do), want to (do), construct future tense.

UNIT II **9**

Asking about feelings, asking about problems and giving advice, brief introductions - Grammar: Noun modifier, please try doing (something), irregular adjective/verb

UNIT III **9**

Asking about hobbies, asking about abilities (sports), job requirements, Ordering things for delivery, ordering a meal at a restaurant - Grammar: Sentence ending for the honorific form, please do something for me, have tried (something),

UNIT IV **9**

Asking about evening plans, making plans with others, making preparations - Asking about rooms, describing your room to your classmates, describing your house. Grammar: to know/not know how to do something, must (do), have to (do), should,

UNIT V **9**

Describing your plans and giving reasons, cancelling appointments. Grammar: Shall we~? / Should we~?, with, and, irregular verbs/adjective, so, because, cannot, intend to, plan to, or hope to, (more) than, the most, tag question/is n**'**t it? ,will (do)

Total: 45 Periods

Course Material:

1. Korean for Non-Native Speakers (Student Book 1B) Korean Language Education Center, Sogang University

BCN 101/201 **CHINESE** **L T P C**
3 0 0 3

Aim: To make the learners get acquainted with the language for professional life.

Objective: To enhance the students use this language in day today conversations with ease and confidence.
Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-1 **9**
History, Origins, Old and middle Chinese, Rise of northern dialects

UNIT-II **9**
Influences 3 Varieties of Chinese. 1.Classification 2.Standard Chinese and diglossia 3.Nomenclature

UNIT-III **9**
Chinese characters, Homophones, Phonology

UNIT-IV **9**

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT-V **9**

Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords

Total: 45 Periods

REFERENCES:

Hannas, William C. (1997), Asia's Orthographic Dilemma, University of Hawaii Press, ISBN HYPERLINK “http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0” 978-0-8248- 1892-0.

Qiu, Xigui (2000), Chinese Writing, trans. Gilbert Louis Mattos and Jerry Norman, Society for the Study of Early China and Institute of East Asian Studies, University of California, Berkeley, ISBN HYPERLINK http://en.wikipedia.org/wiki/Special:BookSources/978-1-55729-071-7 978-1-55729- 071-7.

Ramsey, S. Robert (1987), The Languages of China, Princeton University Press, ISBN HYPERLINK http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5 978-0-691-01468-5.

Schuessler, Axel (2007), ABC Etymological Dictionary of Old Chinese, Honolulu: University of Hawaii Press, ISBN HYPERLINK "http://en.wikipedia.org/wiki/Special: BookSources/978-0-8248-2975-9" 978-0-8248-2975-9.

R. L. G. " Language borrowing Why so little Chinese in English?" The Economist. June 6, 2013.

BME 203 ENGINEERING MECHANICS **L T P C**
3 1 0 3

Objective:

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

- The vectorial and scalar representation of forces and moments
- Static equilibrium of particles and rigid bodies in two dimensions
- Physical properties of surfaces and solids
- Effect of friction on equilibrium and their application
- Principle of work and energy
- The laws and kinematics of motion of particles and rigid bodies

Course outcomes

CO1: Students will gain knowledge regarding the various laws and principles associated with statics and dynamics statics and to apply them for practical solutions.

CO2: Students will gain knowledge regarding center of gravity and momenta inertia and apply them for practical problems.

CO3: Students will gain knowledge regarding various types of forces and reactions and tom draw free body diagram to quicker solutions for complicated problems.

CO4: Student will gain knowledge in work and energy

CO5: Student will gain knowledge on friction on equilibrium and its application.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I Basics and Statics Of Particles **12**

Introduction - Units and Dimensions - Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations on forces - Coplanar Forces – Resolution and Composition of forces – Resultant of several concurrent forces - Equilibrium of a forces – Forces in space - Equilibrium of particle in space - Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT – II Equilibrium of Rigid Bodies **10**

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments andCouples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions.

UNIT – III Properties of Surfaces and Solids **10**

Determination of areas – First moment of area and the Centroid of standard sections – T section, I section, Composite figures, Hollow section – second moments of plane area – Rectangle, triangle, circle - T section, I section, Hollow section – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Basic concept of Mass moment of inertia.

UNIT – IV Friction **10**

Frictional force – Laws of Coloumb friction – Cone of friction – Angle of repose – Simple contact friction – Sliding of blocks – Wedge friction - Ladder friction – Screw Jack – Belt friction - Rolling resistance.

UNIT – V Dynamics Of Particles **10**

Displacements, Velocity and acceleration, their relationship – Relative motion – Relative acceleration – Curvilinear motion of particles – Newton's law – work energy equation – impulse and Momentum – Impact of elastic bodies.

TEXT BOOK:

1. **Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers**: Vol. 1 Statics and vol. 2 Dynamics**"**, McGraw-Hill International Edition, 2013.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2011.

REFERENCES :

1. Kumar, K. L Kumar, V., Engineering Mechanics, Tata McGraw – Hill, New Delhi, 2010

2. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw - Hill, 2013.

3. Timoshenko, and Young, Engineering Mechanics, Tata McGraw-Hill, New Delhi, 2013.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2006.

BEE 201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
2 0 0 2

UNIT – I D.C. AND A.C CIRCUITS **6**

Ohm's law – Kirchoff's Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C).Series parallel combination of R, L&C – Current and voltage source transformation – mesh current & node voltage method –superposition theorem – Thevenin's and Norton's Theorem -Problems.

UNIT – II ELECTRICAL MACHINES **6**

Construction, principle of operation, Basic Equations and applications - D.C.Generators and D.C.Motors**.** -Single phase Induction Motor - Single Phase Transformer.

UNIT – III BASIC MEASURMENT SYSTEMS **6**

Introduction to Measurement Systems, Construction and Operating principles of PMMC, Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method **–** and Energy meter.

UNIT IV – SEMICONDUCTOR DEVICES **6**

Basic Concepts of semiconductor devices **–** PN Junction Diode Characteristics and its Application **–** HWR, FWR **–** Zener Diode **–** BJT (CB, CE, CC) configuration & its characteristics.

UNIT V – DIGITAL ELECTRONICS **6**

Number system **–** Logic Gates **–** Boolean Algebra **–** De-**Morgan's Theorem –** Half Adder & Full Adder **–** Flip Flops.

TOTAL NO. OF PERIODS: 30

TEXT BOOKS:

1. N.Mittle "Basic Electrical Engineering". Tata McGraw Hill Edition, New Delhi, 1990.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation',
   Dhanpat Rai and Co, 2004.
3. Jacob Millman and Christos C-Halkias, "Electronic Devices and Circuits", Tata McGraw Hill

REFERENCE BOOKS:

1. Edminister J.A. ***"Theory and problems of Electric Circuits"*** **Schaum's Outline Series. McGraw** Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. "*Engineering Circuit Analysis*", McGraw Hill Internatinal Editions, 1993.
3. D. P. Kothari and I. J. Nagrath " Electric machines" Tata McGraw-Hill Education, 2004

BCS 1L1/BCS 2L2 COMPUTER PRACTICE LABORATORY I L T P C
0 0 2 1

LIST OF EXERCISES

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

A) Word Processing **11**

Document creation,Text manipulation with Scientific Notations. Table creation,Tabl formatting and Conversion. Mail merge and Letter Preparation. Drawing-Flow Char

B) Spread sheet

Chart-Line Xy Bar and Pie – Formula-Formula Editor-Spread sheet-Inclusion of Object, Picture and Graphics Protecting the document and sheet-Sorting and Import/Export features.

C) Simple C Programming*

Data types, Expression Evaluation, Condition Statement. Arrays structures and Unions – Functions

D) Simple C++Programming

13. Classes and Objects
14. Constructor and Destructor

*For Programming exercises Flow chart and Pseudo code are essential.

Total: 45 Periods

BEE2L1 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES LAB

L T P C
0 0 2/2 1

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

I - List of Experiments for Electrical Engineering Lab

1. Fluorescent lamp wiring
2. Stair case wiring
3. Measurement of electrical quantities-voltage current, power & power factor in RLC circuit
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter
5. Measurement of energy using single phase energy meter
6. Measurement of resistance to earth of electrical equipment

I - List of Experiments for Electronics Engineering Lab

1. Study of electronic components and equipments.
    A. Resistor colour coding using digital multi-meter.
    B. Assembling electronic components on bread board.
2. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
3. Soldering and desoldering practice.
4. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).

5. Implementation of half adder circuit using logic gates.

BPC 2L1 PHYSICS AND CHEMISTRY LABORATORY

L	T	P	C
0	0	2/2	1

Practical

Direct	Indirect
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of resistivity of high resistance alloys and temperature coefficient
2. Study of Hall effect – Hall coefficient determination
3. Determination of electrical conductivity of good conductors
4. Study of magnetic hysteresis and energy product
5. Determination of Band gap of a semiconductor
6. Determination of Dispersive power of a prism – Spectrometer

II - LIST OF EXPERIMENTS – CHEMISTRY

1. Conducto metric titration (Simple acid base)
2. Conducto metric titration (Mixture of weak and strong acids)
3. Conducto metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
7. Estimation of Ferric iron by spectrophotometer.

BMA 301 MATHEMATICS –III L T P C
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Mathematics –III. The detailed concept of Laplace Transforms, Complex Variables, Complex integration, Theory of Sampling and Test of Hypothesis, Design of Experiments will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of laplace transforms
CO02 - To learn the detailed study of complex variables
CO03 - To learn the detailed study of complex integration
CO04 – To learn the detailed study of theory of sampling and test of hypothesis
CO05 - To learn the detailed study of design of experiments

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
4	Online test		
5	End Semester Examinations		

UNIT – I LAPLACE TRANSFORMS 12

Transforms of simple functions-properties-Transforms of derivatives and integrals-Inverse transforms-Periodic functions-Convolution theorem-Initial and final value theorems. Applications-Linear ordinary differential equations-Integral equations.

UNIT – II COMPLEX VARIABLES 12

Analytic functions-Cauchy-Rieman equations in Cartesian and polar form-properties of analytic function-Construction of analytic functions-Conformal mapping-standard types-Bilinear-Christoffel and Joukously transformations.

UNIT – III COMPLEX INTEGRATION 12

Cauchy,s integral theorem, integral formula-Taylor's and Laurent series (without proof)-Residues-Cauchy's residue theorem-Contour integration around the circle and semi circular countours.

UNIT – IV THEORY OF SAMPLING AND TEST OF HYPOTHESIS 12

Theory of sampling-Types of Sampling-Random-Stratified Systematic-Teat of hypothesis-Large sample-Test of significance-Proportion-Difference of proportions-Single mean-Difference of means and variances, small sample-Students 't' test-Single mean-difference of variances, exact sample-Chi square test-Goodness of fit-Independence of attributes.

UNIT – V DESIGN OF EXPERIMENTS 12

Analysis of variance-One way classifications-Two way classification (with one observation)- Two way classification with one and k observations per cell, design of experiments-Completely randomized design (CRD)-Randomized Block Design (RBD)-Efficiency of RBD over CRD-Estimation of missing value by RBD-Latin square design (LSD).

Total No. of Periods: 60

REFERENCE BOOKS:

1. Grewal B.S. "Higher Engineering Mathematics" 40th Edition, Khanna Publishers, New
2. Delhi, 2007
3. Kanpur J.N. and Saxsena H.C. "Mathematical Statistics", S. Chand & Company
4. Gupta S.C. & Kapur V.K. "Fundamentals of Applied Statistics"-Sulthan Chand & Sons
5. Trivedi K.S., "Probability and Statistics with Reliability", Prentice Hall India Pvt. Ltd.

BAM301 **SOLID MECHANICS**

3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Solid Mechanics. The detailed concept, stresses in beams, Deflection of beams will be taught to the students. Stresses in helical springs and biaxial stresses will also be introduced to the students.

Course Outcomes

CO01 - To learn the statically determinate and indeterminate problems in tension & compression

CO02 -To learn Shear force & bending moment diagrams – bending stresses – shear stress Variation in beams of symmetric sections – beams of uniform strength.

CO03 -To learn deflection of beams strain energy by Macaulay's method in axial Bending, torsion and shear loadings

CO04 -To learn Torsion of solid and hollow circular shaft.

CO05 -To learn biaxial stress and determination of principal stresses.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	**Programme Outcomes (POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I AXIAL LOADING 12

Stresses and strains – Hooke's law – stress and strain diagrams - elastic constants – statically determinate and indeterminate problems in tension & compression – thermal stresses – impact loading.

UNIT – II STRESSES IN BEAMS 10

Shear force & bending moment diagrams – bending stresses – shear stress variation in beams of symmetric sections – beams of uniform strength.

UNIT – III DEFLECTION OF BEAMS 12

Double integration method – Macaulay's method – moment area method – conjugate beam method – principle of superposition – Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and their applications.

UNIT – IV TORSION – SPRINGS – COLUMNS 14

Torsion of solid and hollow circular shafts – shear stress variation – power transmission in shafts – open and closed-coiled helical springs – stresses in helical springs – classification of columns – Euler buckling – columns with different end conditions.

UNIT – V BIAXIAL STRESSES 12

Stresses in thin-walled pressure vessels – combined bending, torsion and axial loading of circular shafts – Mohr's circle and its construction – determination of principal stresses.

L = 45, T = 15, TOTAL: 60 PERIODS

TEXTBOOKS:

1. Gere & Timoshenko, 'Mechanics of Materials', McGraw Hill, 1993
2. William Nash, Strength of Materials, Tata McGraw Hill, 2004

REFERENCES:

1. Dym, C.L., and Shames, I.H., 'Solid Mechanics', McGraw Hill, Kogakusha, Tokyo, 1973.
2. Stephen Timoshenko, 'Strength of Materials', Vol I & II, CBS Publishers and Distributors, Third Edition.
3. R.K.Rajput, 'Strength of Materials', S. Chand and Co., 1999.
4. Timoshenko,S. and Young,D.H., Elements of Strength of Materials, T.Van Nostrand Co. Inc., Princeton, N.J., 1977.

BAM 302 **AUTOMOTIVE PETROL ENGINES** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in Automotive Petrol Engines. The detailed concept, fuel supply system cooling and lubrication system and combustion and combustion chambers and other petrol engines will be taught to the students.

Course Outcomes

CO01 - To learn Engine Construction and Operation
CO02 - To learn Fuel supply system (Carburetor type) and electronic Fuel Injection system
CO03 - To learn different cooling and types lubrication system
CO04 – To learn detailed combustion system
CO05 – To learn other petrol engines

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I ENGINE CONSTRUCTION AND OPERATION 10

4 stroke engine - Constructional details, working principle. Otto cycle, Actual indicator diagram, Fuel air cycle. Cylinder layout and configurations. Firing order and its significance. Engine balancing. Materials of engine components.

UNIT – II FUEL SUPPLY SYSTEM 10

Carburettor working principle, Requirements of an automotive carburetor – starting, idling, acceleration and normal circuits of a carburetor – Compensation –Fuel filters-Constant vacuum carburetor, multi barrel and multiple venturi systems – Fuel Pumps– Mechanical and electrical pumps – Electronic Fuel Injection systems.

UNIT – III COOLING AND LUBRICATION SYSTEM 8

Need for cooling. Types of cooling system – air cooling and Liquid cooled systems. Forced circulation system, pressure cooling system – Need for Lubrication system. Mist lubrication system, wet sump lubrication – Properties of lubricants, properties of coolant- SAE standards of lubricants and coolants.

UNIT – IV COMBUSTION AND COMBUSTION CHAMBERS 9

Combustion in SI engine – Laminar Flame theory- Flame Propogation- Flame structure of turbulent and premixed flames- Stages of combustion– Rate of pressure rise – Abnormal combustion – Pre ignition and knock – Combustion chambers – Different types – Factors controlling combustion chamber design.

UNIT – V OTHER PETROL ENGINES 8

Two stroke engine – Types – construction and operation. Comparison of four stroke and two stroke engine operation- Rotary Engines.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ramalingam. K. K., Internal Combustion Engines, SciTech publications, Chennai, 2003
2. Ganesan.V, Internal Combustion Engines, Tata McGraw Hill Publishing Co., New York, 1994.

REFERENCES:

1. Heldt.P.M. High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1975.
2. William.H.Crouse, Automotive Engines, McGraw Hill Publishers, 1985.

BAM303 **ENGINEERING THERMODYNAMICS** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Engineering Thermodynamics. The detailed concept, Basic Thermodynamics, Air cycle and Compressors, Refrigeration and Air-conditioning, Heat Transfer and Heat exchangers will be taught to the students.

Course Outcomes

CO01 –To learn the detailed study of zeroth and first law of thermodynamics
CO02 – To learn detailed study of Air cycle and Compressors
CO03 – To learn detailed study and types of Refrigeration and Air conditioning
CO04 – To learn detailed study of Heat Transfer
CO05 – To learn detailed study of Heat exchangers and its types

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I BASIC THERMODYNAMICS 16

Systems, Zeroth low, First law. Properties of gases and vapours. Steady flow energy equation. Heat and work transfer in flow and non-flow processes. Second law, Kelvin-Planck statement - Clausius statement - Concept of Entropy, Clausius inequality, Entropy change in non-flow processes.

UNIT – II AIR CYCLE AND COMPRESSORS 12

Otto, Diesel, Dual and Brayton cycles. Air standard efficiency. Mean effective pressure, reciprocating compressors – Inter cooling – Minimum work requirement.

UNIT – III REFRIGERATION AND AIR-CONDITIONING 10

Principles of Psychometry and refrigeration - Vapour compression - Vapour absorption types -Co-efficient of performance, Properties of refrigerants – Basic Principle and types Air conditioning.

UNIT – IV HEAT TRANSFER 10

Conduction in parallel, radial and composite wall – Basics of Convective heat transfer - Fundamentals of Radiative heat transfer.

UNIT-V HEAT EXCHANGERS 12

Types of Heat Exchangers- Radiators-Types- Design of Parallel, Counter and Cross flow Heat Exchangers.

L = 45, T = 15, TOTAL = 60 PERIODS

(Use of standard thermodynamic tables, Mollier diagram and Refrigerant property tables are permitted)

TEXT BOOKS:

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2007.
2. Rathakrishnan E., "Fundamentals of Engineering Thermodynamics", Prentice-Hall India, 2005**.**

REFERENCES:

1. Ramalingam K.K. "Thermodynamics", Sci-Tech Publications, 2006
2. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2007.
3. Venwylen and Sontag, "Classical Thermodynamics", Wiley Eastern, 1987
4. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.

BAM 304 **ENGINEERING FLUID MECHANICS** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Engineering Fluid Mechanics. The detailed concept, Basic theory of Engineering Fluid Mechanics, Basic Equations of fluid Flow Analysis, Incompressible Inviscid flow, Incompressible viscous flow and Fluid machinery will be taught to the students.

Course Outcomes

CO01 - To learn the basic theory of engineering fluid mechanics
CO02 - To learn basic Equations of fluid Flow Analysis
CO03 - To learn Incompressible in viscid flow
CO04 – To learn Incompressible viscous flow
CO05 – To learn different types of Fluid Machinery and Turbines

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I BASIC CONCEPTS **15**

Introduction – Fluid properties – Newton's viscosity law – Classification of fluids and fluid motion – Fluid statics – Hydrostatic force on submerged surfaces – stability of floating bodies.

UNIT – II BASIC EQUATIONS OF FLUID FLOW ANALYSIS 15

Basic laws for a system in integral form – Conservation of mass – Newton's 2nd law – Laws of thermodynamics – Application of the basic laws for a control volume – Kinematics – Motion of a fluid particle – Fluid deformation – Differential analysis of fluid motion – Continuity equation

UNIT – III INCOMPRESSIBLE INVISCID FLOW 8

Euler's equations of motion – Bernoulli's equations – Applications – Methods of pressure measurement – Flow measurement – Orifice plate – Venturi meter – Irrotational flow – Stream function and velocity potential – Laplace equation – Elementary plane flows

UNIT – IV INCOMPRESSIBLE VISCOUS FLOW 8

Fully developed laminar flow between infinite parallel plates – Laminar and turbulent flow through pipes – Velocity profiles – Energy considerations in pipe flow – Calculation of head loss Pipe flow problems

UNIT – V FLUID MACHINERY 14

Introduction and classification of fluid machines – Turbo machinery analysis – The angular momentum principle – Euler turbo machine equation– Application to fluid systems – Working principle of turbines, fans, blowers, pumps and compressors.

L = 45, T = 15, TOTAL = 60 PERIODS

TEXT BOOKS:

1. R.K.Bansal, Fluid Mechanics & Hydraulic Machines. Laxmi Publications (P) Ltd., New Delhi 2001
2. Fluid Mechanics, John F.Douglas.

REFERENCES

1. Yuan S W, 'Foundations of fluid Mechanics', Prentice-Hall, 1987
2. Milne Thompson L M, 'Theoretical Hydrodynamics', MacMillan, 1985
3. Rathakrishnan, E, 'Fundamentals of Fluid Mechanics', Prentice-Hall, 2007

BAM305 MEASUREMENTS AND METROLOGY

L	T	P	C
3	0	0	3

OBJECTIVE:

The main objective of this course is to impart knowledge in Measurements and Metrology. The detailed concept of Linear Measurement, Pressure measurement, Flow and Temperature measurement and Force and Torque measurement will be taught to the students.

Course Outcomes

CO01 - To learn the detailed concept of linear measurement.
CO02 - To learn the detailed study of Pressure measurement and types.
CO03 - To learn the detailed of flow and temperature measurement.
CO04 – To learn the detailed of force and torque measurement and types.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I LINEAR MEASUREMENT 9

Units and standards, errors in measurement, linearity, repeatability, precision and accuracy, calibration. Linear measuring instruments, taper, wire and thickness gauge, vernier instruments, micrometer, internal measurements slip gauges and its accessories, dial gauges, comparators.

UNIT – II INTERFEROMETRY 9

Interferometry surface texture measurements, flatness testing, collimators, angular measurements, metrology of screw threads, measurement and testing of gears, measuring machines.

UNIT – III PRESSURE MEASUREMENT 9

Bourden tube, diaphragm, bellows and pressure capsules: Transducers used in pressure measurement- potentiometer, strain gauges, LVDT, capacitive and variable reluctance type transducers. Dynamic pressure measurement piezo electric and piezo resistive transducers. Farnboro engine indicator. Low pressure measurement Mc leod gauge, Pirani gauge,thermal conductivity type pressure measurement.

UNIT – IV FLOW AND TEMPERATURE MEASUREMENT 9

Obstruction type flow meter, Positive displacement flow meters – turbine flow meter, flouted tube flowmeter, anemometer, ultrasonic flow meter, magnetic flow meters. Alcock viscous air flow meter. Temperature scales – mechanical temperature sensors, liquid in glass, vapour pressure, bimetal temperature gauges. RTD, Thermistors, thermocouples, Pyrometers.

UNIT – V FORCE AND TORQUE MEASUREMENT 9

Force measuring devices- Balances, platform scales, weigh bridges, load cells, proving ring. Torque measurement – prony brake, rope brake and fan type brakes. Dynamometers – hydraulic, electric cradle and eddy current dynamometers. Transmission dynamometers. Chassis dynamometers.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Jain R.K., Engineering metrology, Khanna publishers, New Delhi, 2005
2. Rangan C.S., Sarma G.E and Mani V.S Instrumentation devices and systems. TMH Publishing Co. New Delhi, 2001
3. Beckwith T.G & Buck N.L Mechanical measurements, Oxford and IBH publishing house New Delhi, 2004

BAM306 **PRODUCTION TECHNOLOGY** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in Production Technology. The detailed concept of casting, metal Forming & powder metallurgy, Welding, and theory of metal Cutting & machining will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of casting and types.
CO02 - To learn the detailed study of metal forming & powder metallurgy.
CO03 - To learn the detailed study of welding and types.
CO04 – To learn the study of theory of metal cutting & machining process.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I CASTING **9**

Casting types, procedure to make sand mould, types of core making, moulding tools, Machine moulding, Special moulding processes-CO_2 moulding, Shell moulding, Investment moulding, Pressure die casting, Centrifugal casting, Continuous casting, Casting defects.

UNIT – II METAL FORMING & POWDER METALLURGY 9

Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principle steps involved advantages, disadvantages and limitations of powder metallurgy.

UNIT – III WELDING 9

Classification of welding processes, Principles of Oxy-acetylene gas welding, A.C Metal arc welding, Resistance welding, Submerged arc welding, Tungsten Inert Gas welding, Metal Inert Gas welding, Electron beam welding, Laser beam welding, Defects in welding, Soldering and Brazing.

UNIT – IV THEORY OF METAL CUTTING 9

Mechanism of cutting, chip formation and types, tool materials, tool geometry, cutting forces, Cutting fluids, Tool wear and Tool life, machinability.

UNIT – V MACHINING 9

General principles of working and commonly performed operations in the following Machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal Drilling machine, Cylindrical Grinding machine, Capstan and Turret lathe. Basics of CNC machines.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol. I & II, Media Promoters and Publishers Pvt., Ltd., Mumbai, 2005
2. Nagendra ParasharB.S and Mittal R.K., "Elements of Manufacturing Processes", Prentice – Hall of India Pvt., Ltd., 2007

REFERENCES:

1. R.K. Jain and S.C. Gupta, "Production Technology", Khanna Publishers, 16th Edition, 2001
2. "H.M.T. Production Technology – Hand Book", Tata McGraw Hill, 2000
3. Roy. A. Linberg, Process and Materials of Manufacture", PHI, 2000

BAM 3L1 AUTOMOTIVE PARTS AND ASSEMBLY DRAWING

L	T	P	C
0	0	4	2

OBJECTIVES

The main objective of this Study is to Design and drawing practice of Automotive Parts.

Course Outcomes

CO01 - To learn the Design and drawing practice of machine and production drawing
CO02 - To learn the Design and drawing practice concepts of limits, tolerance, fits
CO03 - To learn the Design and drawing practice of Machine element joints
CO04 – To learn the detailed part drawing and assembly drawings and Computer aided design and drafting

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Unit-I

Instruction to machine drawing & production drawing, classification of drawing – BIS conventions – Orthographic and sectional views.

Unit-II

Reviews of the concepts of limits, tolerance, fits, surface roughness, and symbols terminology used in Production drawing.

Unit-III

Machine element joints – Types of joints – Screw fasteners – Pin joints, couplings welded joints.

Unit-IV

Detailed part drawing and assembly drawings (with suitable tolerances, machine symbols, specification of fit).

1) Screw jack
2) Shaper tool head
3) Non return valve
4) Plummer block
5) Foot step drawing
6) Machine vice
7) Four jaw chuck of lathe
8) Lathe tail stock
9) Square tool post
10) Universal coupling
11) Hydraulic & Pneumatic Assembly

Unit-V

Introduction to Computer aided drafting – methods of preparation of drawings – Printing/ Plotting of technical drawings.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Narayana K.L., Kannaiah P and Venkata Reddy – "Production Drawing" New Age International Limited, Delhi 2004.

REFERENCE BOOKS:

1. Bhat N.D., "Machine Drawing", Charotar Publishing House, Anand 2000
2. Nagtal G.R., "Machine Drawing", Khanna Publishers, New Delhi 1994.
3. Sache Singh & P.L. Shah – Fundamentals of Machine Drawing, Prentice Hall India, 2003.

BCE 3L2 FLUID MECHANICS & STRENGTH OF MATERIALS LAB L T P C
0 0 4 2

OBJECTIVE

The main objective of this Study is to lab practice of fluid flows, Determination of Flow through notches, weir and orifice. The practical study of strength of materials.

Course Outcome

CO01 - Determination of flow through pipes, losses in pipes.
CO02 - Calibration of orificemeter and venturimeter.
CO03 - Performance characteristics of pumps and turbines.
CO04 – Tension and Torsion test of a mild steel rod
CO05 - Deflection test on helical springs, beams and Impact test on Metal

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

FLUID MECHANICS LAB

1. Determination of flow through pipes, losses in pipes.
2. Calibration of orificemeter and venturimeter.
3. Flow through notches and weir.
4. Flow through open orifice.
5. Buoyancy experiment-Metacentric height.
6. Impact of jet on vanes-inclined and curved vanes.
7. Verification of Bernoulli’s equation.

FLUID MACHINERY LAB

1. Performance characteristics of Jet pump
2. Performance characteristics of Vane pump
3. Performance characteristics of Centrifugal pump
4. Performance characteristics of Reciprocating pump
5. Performance characteristics of Gear pump
6. Characteristics of Impulse turbine
7. characteristics of Reaction turbine

STRENGTH OF MATERIALS LAB

1. Tension test of a mild steel rod
2. Double shear test on mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Hardness test on metals- Brinell and Rockwell hardness
5. Deflection test on helical springs
6. Deflection test on beams
7. Double shear test in U.T.M
8. Impact test on Metals

BAM401 **THEORY OF MACHINES** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Theory of Machines. The detailed concept of Mechanisms, Friction, Gearing and Cams, Balancing and Vibration will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of machines and structure
CO02 - To learn the detailed study of friction and types
CO03 - To learn the detailed study of gearing and cams
CO04 - To learn the detailed study of balancing
CO05 – To learn the detailed study of vibration

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I MECHANISMS **14**

Definition – Machine and Structure – Kinematic link, pair and chain – classification of Kinematic pairs – Constraint & motion – Degrees of freedom slider crank – Single and double – Crank rocker mechanisms – Inversions – applications, Kinematic analysis and synthesis of simple mechanisms – Determination of velocity and acceleration of simple mechanisms.

UNIT – II FRICTION 12

Types of friction – friction in screw and nut – pivot and collar – thrust bearings – collar bearing – plate and disc clutches – belt (flat & vee) and rope drives – creep in belts – Jockey pulley – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – Effect of centrifugal and initial tension – condition for maximum power transmission.

UNIT – III GEARING AND CAMS 12

Gear profile and geometry – nomenclature of spur & helical gears – laws of gearing – interference – requirement of minimum number of teeth in gears – gear trains – simple and compound gear trains – determination of speed and torque in epicyclic gear trains – cams different types of followers – cam design for different follower motions.

UNIT – IV BALANCING 11

Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – balancing single and multi cylinder Engines – Governors and Gyroscopic effects.

UNIT – V VIBRATION 11

Free, forced and damped vibrations of single degree of freedom systems – force transmitted to supports – vibration Isolation – vibration absorption – torsional vibration of shafts – single and multirotor systems – geared shafts – critical speed of shafts.

L = 45, T = 15, TOTAL : 60 PERIODS

TEXT BOOKS:

1. Bansal Dr.R.K. " Theory of Machines" Laxmi Publications (P) Ltd., New Delhi 2001
2. Rattan S.S."Theory of machines" Tata McGraw Hill publishing Co., New Delhi, 2002.

REFERENCES:

1. Rao J.S.and Dukkipati R.V. "Mechanism and Machine Theory" Second Edition, Wiley Eastern Limited, 1992.
2. Malhotra D.R. and Gupta H.C "The Theory of machines" Satya Prakasam, Tech. India Publications, 1989
3. Gosh A and Mallick A.K. "Theory of Machines and Mechanisms" affiliated east west press, 1989

BAM402 **AUTOMOTIVE CHASSIS** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Automotive Chassis. The detailed concept of Introduction, Frame, Steering system, Propeller shaft and final drive, Axles and Tyres, Suspension system and Braking system will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of frame, steering system
CO02 - To learn the study of steering system
CO03 - To learn the detailed study of propeller shaft and final drive
CO04 – To learn the detailed study of sxles and tyres, Suspension system
CO05 - To learn the detailed study of suspension system and braking system

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION, FRAME, STEERING SYSTEM 9+3

Types of Chassis layout, with reference to Power Plant location and drive, various types of frames, Loads acting on vehicle frame, Constructional details and materials for frames, Testing of frames, Types of Front Axles and Stub Axles, Front Wheel Geometry, namely, Castor, Camber, King Pin Inclination and Toe–in, Condition for True Rolling Motion of Wheels during Steering, Ackerman's and Davis Steering Mechanisms, Steering Error Curve, Steering Linkages, Different Types of Steering Gears, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, Power–Assisted Steering- Hydraulic and Electrically assisted steering.

UNIT – II PROPELLER SHAFT AND FINAL DRIVE 9+2

Effect of Driving Thrust, torque reactions and side thrust, Hotchkiss drive, torque tube drive, radius rods and stabilizers, Propeller Shaft, Universal Joints, Constant Velocity Universal Joints, Front Wheel drive, Final drive, different types, Double reduction and twin speed final drives, Multi–axled vehicles, Differential principle and types, Differential housings, Non–Slip differential, Differential locks, Final drive of Crawler Tractors.

UNIT – III AXLES AND TYRES 9+2

Construction and Design of Drive Axles, Types of Loads acting on drive axles, Full – Floating, Three–Quarter Floating and Semi–Floating Axles, Axle Housings and Types, Types and Constructional Details of Different Types of Wheels and Rims, Different Types of Tyres and their constructional details.

UNIT – IV SUSPENSION SYSTEM 9+4

Need for Suspension System, Types of Suspension Springs, Constructional details and characteristics of Single Leaf, Multi–Leaf, Coil, Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension Spring Systems, Independent Suspension System, Shock Absorbers, Types and Constructional details, Design of Leaf and Coil Springs-Introduction to adaptive suspension systems.

UNIT – V BRAKING SYSTEM 9+4

Theory of Automobile Braking, Stopping Distance Time and Braking Efficiency, Effect of Weight Transfer during Braking, Theory of Drum Brakes, Leading and Trailing Shoes, Braking Torque, Constructional Details of Drum Brake and its Activators, Disc Brake Theory, Hydraulic, Mechanical, Pneumatic and Power–Assisted Braking System, Servo Brakes, Retarders, Anti–Lock Braking System.

L = 45, T = 15, TOTAL: 60 PERIODS

TEXTBOOKS:

1. Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi , 2006
2. R.K. Rajput, A Text–Book of Automobile Engineering, Laxmi Publications Private Limited, 2007
3. N.K. Giri, Automotive Mechanics, Kanna Publishers, 2007

REFERENCES:

1. Heldt P.M., Automotive Chassis, Chilton Co., New York, 1990
2. Newton Steeds and Garret, Motor Vehicles, 13th Edition, Butterworth, London, 2005.
3. Heinz Hazler, Modern Vehicle Technology, Butterworth, London, 2005.

BAM403 **AUTOMOTIVE DIESEL ENGINES** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in Automotive Diesel Engines. The detailed concept of Basic Theory, Fuel Injection System, Air Motion, Combustion and Combustion Chambers, Super charging and Turbo charging, Engine performance and Evaluation will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Basic Theory of Diesel Engine
CO02 - To learn the detailed study of Fuel Injection System and types
CO03 - To learn the detailed study of Air Motion Combustion and Combustion chambers
CO04 – To learn the detailed study of super charging and Turbo charging
CO05 - To learn study of Engine performance and Evolution

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I BASIC THEORY **9**

Diesel engine construction and operation. Two stroke and four stroke diesel engines. Diesel cycle – Fuel-air and actual cycle analysis. Diesel fuel. Ignition quality. Cetane number. Laboratory tests for diesel fuel. Standards and specifications- Alternate fuels in CI engines.

UNIT – II FUEL INJECTION SYSTEM 9

Requirements – solid injection. Function of components –common rail direct injection - Jerk and distributor type pumps. Pressure waves, Injection lag. Unit injector. Mechanical and pneumatic governors. Fuel injector, Types of injection nozzle, Nozzle tests. Spray formation, Spray dynamics, Spray models, Injection timing. Pump calibration. Pilot injection.

UNIT – III AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 10

Impartance 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. Comparison of knock in CI & SI engines. Direct and indirect injection combustion chambers. Air cell chamber. Combustion chamber design – objectives – Different types of combustion chamber. MAN Combustion chamber.

UNIT – IV SUPERCHARGING AND TURBOCHARGING 8

Necessity and limitation – Charge cooling. Types of supercharging and turbocharging – Relative merits. Matching of turbocharger-Turbocharger waste gates- Variable geometry-Turbochargers.

UNIT – V ENGINE PERFORMANCE AND EVALUATION 9

Automotive and stationary diesel engine testing and related standards – Engine power and efficiencies – performance characteristics. Variables affecting engine performance – Methods to improve engine performance – Heat balance – Performance maps.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
2. Ganesan,V., Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 1994.

REFERENCES:

1. Heldt,P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1985.
2. Maleev,V.M., Diesel Engine Operation and Maintenance, McGraw Hill, 1974.

BAM404 **AUTOMOTIVE ELECTRICAL SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in Automotive Electrical Systems. The detailed concept of Batteries, Starting system, Charging system, Ignition system, Lighting system & Accessories will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Batteries,
CO02 - To learn the detailed study of Starting system
CO03 - To learn the detailed study of charging system
CO04 – To learn the detailed study of Ignition system
CO05 - To learn the detailed study of Lighting system & Accessories

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I BATTERIES **8**

Principle and construction of lead-acid battery. Characteristics of battery, rating, capacity and efficiency of batteries. Various tests on battery condition, charging methods - Modern storage batteries- Lion- Nickel and others-Batteries for electric cars-Limitations

UNIT – II STARTING SYSTEM 9

Condition of starting Behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor.Working of different starter drive units. Care & maintenance of starter motor, Starter switches.

UNIT – III CHARGING SYSTEM 9

Function, Components of DC and AC Charging System for Automobile, construction, operating principle, characteristics, charging circuit controls – cut out, relays, voltage and current regulators, troubleshooting

UNIT – IV IGNITION SYSTEM 10

Types, construction & working of battery coil and magneto ignition systems. Relative merits, centrifugal and vacuum advance mechanisms. Types and construction of spark plugs, Electronic Ignition systems. DLI systems.

UNIT – V LIGHTING SYSTEM & ACCESSORIES 9

Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Head light dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system, Trafficator, wiring system.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Judge,A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992.
2. Kholi,P.L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd., New Delhi, 1975.

REFERENCES:

1. Crouse,W.H., Automobile Electrical Equipment, McGraw Hill Book Co. Inc., New York, 1980.
2. Automotive Hand Book, fifth edition, Robert Bosch, Bently Publishers, 2003.
3. Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi , 2006.

BCE 406 **ENVIRONMENTAL STUDIES** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in Environmental studies. The detailed concept of The Multidisciplinary Nature of Environmental studies, Ecosystems, Biodiversity and its conservation, Environmental pollution, Social issues and the Environment, Human population and the environment, Field work will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of The Multidisciplinary Nature of Environmental studies

CO02 - To learn the detailed study of Ecosystems,

CO03 - To learn the detailed study of Biodiversity and its conservation

CO04 – To learn the detailed study of Environmental pollution

CO05 - To learn the detailed study of Social issues and the Environment and Human population and the environment, Field work

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I -THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and impartance, Need for public awareness

NATURAL RESOURCES: RENEWABLE AND NON RENEWABLE RESOURCES:

Natural resources and associated problems.

- Forest resources: Use and over – exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Flood resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies.
- Land resources: Land as a resource, land degradation, man induced landsides, soil erosion and desertification.

Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.

UNIT II - ECOSYSTEMS

Concepts of an ecosystems structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids, introduction, types, characteristics features, structure and function of the following ecosystem: Forest ecosystem, grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, oceans, estuaries)

UNIT III- BIODIVERSITY AND ITS CONSERVATION

Introduction- Define, genetic, species and ecosystem diversity, biogeographically classification of India, Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega diversity nation , hot spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wildlife, Conservation of biodiversity: In-situ conservation of biodiversity.

ENVIRNOMENTAL POLLUTION

Definition, Causes, effects and control measures of: Air pollution, Water pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, thermal pollution Nuclear

hazards. Solids waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Pollution case studies. Diaster management : floods, earthquake, cyclone and landslides.

UNIT IV- SOCIAL ISSUES AND THE ENVIRONMENT

From Unsustainable to Sustainable development, urban problems related to energy, water conservation, rain water harvesting, watered management, Resettlement and rehabilitation of people; its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion nuclear accident and holocaust. Case Studies. Wasteland reclamation, Environment protection Act, Air (prevention and control of pollution) Act, Water (Prevention and control of pollution) Act, Wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness**.**

UNIT V- HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion family Welfare Programme, Environment and human health, Human rights, Value Education HIV/AIDS, Woman and Child Welfare, Role of Information Technology in Environment and human health. Case Studies.

FIELD WORK

Visit to a local area to document environment assets – river forest/grassland/hill mountain, Visit to a local polluted site-rural/Industrial/Agricultural. Study of common Plants, insects, birds, Study of simple ecosystems-ponds, river, hill slopes, etc. (Field work Equal to 5 Lecture hours)

BMA 402 **NUMERICAL METHODS** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in Numerical Methods. The detailed concept of Solution of Equations and Eigen Value problem, Interpolation (Finite Differences), Numerical Differentiation and Integration, Initial Value Problems for ordinary Differential Equations, Boundary Value Problems for ODE and PDE will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Solution of Equations and Eigen Value Problem

CO02 - To learn the detailed study of Interpolation (Finite Differences)

CO03 - To learn the detailed study of Numerical Differentiation and Integration

CO04 – To learn the detailed study of Initial Value Problems for ordinary Differential Equations

CO05 - To learn the detailed study of Boundary Value Problems for ODE and PDE

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT- I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEM 12

Iterative method, Newton-Raphson method for single variable-solutions of linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedel methods, Inverse of matrix by Gauss-Jordan method, Eigen value of a matrix power and Jacobian methods.

UNIT-II INTERPOLATION 12

Newton's Divide difference formula, Lagrange's interpolation-forward and backward difference formula-Stirling's Bessel's central difference formula

UNIT-III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal Simpson's (Both 1/3" and 3/8") rule, Double integrals using Trapezoidal and Simpson's rule

UNIT -IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERNTIAL EQUATIONS 12

Single step methods, Taylor series, Euler and modified Euler, Runge kutta method of first and second order differential equations, multiple step methods, Milne and Adam's –Bash forth predic and corrected method

UNIT -V BOUNDARY VALUE PROBLEMS FOR ODE AND PDE 12

Finite difference for the second order ordinary differential equations, finite difference solutions for one dimensional heat equations (both implicit and explicit), one dimensional wave equation, Two dimensional, Laplace and Poisson equation

Total No. of Periods: 60

TEXTBOOKS:

1. M.K.Venkatraman'Numerical Methods', NPC, Chennai

REFERENCES:

1. Jain.M.K.Iyengar, S.R.K.Andjain, RK "Numerical Methods for Scientific and Engineering Computation",(3rd edition, New age International Pub,Co(1993))
2. Grewal.B.S."Higher Engineering Mathematics" (6th edition)Khanna Publisher, Delhi,2004.

BAM 4L1 AUTOMOTIVE ENGINE COMPONENTS LAB

L	T	P	C
0	0	3	2

OBJECTIVE

Study of the following engines and its components by Dismantling, Comparing with Recent Engine Components and Assembling Various Parts**.**

Course Outcomes

CO01 – Dismantling procedure of LCV
CO02 – Dismantling procedure of HCV
CO03 – Study and Readings
CO04 – Assembling procedure of LCV and HCV

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Lab Practice	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Record Works	3	Results
4	End Semester Examinations		

1. Study of the Following Engines and Its Components by Dismantling, Comparing With ` Recent Engine Components and Assembling Various Parts:
    a) Tata Engine
    b) Leyland Engine
    c) Anyone type of CRDI engine
    d) Anyone type of EFI engine
    e) Two Stroke Engines
2. Engine Overhaul Procedure
3. Study, Dismantling and Assembling of a Carburetor
4. Study, Dismantling and Assembly of a Mechanical Fuel Pump

5. Measurement of Critical Dimensions of
    A) Piston
    B) Connecting Rod
    C) Piston Rings
    D) Crankshaft
    e) Valves

6. Find the Cubic capacity and Compression ratio of a vehicle.
7. Other Engine Subsystems/Components.
    a) Fuel filter
    b) Injector
    c) Turbocharger
    d) Radiator
    e) Thermostat
    f) Water Pump
    g) Oil Pump
    h) Catalytic convertor
    i) Muffler

BAM 4L2 ENGINE TESTING & EMISSION MEASUREMENT LAB **L T P C**
0 0 3 2

OBJECTIVE

Performance study of Petrol and Diesel engines. Heat balance Test and Emission Measurements

Course Outcomes

CO01 – Study of Dynamometers
CO02 – Performance study of Petrol and Diesel engines
CO03 – Study of balance Test
CO04 – Study of Emission Test and Exhaust gas Analyzer

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Lab Practice	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Record Works	3	Results
4	End Semester Examinations		

1. Study of Dynamometers.
2. Valve timing diagram.
3. Port timing diagram.
4. Performance test in single cylinder diesel engine.
5. Performance test in twin cylinder diesel engine.
6. Performance test in three cylinder petrol engine.
7. Morse test on Petrol engine.
8. Heat balance test on an automotive diesel engine.
9. Study of NDIR Gas Analyzer and FID.
10. Study of Gas Chromatography.
11. Study of Chemiliminescent NOx analyzer.
12. Measurement of HC, CO, CO_2, O_2 and NOX using exhaust gas analyzer.
13. Diesel smoke measurement.

BAM 4L3 AUTOMOTIVE ELECTRICAL LABORATORY L T P C
0 0 3 2

OBJECTIVE

Laboratory study of Starting, Charging systems and Performance study of Alternator.

Course Outcomes

CO01 – Study of various types of Batteries
CO02 – Study of Automotive Electric system and Lighting Accessories
CO03 –Study of Starting, Charging systems
CO04 – Study of Electrical assisted power steering

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Lab Practice	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Record Works	3	Results
4	End Semester Examinations		

1. Study of various types of Batteries
2. Study of Automotive Electric system and Lighting Accessories
3. Battery testing – Specific gravity test, Voltage test.
4. Checking of cutoff voltage using electronic regulator.
5. Testing of ignition coil.
6. Performance test on Alternator.
7. Working of Stepper motors.
8. Study of Electrical assisted power steering.

BAM 4S1 **TECHNICAL SEMINAR** **L T P C**
0 0 3 2

OBJECTIVE

The students know about the resent techniques in Automobile Evaluation will be made based on the reports, the presentations and the interactions during the question answer sessions.

Course Outcomes

CO01 –Ability and Skills to be improved
CO02 – self confidents to be improved
CO03 –leadership quality to be improved
CO04 –innovative ideas will be generated

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Skill Practice	1	innovative idea
2	Observation	2	Performance of observation
3	Presentation	3	Results
4	End Semester Examinations		

The students are expected to make presentations throughout the semester under the supervision of a team of respective department faculty. The students are to be grouped appropriately so that each student makes a minimum of two different presentations on engineering topics of current interest. Every student has to submit an approved technical report prior to his presentation. Evaluation will be made based on the reports, the presentations and the interactions during the question answer sessions.

BAM501 COMPUTER CONTROL OF VEHICLE SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVE

The main objective of this course is to impart knowledge in Computer Control of vehicles systems. The detailed concept of Introduction, Driveline control system, Safety and security system, Comfort system, Intelligent Transportation system will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Components of chassis management system
CO02 - To learn the detailed study of Driveline control system
CO03 - To learn the detailed study of Safety and Security system
CO04 – To learn the detailed study of Comfort System
CO05 - To learn the detailed study of Intelligent Transportation System

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **9**

Components of chassis management system – role of various sensors and actuators pertain to chassis system – construction – working principle.

UNIT – II DRIVELINE CONTROL SYSTEM **9**

Speed control – cylinder cut- off technology, Gear shifting control – Traction / braking control, brake by wire – Adaptive cruise control, throttle by wire. Steering - power steering, collapsible and tiltable steering column – steer by wire.

UNIT – III SAFETY AND SECURITY SYSTEM 9

Airbags, seat belt tightening system, collision warning systems, child Lock, anti lock braking systems, Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding.

UNIT – IV COMFORT SYSTEM 9

Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, power windows, thermal management system, adaptive noise control.

UNIT – V INTELLIGENT TRANSPORTATION SYSTEM 9

Traffic routing system - Automated highway systems - Lane warning system – Driver Information System, driver assistance systems - Data communication within the car, Driver conditioning warning - Route Guidance and Navigation Systems - In-Vehicle Computing – Vehicle Diagnostics system – Hybrid / Electric and Future Cars – Case studies.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. U. Kiencke, and L. Nielsen,Automotive Control Systems,SAE and Springer-Verlag, 2000.
2. William B.Ribbens -Understanding Automotive Electronics, 5th edition, Butter worth Heinemann Woburn,1998.

REFERENCES:

1. Crouse, W.H. & Anglin, D.L., Automotive Mechanics, Intl. Student edition, TMH, New Delhi 1986.
2. Robert Bosch -Automotive Hand Book- SAE , 5th Edition, 2000
3. Internet References

BAM502 AUTOMOTIVE POLLUTION AND CONTROL 3 0 0 3

OBJECTIVE

The main objective of this course is to impart knowledge in Automotive Pollution and Control. The detailed concept of Pollutants and standards for Emission of pollutants, Emissions of SI Combustion, Emissions of CI Combustion, Emission control strategies, Test Procedure & instrumentation for Emission Measurement and Emission standards will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Pollutants and standards for Emission of Pollutants

CO02 - To learn the detailed study of Emissions of SI Combustion

CO03 - To learn the detailed study of Emissions of CI Combustion

CO04 – To learn the detailed study of Emission control strategies

CO05 - To learn the detailed study of Test Procedure & instrumentation for Emission Measurement and Emission standards

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION 6

Pollutants– sources–formation – effects – transient operational effects on pollution – Standards for Emission of pollutants- Bharath standards-European standards- Driving cycles

UNIT – II EMISSIONS OF SI COMBUSTION 11

Chemistry of SI engine combustion – HC and CO formation in 4-stroke and 2-stroke SI engines – NO formation in SI engines – Particulate emissions from SI engines – Effect of operating variables on emission formation.

UNIT – III EMISSIONS OF CI COMBUSTION 10

Basics of diesel combustion – Smoke emission in diesel engines – NO emission from diesel engines – Particulate emission in diesel engines. Color and Aldehyde emissions from diesel engines – effect of operating variables on emission formation.

UNIT – IV EMISSION CONTROL STRATEGIES 9

Design changes – Optimization of operating factors – Exhaust gas recirculation – Fumigation – Air injector PCV system – Exhaust treatment in SI engines – Thermal reactors – Catalytic converters – Catalysts – Use of unleaded petrol.

UNIT – V TEST PROCEDURE & INSTRUMENTATION FOR EMISSION MEASUREMENT AND EMISSION STANDARDS 9

Test procedures – NDIR analyzer – Flame ionization detectors – Chemiluminescent analyser – Gas chromatograph – Smoke meters.

TOTAL: 45 PERIODS

TEXT BOOK

1. Springer and Patterson, Engine Emission, Plenum Press, 1990.

REFERENCES

1. Ramalingam. K.K., Internal Combustion Engines, Scitech Publications, Chennai, 2003.
2. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 1994.
3. Heywood,J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co., 1995.
4. Internal Combustion Engines, M.L.Mathur/ R.Psharma.

BAM503 **AUTOMOTIVE TRANSMISSION** **L T P C**
3 1 0 4

OBJECTIVE

The main objective of this course is to impart knowledge in Automotive Transmission. The detailed concept of Clutch and Gear Box, Hydrodynamic Drive, Planetary Gear Boxes, Automatic Transmission Applications, Hydrostatic and Electric Drive will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Clutch and Gear Box
CO02 - To learn the detailed study of Hydrodynamic Drive
CO03 - To learn the detailed study of Planetary Gear Boxes
CO04 – To learn the detailed study of Automatic Transmission Applications
CO05 - To learn the detailed study of Hydrostatic and Electric Drive

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I CLUTCH AND GEAR BOX **14**

Problems on performance of automobile - such as resistance to motion, tractive effort, engine speed, engine power and acceleration. Requirement of transmission system. Different types of clutches, principle, Construction and torque capacity. Determination of gear ratios for vehicles. Different types of gearboxes such as Sliding mesh gearbox, Constant mesh gearbox and Synchromesh gearbox.

UNIT – II HYDRODYNAMIC DRIVE 12

Fluid coupling - Principle of operation, Constructional details, Torque capacity, Performance characteristics and Reduction of drag torque. Hydrodynamic Torque converter - Principle of operation, Constructional details and Performance characteristics. Multistage torque converters. Polyphase torque converters. Converter coupling

UNIT – III PLANETARY GEAR BOXES 10

Construction and operation of Ford – T-model gearbox, Wilson Gear box and Cotal electromagnetic transmission.

UNIT – IV AUTOMATIC TRANSMISSION APPLICATIONS 12

Need for automatic transmission, Principle of operation. Hydraulic control system for automatic transmission. Chevrolet "Turboglide" Transmission, Continuously Variable Transmission (CVT) – Types – Operations-Automated Manual Transmission systems.

UNIT – V HYDROSTATIC AND ELECTRIC DRIVE 12

Hydrostatic drive - Various types of hydrostatic systems, Principles of Hydrostatic drive system. Advantages and limitations. Comparison of hydrostatic drive with hydrodynamic drive, Construction and Working of typical Janny hydrostatic drive. Electric drive - Principle of operation of Early and Modified Ward Leonard Control system, Advantages & limitations.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Newton and Steeds, Motor vehicles, Illiffe Publishers, 2000.
2. Judge, A.W., Modern Transmission systems, Chapman and Hall Ltd., 1990**.**

REFERENCES:

1. Heldt, P.M., Torque converters, Chilton Book Co., 1992.
2. Crouse, W.H., Anglin, D.L., Automotive Transmission and Power Trains construction, McGraw Hill, 1992.

BEI504 **ELECTRONICS AND INSTRUMENTATION** **L T P C**
3 0 0 3

OBJECTIVE

The main objective of this course is to impart knowledge in Electronics and Instrumentation. The detailed concept of Classification of design & Reduction of Stress concentration. , Design of Shafts and springs, Gear Design, Flywheels, Design of Bearings will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of Classification of design & Reduction of Stress Concentration.
CO02 - To learn the detailed study of Design of analog and digital circuits
CO03 - To learn the detailed study of Automatic Control System
CO04 – To learn the detailed study of Application and Control system
CO05 – To learn the detailed study of Microprocessors and Applications

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I ELECTRONIC COMPONENTS AND DEVICES 10

Resistors, Capacitors, Inductors and Transformers - properties, types. Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor and Field Effect Transistors – operating principles and characteristics. Other Devices - UJT, SCR, LED, Photodetectors.

UNIT – II ANALOG AND DIGITAL CIRCUITS 10

Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) - properties and typical circuits like differentiator, integrator, summer, comparator, single-stage BJTs and FETs amplifiers - Multistage Amplifier Principles- Flip-Flops, Shift-Registers, Counters, Decoders/Drivers, Timer, Display Devices, A/D and D/A Converters.

UNIT – III AUTOMATIC CONTROL SYSTEM 10

Basic elements- Feedback Principle-Implication of Measurements Error Detectors-Final actuating elements-Two position multi position floating proportional controls- Relays- Servo amplifier- Servomotor- Mechanical, Electrical, Magnetic, Electronic, Hydraulic and Pneumatic systems.

UNIT – IV APPLICATION OF CONTROL SYSTEM 7

Governing of speed kinetic and Process control- Pressure, Temperature, Fluid level, Flow thrust and Flight control Photo electric controls.

UNIT – V MICROPROCESSORS AND APPLICATIONS 8

Architecture of 8085 processors, Address Modes Instruction set, simple programming like addition, subtraction, multiplication, logical operation, Peripherals and Interfacing – 8255, 8251. Applications like motor control, keyboard and PC interfacing.

Total : 45 PERIODS

TEXT BOOKS:

1. Millman.J. and Grabel.S., Integrated Electronics, Tata McGraw Hill, 1995.
2. M.Gopal, Automatic Ccntrol systems, Tata McGraw Hill Edition.
3. Goankar.R.S., Microprocessor Architecture, Programming and Applications, Wiley Eastern 1992.

REFERENCES:

1. Malvino.A.P., Leach.D.P., Digital Principles & Applications, Tata McGraw Hill, 1990.
2. Helfrick.A.D. and Cooper.W.D. Modern Electronics Instrumentation and Measurement Techniques, Prentice Hall 1990.

BAM505 ENGINEERING DESIGN FOR AUTOMOBILE ENGINEERS **L T P C**
3 1 0 4

OBJECTIVE

The main objective of this course is to impart knowledge in Engineering Design for Automobile Engineers. The detailed concept of Classification of design and Reduction of stress concentration will be taught to the students**.**

Course Outcomes

CO01 - To learn the detailed study of Classification of design and Reduction of Stress concentration
CO02 - To learn the detailed study of Design of shafts and springs
CO03 - To learn the detailed study of Gear Design
CO04 – To learn the detailed study of Flywheels
C005 – To learn of detailed study of Design of Bearings

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	**Programme Outcomes (POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **12**

Classification of design – Engineering materials and their physical properties as applied to design – Selection of materials – Factors of safety in design – Endurance limit of materials – Determination of endurance limit for ductile materials – Notch sensitivity – Principle of design optimization – Future trends – CAD Euler's formula – – Rankine's formula – Tetmajer's formula – Johnson formula – Design of push rods and eccentricity loaded columns – Reduction of stress concentration.

UNIT – II DESIGN OF SHAFTS AND SPRINGS 9

Introduction – Material and design stresses – Design of axles – Design of shafts on the basis of strength – Design of shaft on the basis of rigidity – Design of hollow shafts – Design of close coiled helical spring subjected to axial loading – Torsion of helical springs.

UNIT – III GEAR DESIGN 8

Design considerations – strength of gear teeth – Lewis equation – Terminology of gears – Dynamic tooth load – Design of spur gears – helical gears – herringbone gears – bevel gears and worm gears. .

UNIT – IV FLYWHEELS 7

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

UNIT – V DESIGN OF BEARINGS 9

Design of journal bearings - Ball and Roller bearings – Types of Roller bearings – Bearing life – Static load capacity – Dynamic load capacity – Bearing material – Boundary lubrication – Oil flow and temperature rise.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Jain,R.K., Machine Design, Khanna Publishers, 1992.
2. Sundararaja Murthy,T.V., Machine Design, Khanna Publishers, New Delhi, 1991.
3. T.J. Prabhu, Fundamentals of Machine Design, 2009.
4. T.J. Prabhu, Design of Transmission Elements, 2009.

REFERENCES:

1. Sigley, Machine Design, McGraw Hill, 1981.
2. Design Data Book, PSG College of Technology, Coimbatore, 1992.

BAM506 ALTERNATE FUELS AND ENERGY SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVE

The main objective of this course is to impart knowledge in Alternate Fuels and Energy Systems. The detailed concept of Classification of design and Reduction of stress concentration, Alcohols, Natural Gas, LPG, Hydrogen and Biogas, Vegetable Oils, Electric and Solar Powered Vehicles will be taught to the students.

Course Outcomes

CO01 -To learn the detailed study of Availability of alternate fuels and other alternate Energy sources
CO02-To learn the detailed study of Alcohols
CO03-To learn the detailed study of Natural Gas, LPG, Hydrogen and Biogas
CO04-To learn the detailed study of Vegetable Oils
C005 -To learn of detailed study of Electric and Solar Powered Vehicles

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **6**

Estimation of petroleum reserve "World Energy Scenerio, Energy Survey of India" – Need for alternate fuel – Availability of alternate fuels- Other alternate energy sources

UNIT – II ALCOHOLS 9

Properties as engine fuels, alcohols and gasoline blends, Performance in SI engine. Methanol and gasoline blends - Performance combustion and emission characteristics.

UNIT – III NATURAL GAS, LPG, HYDROGEN AND BIOGAS 9

Availability of CNG, properties, modification required to use in engines – performance and emission characteristics of CNG and LPG in SI & CI engines. Performance and emission for LPG – Hydrogen – Storage and handling, performance and safety aspects.

UNIT – IV VEGETABLE OILS 10

Various vegetable oils for engines – Transesterification – Performance in engines – Performance and emission characteristics.

UNIT – V ELECTRIC AND SOLAR POWERED VEHICLES 11

Layout of an electric vehicle – advantage and limitations – Specifications – System component, Electronic control system – High energy and power density batteries – Hybrid vehicle – Solar powered vehicles. Fuel cell vehicles.

TOTAL : 45 PERIODS

TEXTBOOKS:

1. Ramalingam. K.K., Internal combustion engine, scitech publications, Chennai, 2003.
2. Bechtold,R.L., Alternative Fuels Guide Book, SAE, 1997.

REFERENCES:

1. Nagpal, Power Plant Engineering, Khanna Publishers, 1991.
2. Alcohols and motor fuels progress in technology, Series No.19, SAE Publication USA 1980.

BAM 5L1 AUTOMOTIVE CHASSIS COMPONENTS LAB L T P C
0 0 3 1

OBJECTIVE

Study Of The Following Engines and Its Components By Dismantling, Comparing With Recent Engine Components And Assembling Various Parts

Course Outcomes

CO01 – Dismantling procedure of Clutch, Gear Box, Brake system
CO02 – Dismantling procedure of Differential Unit
CO03 – Study and Propeller Shaft Unit
CO04 – Assembling procedure of Clutch, Gear Box, Brake system, Differential Unit

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Observation Book	1	Student Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	End Semester Examinations	4	Alumni

1. Study, Dismantling & Assembling of Clutch Assembly
2. Study, Dismantling & Assembling of Gear Box Assembly
3. Study, Dismantling & Assembling of Differential Unit
4. Study of Propeller Shaft Unit
5. Study, Dismantling & Assembling of Steering Gear Boxes
    a) Rack and Pinion (Power and Manual) types
    b) Recirculating Ball type
6. Measurement Of Critical Dimensions Of
    A) Ladder Frame Chassis
    B) Monocoque Body
7. Calculation Of Gear Ratios
    A) Differential Unit
    B) Gear Box
8. Study of Pneumatic/ Hydraulic Brake system.
9. Study of Front axle assembly –critical dimensions

BME 5L1 **WORKSHOP PRACTICE** **L T P C**
0 0 3 1

OBJECTIVE

Exercise on production process of using different machines.

Course Outcomes

CO01 – Exercise on Plane turning, taper turning, thread cutting and Eccentric turning
CO02 – Exercise on drilling, reaming and taping and Welding
CO03 – Study & Exercise on Slotting (Both internal & external keyway cutting)
CO04 – Exercise in Surface Grinding.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Observation Book	1	Student Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	End Semester Examinations	4	Alumni

Part-A

1. Exercise on Plane turning, taper turning, thread cutting and Eccentric turning.
2. Exercise on drilling, reaming and taping.
3. Exercise on Spur Gear Milling, Helical Gear Milling and Bevel Gear Milling
4. Study & Exercise on Boring Machine.
5. Study & Exercise on Slotting (Both internal & external keyway cutting).
6. Practice in Capstan & Turret lathes.
7. Exercise in Surface Grinding.

Part-B

a. Welding Practice
   1. Arc welding
   2. Gas welding

BEC 5L1 AUTOMOTIVE ELECTRONICS & MICROPROCESSOR LAB L T P C
0 0 3 1

OBJECTIVE

Laboratory study of Automotive Electronics and Microprocessor

Course Outcomes

CO01 – Verification of truth table of Logic Gates,
CO02 – Characteristics of rectifiers – Half wave & Full wave
CO03 – Characteristics of SCR.
CO04 – Assembly language programming exercise

Course Assessment Methods:

Direct		Indirect	
1	Observation Book	1	Student Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	End Semester Examinations	4	Alumni

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

1. Verification of truth table of Logic Gates.
2. Verification of truth table of Adder, Subtractor & Flip-Flops.
3. Characteristics of rectifiers – Half wave & Full wave.
4. Timer – 555
5. Characteristics of SCR.
6. D/A and A/D converters.
7. Interfacing stepper motor control and CRT terminal
8. Assembly language programming exercise.
9. Interfacing A/D converter and simple data acquisition

BAM 5S1 **TECHNICAL SEMINAR-II** **L T P C**
0 0 3 1

OBJECTIVE

The students know about the resent techniques in Automobile Evaluation will be made based on the reports, the presentations and the interactions during the question answer sessions.

Course Outcomes

CO01 –Ability and Skills to be improved
CO02 – self confidents to be improved
CO03 –leadership quality to be improved
CO04 –innovative ideas will be generated

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Skill Practice	1	innovative idea
2	Observation	2	Performance of observation
3	Presentation	3	Results
4	End Semester Examinations		

The students are expected to make presentations throughout the semester under the supervision of a team of respective department faculty. The students are to be grouped appropriately so that each student makes a minimum of two different presentations on engineering topics of current interest. Every student has to submit an approved technical report prior to his presentation. Evaluation will be made based on the reports, the presentations and the interactions during the question answer sessions.

ELECTIVE-I

BAM 601 COMPUTER INTEGRATED MANUFACTURING SYSTEMS **L T P C 3 0 0 3**

OBJECTIVE:

The main objective of this course is to impart knowledge introduction to cad, manufacturing systems, flexible manufacturing systems, computer aided manufacturing, production planning and control concentration will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction to cad
CO02 - To learn the detailed study of manufacturing systems
CO03 - To learn the detailed study of flexible manufacturing systems
CO04 – To learn the detailed study of computer aided manufacturing
C005 – To learn of detailed study of production planning and control

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION TO CAD **8**

Fundamental concepts in manufacturing and automation – Need for automation – Automation stages – Economic analysis and production – Fundamentals of CIMS. Elements of CAD system – Graphics hardware – ALU – CPU – Input/Output devices – Geometric modeling – Automated drafting

UNIT – II MANUFACTURING SYSTEMS 10

Basics of numerical control – Types of NC systems – CNC and DNC machines – Machining centre – Tool magazine – NC tape format – Programming – Manual part programme – Simple programmes – Computer assisted part programming – APT language – Simple examples

UNIT – III FLEXIBLE MANUFACTURING SYSTEMS 9

Group technology – Part families – Part classification and coding – Production flow analysis – Machine cell design – Description of FMS – Equipment, Tooling and fixture. Design for Manufacturing and Assembly - Process Planning Techniques - Total approach to product development - Concurrent Engineering – Rapid prototyping

UNIT – IV COMPUTER AIDED MANUFACTURING 9

Computers in manufacturing – Automated manufacturing systems – Work piece handling – Types of transfer – Continuous, Intermittent and Non-synchronous walking beam – Computer aided process planning – Computer aided inspection – Computer aided quality control – Basic model of CIMS – Interfacing methods of CAD and CM – Computer Process Monitoring.

UNIT – V PRODUCTION PLANNING AND CONTROL 9

Introduction to production planning and control - Shop Floor Control Systems - Just in time approach - Emerging Challenges in CAD / CAM, Product Data Management - Product Modeling - Assembly and Tolerance Modeling.

TOTAL: 45 PERIO

TEXT BOOKS:

1. Groover,M.P., Automation Production Systems and CAM, Prentice Hall, 1990.
2. Ibrahim Zeid, " CAD - CAM Theory and Practice ", Tata McGraw-Hill Publishing Co. Ltd., 1998.

REFERENCES:

1. Groover,M.P., CAD/CAM Computer Aided Design and Manufacturing, Prentice Hall, 1990.
2. GG.S.Kant Vajpayee, , " Principles of Computer Integrated Manufacturing ", Prentice Hall of India Ltd., 1999
3. Barry Hawker, CAD/CAM Processes, Pitman, 1988

BAM 602 ELECTRONIC ENGINE MANAGEMENT SYSTEM

L	T	P	C
3	0	0	3

OBJECTIVE:

The main objective of this course is to impart knowledge in fundamentals of automotive electronics, sensors and actuators, si engine management, CI engine management; digital engine control system concentration will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of fundamentals of automotive electronics
CO02 - To learn the detailed study of sensors and actuators
CO03 - To learn the detailed study of SI engine management
CO04 – To learn the detailed study of CI engine management
C005 – To learn of detailed study of digital engine control system

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS 9

Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Parameters to be controlled in SI and CI engines.

UNIT – II SENSORS AND ACTUATORS 9

Inductive, Hall Effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, mass air flow, crank shaft position, cam position, engine and wheel speed,

steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors.

UNIT – III SI ENGINE MANAGEMENT 9

Three way catalytic converter, conversion efficiency versus lambda. Layout and working of SI engine management systems like Bosch Monojetronic, L-Jetronic and LH-Jetronic. Group and sequential injection techniques. Working of the fuel system components. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contactless electronic ignition system, Electronic spark timing control.

UNIT – IV CI ENGINE MANAGEMENT 9

Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valve.

UNIT – V DIGITAL ENGINE CONTROL SYSTEM 9

Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop control of fuel injection and closed loop lambda control – Integrated engine control system, Exhaust emission control engineering, Electromagnetic compatibility – EMI Suppression techniques – Electronic dash board instruments – Onboard diagnosis system.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. William B Ribbens, “Understanding Automotive Electronics”, 5th edition, Butterworth, Hienemann Wobum, 1998.

REFERENCES:

1. Tom Weather Jr and Cland C. Hunter, “Automotive Computers and Control System”, Prentice Hall Inc., New Jersey.

BAM 603	INSTRUMENTATION AND EXPERIMENTAL TECHNIQUES	L T P C 3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in vehicle experimental techniques, transducers modifiers and terminating devices, mechanical measurement, engine experimental techniques, fundamentals of measurement systems concentration will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of fundamentals of measurement systems
CO02 - To learn the detailed study of transducers, modifiers and terminating devices
CO03 - To learn the detailed study of mechanical measurement
CO04 – To learn the detailed study of engine experimental techniques
C005 – To learn of detailed study of vehicle experimental techniques

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I MEASUREMENT SYSTEMS 6

Static and Dynamic Measurement systems- Requirement and characterisitics- Analysis of experimental detail, Error analysis.

UNIT – II TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES 8

Transducers for Automotive Applications- Amplifiers- Filters- Data Acquisition- Indicators, Printers and Displays- Signal Analyzing.

UNIT – III MECHANICAL MEASUREMENT 10

Instrumentation for Measuring weight, Force, Torque, Pressure Power, Temperature, Fluid flow, Vibration, Rotational speed, Velocity, Acceleration and Angular motion.

UNIT – IV ENGINE EXPERIMENTAL TECHNIQUES 12

I S Code for Engine testing- Instrumentation for Performance testing of engine- Instrumentation for Research and Development, Instrumentation for noise, vibration, in cylinder gas flow, Flame temperature dynamic cylinder pressure measurements.

UNIT – V VEHICLE EXPERIMENTAL TECHNIQUES 9

Laboratory tests- Tests tracks-Endurance tests-Crash tests- Wind tunnel tests-Brake tests.

TOTAL: 45 PERIODS

TEXTBOOK:

1. J.G. Giles, "Engine and Vehicle Testing", Illiffe books Ltd., London, 1968.
2. T.G. Beckwith and Buck, "Mechanical Measurements", Oxford and IBH Publishing House, New Delhi, 1995.

REFERENCE:

1. A.W. Judge, "Engineering Precision Measurement", Chapman and Hall Ltd, Essex Street W.C., 1951.
2. D.Patambis. "Principle of Industrial Instrumentation", Tata McGraw Hill Publishing Company, New Delhi, 1990.
3. Rangan, Sharma and Mani, "Instrumentation Devices and Systems ", Tata McGraw Hill Publishing Company, New Delhi, 1990.

BAM604 **AUTOMOTIVE AERODYNAMICS** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction of automotive aerodynamics, aerodynamic drag of cabs, shape optimization of cabs, vehicle handling, wind tunnels for automotive aerodynamics systems concentration will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction
CO02 - To learn the detailed study of aerodynamic drag of cabs
CO03 - To learn the detailed study of shape optimization of cabs
CO04 – To learn the detailed study of vehicle handling
C005 – To learn of detailed study of wind tunnels for automotive aerodynamics

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **10**

Scope – historical development trends – Fundamentals of fluid mechanics – Flow phenomenon related to vehicles – External & Internal flow problems – Resistance to vehicle motion – Performance – Fuel consumption and performance – Potential of vehicle aerodynamics.

UNIT – II AERODYNAMIC DRAG OF CABS 8

Car as a bluff body – Flow field around car – drag force – types of drag force – analysis of aerodynamic drag – drag coefficient of cars – strategies for aerodynamic development – low drag profiles.

UNIT – III SHAPE OPTIMIZATION OF CABS 7

Front and modification – front and rear wind shield angle – Boat tailing – Hatch back, fast back and square back – Dust flow patterns at the rear – Effect of gap configuration – effect of fasteners.

UNIT – IV VEHICLE HANDLING 10

The origin of force and moments on a vehicle – side wind problems – methods to calculate forces and moments – vehicle dynamics Under side winds – the effects of forces and moments – Characteristics of forces and moments – Dirt accumulation on the vehicle – wind noise – drag reduction in commercial vehicles.

UNIT – V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS 10

Introduction – Principles of wind tunnel technology – Limitation of simulation – Stress with scale models – full scale wind tunnels – measurement techniques – Equipment and transducers – road testing methods – Numerical methods.

TOTAL : 45 PERIODS

TEXTBOOK:

1. Hucho, W.H., Aerodynamics of Road vehicles, Butterworths Co. Ltd., 1997.

REFERENCES

1. Pope, A, Wind Tunnel Testing, John Wiley & Sons, 2nd Edn., New York, 1994.
2. Automotive Aerodynamics: Update SP-706, SAE, 1987.
3. Houghton, Aerodynamics

BAM 605 **VEHICLE DYNAMICS** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction vehicle dynamics, multi degree freedom introduction vehicle dynamics systems numerical methods, vehicle handling and stability of vehicles, suspension, tyres concentration will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction vehicle dynamics
CO02 - To learn the detailed study of multi degree freedom introduction vehicle dynamics systems
CO03 - To learn the detailed study of numerical methods
CO04 – To learn the detailed study of vehicle handling and stability of vehicles
C005 – To learn of detailed study of suspension, tyres

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **9**

Fundamentals of vibration, single degree of freedom, two degree of freedom, multidegree freedom, free, forced and damped vibrations, modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber.

UNIT – II MULTI DEGREE FREEDOM SYSTEMS 9

Closed and far coupled system, eigen value problems, orthogonality of mode shapes, modal analysis, forced vibration by matrix inversion.

UNIT – III NUMERICAL METHODS 9

Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched systems.

UNIT – IV VEHICLE HANDLING AND STABILITY OF VEHICLES 9

Load distribution, calculation of acceleration, tractive effort and reactions for different drives, stability of a vehicle on a curved track, slope and a banked road. Oversteer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.

UNIT – V SUSPENSION, TYRES 9

Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of damper characteristics and suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft direction, roll axis and vehicle under the action of side forces. Tyre – Requirements, types, testing, dynamics, ride characteristics, power consumed by a tyre.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Gillespie, T.D., Fundamentals of vehicle dynamics society of Automotive Engineers, USA, 1992.
2. T.Y.Wong, *"Theory of Ground Vehicles"*, JohnWiley & Sons Inc ,New York

REFERENCES:

1. W.Steeds, "Mechanics of Road Vehicles", llliffe Books Ltd,London,1960
2. Heldt,P.M., Automotive Chassis, Chilton Co., New York, 1992.
3. Giri N.K – Automotive Mechanics, Khanna Publishers, 2007.

ELECTIVE-II

B**AM6L1**	**AUTOTRONICS LABORATORY**	**L T P C** **0 0 3 1**

OBJECTIVE

Study and performance of pneumatic and hydraulic applications in automobiles

Course Outcomes

CO01 – Design and testing of hydraulic circuits
CO02 – Design and testing of pneumatic circuits
CO03 – Design of speed control circuits and Design of synchronizing circuit
CO04 – Design of sequence circuit

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	**Programme Outcomes (POs)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		**Indirect**	
1	Lab Practice	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Record Works	3	Results
4	End Semester Examinations		

1. Design and testing of hydraulic circuits such as
   a) Pressure control
   b) Flow control
   c) Direction control
   d) Design of circuit with programmed logic sequence, using an optional PLC in hydraulic Electro hydraulic Trainer.
2. Design and testing of pneumatic circuits such as
   a) Pressure control
   b) Flow control
   c) Direction control
   d) Circuits with logic controls
   e) Circuits with timers
   f) Circuits with multiple cylinder sequences in Pneumatic Electro pneumatic

Trainer.

3. Design of speed control circuits
    a) Meter – In Circuit
    b) Meter – Out Circuit
4. Design of continuous cycle circuit
5. Design of synchronizing circuit
6. Design of sequence circuit

BAM6L2 **VEHICLE DYNAMICS LAB** **L T P C**

0 0 4 2

OBJECTIVE

Study and performance of stability of vehicle under test conditions

Course Outcomes

CO01 – Total Resistance for various Vehicles.

CO02 – Find the displacement velocity, acceleration and inertia force.

CO03 – Determine the Pressure distribution over a car model.

CO04 – Determine the Pressure distribution in a 2D spoiler.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Observation Book	1	Student Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	End Semester Examinations	4	Alumni

Part-A

1. Total Resistance for various Vehicles.
2. To find the DHP, DF & Mechanical Efficiency.
3. Find the displacement velocity, acceleration and inertia force.
4. Find the thrust turning moment and combined turning movement.

Part-B

1. Determine the Pressure distribution over a car model.
2. Determination of co-efficient of lift and drag over a car model.
3. Determine the Pressure distribution in a 2D spoiler.

BAM 6P1 **DESIGN AND FABRICATION PROJECT** **L T P C**
0 0 4 2

OBJECTIVE

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Course Outcomes

CO01 – comprehensive report
CO02 – literature survey
CO03 – problem statement, project work details
CO04– project work details, estimation of cost and conclusions

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	literature survey	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Project submission	3	Results
4	End Semester Examinations		

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Every project work shall have a Guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

BAM 701 **INDUSTRIAL ENGINEERING** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in production, productivity and efficiency, plant layout, group technology and material handling/ loading and scheduling, statistical quality control, work study will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of production, productivity and efficiency
CO02 - To learn the detailed study of plant layout
CO03 -To learn the detailed study of group technology and material handling/ loading and scheduling
CO04 – To learn the detailed study of statistical quality control
CO05 - To learn the detailed study of work study

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I PRODUCTION, PRODUCTIVITY AND EFFICIENCY 9

Definitions - Productivity, Effectiveness, Partial Productivity, Total Productivity- Productivity cycle - Factors influencing productivity- Techniques to improve productivity- Technology based techniques- Material based productivity improvement - Improvement control - M.R.P - Quality circles - brainstorming Pareto analysis cause and effect analysis- Total quality management - Zero Defects - Flextime- Just in time - Kanban - Ergonomics -

Reliability improvement - Modular Design - Difference between reliability and quality maintainability.

UNIT-II PLANT LAYOUT 8

Types of layout - Product/Process/Fixed position/Group-advantage/Disadvantage of Product/Process/Fixed - preference of Product/Process/Fixed position layout - Flow patterns - Tools and Techniques of layout - Operation Process chart - Flow diagram - String diagram - Travel chart method - Plant location - Plant location decision.

UNIT-III GROUP TECHNOLOGY AND MATERIAL HANDLING/ LOADING AND SCHEDULING 9

Introduction - Part families - Group technology layout - Limitation of Group technology - Design and Manufacturing attributes - The composite part concept - Machine cell design - part classification and coding - Automatic storage and retrieval system - Principle of material handling - Loading - Master scheduling - Perpetual loading - Order scheduling - Loading by scheduled method - Index method of scheduling - Factors influencing scheduling - Random number table - Production planning and control - Routing - Dispatching - Job card - Job order - Production control - Order control chart machine load chart

UNIT-IV STATISTICAL QUALITY CONTROL 9

Introduction to quality control - Statistical measures - Control chart - Types - Control chart for attributes - Control chart for number of defects per unit acceptance sampling - Basic probability - normal basic distribution - Acceptance quality level - lot tolerance percent defective (LTPD) - Average outgoing quality (AOQ)

UNIT-V WORK STUDY 9

Techniques of work - Procedure of work study - Method study - Multiple activity chart utility - Unit work measurement - Micro motion study - Predetermined Motion time system - Work sampling - Job analysis - Job evaluation and merit rating - wage and wage incentive

Total no of Periods: 45

TEXT BOOK:

1. Khanna O.P. "Industrial Engineering and Management", Khanna Publishers, New Delhi.

REFERENCES:

1. B. Kumar "Industrial Engineering" Khanna Publishers. New Delhi, 1999
2. Gupta and Patel, "Work Study" Khanna Publishers. New Delhi, 1998

BAM702 **VEHICLE BODY ENGINEERING** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge of car body details, Vehicle aerodynamics, bus body details, commercial vehicle details, body materials, trim and mechanisms will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of car body details
CO02 - To learn the detailed study of vehicle aerodynamics
CO03 - To learn the detailed study of bus body details
CO04 – To learn the detailed study of commercial vehicle details
CO05 – To learn of detailed study of body materials, trim and mechanisms

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I CAR BODY DETAILS **10**

Types of Car - Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility- regulations, driver's visibility, improvement in visibility and tests for visibility. Safety - safety design, safety equipments for vehicles. Car body construction. Various panels of car bodies.

UNIT – II VEHICLE AERODYNAMICS 9

Objectives, Vehicle drag and types. Various types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Various wind tunnel testing such as: Flow visualization techniques, Airflow management test and Test to measure forces and moments.

UNIT – III BUS BODY DETAILS 9

Types – based on capacity, based on distance traveled and based on construction such as Mini bus, Single Decker, Double Decker, Two level, Split-level and Articulated bus. Bus body lay out, Types of metal sections used, Regulations. Constructional details of Conventional and Integral type construction.

UNIT – IV COMMERCIAL VEHICLE DETAILS 8

Different types of commercial vehicle bodies. Light commercial vehicle body types. Construction details of flat platform body, Tipper body & Tanker body – Dimensions of driver's seat in relation to controls – Drivers cab design.

UNIT – V BODY MATERIALS, TRIM AND MECHANISMS 9

Steel sheet, timber, plastics, GRP, properties of materials. Corrosion: Anticorrosion methods, Modern painting process. Body trim items – Body mechanisms.

TOTAL : 45 PERIODS

TEXTBOOK:

1. Powloski, J., Vehicle Body Engineering, Business Books Ltd., 1998.

REFERENCES:

1. Giles, G.J., Body construction and design, lliffe Books Butterworth & Co., 1991.
2. Dieler Anselm., The passenger car body, SAE International, 2000.
3. John Fenton, "Vehicle Body Layout and Analysis", Mechanical Engineering Publication Ltd., London.

BAM 703 **VEHICLE DESIGN** **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge vehicle frame and suspension, front axle and steering systems, clutch, gear box, drive line and rear axle will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of vehicle frame and suspension
CO02 - To learn the detailed study of front axle and steering systems
CO03 - To learn the detailed study of gear box
CO04 – To learn the detailed study of drive line and rear axle
CO05 – To learn of detailed study of drive line and rear axle

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I VEHICLE FRAME AND SUSPENSION 12

Study of loads - moments and stresses on frame members. Design of frame for passenger and commercial vehicle - design of leaf springs - Coil springs and torsion bar springs.

UNIT – II FRONT AXLE AND STEERING SYSTEMS 12

Analysis of loads - moments and stresses at different sections of front axle. Determination of bearing loads at Kingpin bearings. Wheel spindle bearings. Choice of bearings. Determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering. Design of Front Axle Beam.

UNIT – III CLUTCH 12

Torque capacity of single plate, multi plate and cone clutch. Design of clutch components, Design details of roller and sprag type of clutches. .

UNIT – IV GEAR BOX 12

Gear train calculations, layout of gear box constant mesh and synchrono mesh gear box. Design of three speeds and four speed gear boxes.

UNIT – V DRIVE LINE AND REAR AXLE 12

Design of propeller shaft and types of propeller shaft. Design details of final drive gearing. Design details of full floating. Semi-floating and three quarter floating rear shafts and rear axle housings. Design aspects of final drive.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Heldt,P.M., Automotive Chassis, Chilton Book Co., 1992.
2. Heldt,P.M., Torque Converters, Chilton Book Co., 1992.

REFERENCES:

1. Giri,N.K., Automobile Mechanics, Khanna Publishers, New Delhi, 1998.
2. W. Steeds, "*Mechanics of Road Vehicles*", lliffe Books Ltd, London, 1990

BAM 704 **VEHICLE MAINTENANCE** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge maintenance records and schedule, maintenance, repair and overhauling of chassis drive line components, maintenance, repair and servicing of electrical systems, maintenance, repair and servicing of cooling , lubrication system, fuel system and body will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of maintenance records and schedule
CO02 - To learn the detailed study of maintenance, repair and overhauling of engine
CO03 - To learn the detailed study of maintenance, repair and overhauling of chassis drive line components
CO04 – To learn the detailed study of maintenance, repair and servicing of electrical systems
CO05 – To learn of detailed study of maintenance, repair and servicing of cooling lubrication system, fuel system and body

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I MAINTENANCE RECORDS AND SCHEDULE 9

Impartance of maintenance. Scheduled and unscheduled maintenance. Preparation of check lists. Chassis lubrication. Cost effectiveness. Pre-trip, Post-trip. Inspection forms. Log books. Trip sheets. Other maintenance record forms.

UNIT – II MAINTENANCE, REPAIR AND OVERHAULING OF ENGINE 9

Dismantling of engine components. Cleaning methods. Visual inspection and dimensional check of various engine components. Minor and Major tune up Reconditioning, repairing methods of engine components. Assembly procedure. Special tools used for maintenance, repair and overhauling.

UNIT – III MAINTENANCE, REPAIR AND OVERHAULING OF CHASSIS DRIVE LINE COMPONENTS 9

Clutch – Mechanical, Automatic types. Gear box – Mechanical, Automatic types. Final reduction. Propeller shaft. Front and rear suspension system. Rigid and independent types. Brakes systems – Hydraulic, Servo, Air. Air bleeding. Steering system. Wheel alignment. Types.

UNIT – IV MAINTENANCE, REPAIR AND SERVICING OF ELECTRICAL SYSTEMS 9

Battery – Testing methods. Starter motor. Charging system – DC Generator, AC Alternator, Regulator. Ignition systems – Coil ignition, Transistor assisted ignition, Capacitor discharge ignition. Electric Horn, Wiper, Flasher, Electric fuel pump, Gauges. Lighting system. Head lights focusing. Wiring system.

UNIT – V MAINTENANCE, REPAIR AND SERVICING OF COOLING LUBRICATION SYSTEM, FUEL SYSTEM AND BODY 9

Cooling system – types, water pump, radiator, thermostat valve, anti corrosion and anti freezing solutions. Lubricating system – Oil analysis, oil topping up, oil change, oil filters, oil relief valve. Fuel system – Petrol, diesel fuel feed system components. Body repair tools, minor body panel beating, tinkering, soldering, polishing, painting. Door locks mechanism. Window glass actuating mechanism.

TOTAL : 45 PERIODS

TEXTBOOKS:

1. Judge,A.N., Motor vehicle engine servicing, 3rd Edition, Pitman Paperpack, London, ‘69.
2. Venk.Spicer, Automotive Maintenance and Trouble shooting.

REFERENCES:

1. Judge,A.W., Maintenance of High speed diesel engines, Chapman Hall Ltd., London, ’56.
2. Maleev,V.L., Diesel Engine operation and Maintenance, McGraw Hill Book Co., New York, 1954.
3. Vehicle Service Manuals of reputed manufacturers.

ELECTIVE-III

BAM 7L1 VEHICLE MAINTENANCE LABORATORY **L T P C**
0 0 3 1

OBJECTIVE

Study of an automobile repair, service and maintenance shop.

Course Outcomes

CO01 – Engine tune up for Diesel and Petrol Engines.
CO02 – Study of fuel filters and air cleaners.
CO03 – Fault diagnosis in electrical ignition system, gasoline fuel system, diesel fuel system.
CO04 – Removal and fitting of tires and tubes.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Observation Book	1	Student Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	End Semester Examinations	4	Alumni

1. Study of an automobile repair, service and maintenance shop.
2. Study and preparation of different statements/records required for the repair and maintenance works.
3. Study of different types of tools and instruments required for repair and maintenance.
4. Engine tune up for Diesel and Petrol Engines.
5. Fault diagnosis in electrical ignition system, gasoline fuel system, diesel fuel system.
6. Study of the faults in the electrical systems such as headlights, side or parking lights, electric horn system, windscreen wiper system, starting and lighting system.
7. Study of fuel filters and air cleaners.
8. Study and adjustment of pedal play in clutch, hand brake and steering wheel play.
9. Practices on air bleeding from hydraulic brakes, air bleeding of diesel fuel system.
10. Removal and fitting of tires and tubes.

BAM 7L2 **COMPUTER AIDED DRAFTING AND MANUFACTURING LAB** **L T P C 0 0 3 1**

OBJECTIVE

Study of Computer aided drafting and manufacturing

Course Outcomes

CO01 – CNC milling machines; Production of various contour shapes.
CO02 – Introduction to component modeling.
CO03 – NC code generation using CAD/CAM software
CO04 – Manual Part programming for CNC machines using a standard G-codes and M-codes.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Observation Book	1	Student Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	End Semester Examinations	4	Alumni

COMPUTER AIDED MANUFACTURING

1. Manual Part programming for CNC machines using a standard G-codes and M-codes. Simulation of tool path, machining practice on trainer type CNC machines - straight cut, Taper turning, Profile, Parting, Thread cutting.
2. CNC milling machines; Production of various contour shapes.
3. Computer assisted part programming-APT PROGRAMMING LANGUAGE - Part programming using APT and other NC programming languages.
4. Introduction to component modeling.
5. NC code generation using CAD/CAM software - Post Processing for standard CNC controls like FANUC, SIMUMERIC etc.,

COMPUTER AIDED DRAFTING

CAD introduction to computer aided drawing, 2D drawing Orthographic view, Isometric views, 2D -Sectional views , Part drawing, Assembly drawing, Detailed drawing, Dimensioning, Annotations, Symbols, Welding, Surface finish, Threads, Text, Bill of materials. Exercise - Knuckle Joint, Gib and Cotter Joint, Screw Jack, Foot step Bearing.

3D drawing part modeling - Protrusion, Cut Sweep, Draft and Loft-Modify/ Edit - Pattern- Transformation, Boolean operation. Assembly - creating assembly from parts, Modify / Edit - Pattern conversion of 3D solid model to 2D model. Surface modeling - Tabulated, Revolve, Ruled and edge surfaces, Exercise-Piston, Connecting Rod, Knuckle Joint, Universal Joint and Couplings.

PROGRAMMING

1. LISP programming
   - i) Generation of simple drawings using LISP, C program to analyze the following mechanism
   - ii) Four bar mechanism
   - iii) Slider Crank mechanism

   C/C++ program for the following Finite Element method problem.

BAM 7P1 **PROJECT WORK (PHASE-I)** **L T P C**
0 0 18 6

OBJECTIVE

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Course Outcomes

CO01 – comprehensive report
CO02 – literature survey
CO03 – problem statement, project work details
CO04– project work details, estimation of cost and conclusions

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	literature survey	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Project submission	3	Results
4	End Semester Examinations		

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline. Every project work shall have a Guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

BAM7VI INPLANT TRAINING **L T P C**
0 0 0 1

Students should undergo Inplant training in an industry during their holidays for 15 days to acquire practical knowledge and to explore the activities going on in the Industry. A report and Inplant training certificate may be submitted for evaluation.

BAM 8P1 **PROJECT WORK - PHASE (II)** **0 0 18 6**

OBJECTIVE

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Course Outcomes

CO01 – comprehensive report
CO02 – literature survey
CO03 – problem statement, project work details
CO04– project work details, estimation of cost and conclusions

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	literature survey	1	Readings and Calculations
2	Observation	2	Performance of observation
3	Project submission	3	Results
4	End Semester Examinations		

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline. Every project work shall have a Guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

LIST OF ELECTIVES

Elective-I

BAM 001 COMPUTER SIMULATION OF IC ENGINE PROCESSES **L T P C**
3 1 0 4

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction, adiabatic flame temperature, spark ignition engines, si engine simulation with adiabatic combustion, si engine simulation with gas exchange process will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction
CO02 - To learn the detailed study of adiabatic flame temperature
CO03 - To learn the detailed study of spark ignition engines
CO04 – To learn the detailed study of **SI** engine simulation with adiabatic combustion
CO05 - To learn the detailed study of **SI** engine simulation with gas exchange process

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **8**

Simulation, advantages of computer simulation, step – by – step approach, reactive processes, heat reaction, measurement of URP, measurement of HRP.

UNIT – II ADIABATIC FLAME TEMPERATURE 8

Introduction, complete combustion C/H/N/O/ systems, constant – volume adiabatic combustion, constant – pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state.

UNIT – III SPARK IGNITION ENGINES 9

Introduction, Basic details and nomenclature, cylinder pressure indicator diagram, indicated power, brake power, SI Engine simulation with air as working medium, deviation between actual and ideal cycle.

UNIT – IV SI ENGINE SIMULATION WITH ADIABATIC COMBUSTION 10

Introduction, Engine details, temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation, SI Engines simulation with progressive combustion.

UNIT – V SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS 10

Introduction, gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance, simulation of two stroke SI Engine.

TOTAL : 45 PERIODS

TEXTBOOK:

1. Ganesan,V., Computer Simulation of spark ignition engine process, Universities Press (I) Ltd., Hyderabad, 1996.

REFERENCES:

1. Ramoss,A.L., Modelling of Internal Combustion Engines Processes, McGraw Hill Publishing Co., 1992.
2. Ashley Campbel, Thermodynamics analysis of combustion engines, John Wiley & Sons, New York, 1986.

BME001 **FINITE ELEMENT METHODS** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction, discrete elements, continuumelements, isoparametricelements, field problem will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction
CO02 - To learn the detailed study of discrete elements
CO03 - To learn the detailed study of continuum elements
CO04 – To learn the detailed study of iso parametric elements
CO05 - To learn the detailed study of field problem

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **8**

Review of various approximate methods – Raleigh Ritz's, Galerkin and finite difference methods- Governing equation and convergence criteria of finite element method.

UNIT – II DISCRETE ELEMENTS 10

Bar elements, uniform section, mechanical and thermal loading, varying section, truss analysis. Beam element - problems for various loadings and boundary conditions - longitudinal and lateral vibration. Use of local and natural coordinates.

UNIT – III CONTINUUM ELEMENTS 8

Plane stress, Plane strain and axisymmetric problems, constant and linear strain, triangular elements, stiffness matrix, axisymmetric load vector,

UNIT – IV ISOPARAMETRIC ELEMENTS 10

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, Stiffness matrix and consistent load vector, Gaussian integration

UNIT – V FIELD PROBLEM 9

Heat transfer problems, Steady state fin problems, Derivation of element matrices for two dimensional problems, Torsion problems

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tirupathi.R. Chandrapatha and Ashok D. Belegundu – Introduction to Finite Elements in Engineering – Printice Hall India, Third Edition, 2003.
2. Rao. S.S., Finite Element Methods in Engineering, Butterworth and Heinemann, 2001

REFERENCES:

1. Reddy J.N. – An Introduction to Finite Element Method – McGraw Hill – 2000.
2. Krishnamurthy, C.S., Finite Element Analysis, Tata McGraw Hill, 2000.
3. Robert D Cook, David S Malkus, Michael E Plesha, ‘Concepts and Applications of Finite Element Analysis’, 4th edition, John Wiley and Sons, Inc., 2003.

BAM 002 **TWO AND THREE WHEELERS** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in the power unit, chassis and sub-systems, brakes and wheels, two wheelers, three wheelers will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of the power unit
CO02 - To learn the detailed study of chassis and sub-systems
CO03 - To learn the detailed study of brakes and wheels
CO04 – To learn the detailed study of two wheelers
CO05 - To learn the detailed study of three wheelers

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I THE POWER UNIT **9**

Two stroke and four stroke SI engine, merits and demerits, Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes, merits and demerits, scavenging efficiency. Scavenging pumps. Rotary valve engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system. Electronic ignition System. Starting system. Kick starter system.

UNIT – II CHASSIS AND SUB-SYSTEMS 8

Main frame and its types, Chassis and shaft drive. Single, multiple plates and centrifugal clutches, Gear box and gear controls. Front and rear suspension systems. Shock absorbers, Panel meters and controls on handle bar.

UNIT – III BRAKES AND WHEELS 8

Drum brakes, Disc brakes, Front and rear brake links lay-outs. Spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and tubes.

UNIT – IV TWO WHEELERS 10

Case study of motor cycles, scooters and mopeds. Servicing and maintenance.

UNIT – V THREE WHEELERS 10

Case study of Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance.

TOTAL : 45 PERIODS

TEXTBOOK:

1. Irving,P.E., Motor cycle Engineering, Temple Press Book, London, 1992.

REFERENCES:

1. The Cycle Motor Manual, Temple Press Ltd., London, 1990.
2. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.

Elective-II

BAM 003 SIMULATION OF VEHICLE SYSTEMS L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in longitudinal dynamics and control, lateral dynamics and electronic stability control, modeling of passive automotive suspensions , modeling of semiactive and active automotive Suspensions, lateral and longitudinal tire forces will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of longitudinal dynamics and control
CO02 - To learn the detailed study of lateral dynamics and electronic stability control
CO03 -To learn the detailed study of modelling of passive automotive suspensions
CO04 – To learn the detailed study of modelling of semi active and active automotive Suspensions
CO05 - To learn the detailed study of lateral and longitudinal tire forces

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I LONGITUDINAL DYNAMICS AND CONTROL 9

Aerodynamic drag force - Longitudinal tire force - Rolling resistance - Calculation of normal tire forces - Calculation of effective tire radius - Driveline Dynamics - Torque converter -

Transmission dynamics - Engine dynamics - Wheel dynamics - Cruise Control - Anti-Lock Brake Systems - Automated Highway Systems - Longitudinal Control Architecture.

UNIT II LATERAL DYNAMICS AND ELECTRONIC STABILITY CONTROL 9

Lateral Systems - Kinematic Model - Bicycle Model. Motion of Particle Relative to a rotating Frame. Dynamic Model in Terms of Error with Respect to Road, Yaw Rate and Slip Angle. Road Model. Differential Braking Systems - Steer-By-Wire Systems - Independent All Wheel Drive Torque Distribution

UNIT III MODELING OF PASSIVE AUTOMOTIVE SUSPENSIONS 9

Introduction - Modal Decoupling - Performance Variables - Natural Frequencies and Mode Shapes - Approximate Transfer Functions - Analysis of Vibrations in the Sprung Mass Mode and Unsprung Mass Mode - Verification Using Quarter Model. Half-Car and Full-Car Suspension Models.

UNIT IV MODELING OF SEMIACTIVE AND ACTIVE AUTOMOTIVE SUSPENSIONS 9

Semi-Active Suspension Model - Optimal Semi-Active Control Law - Calculation of Transfer Function Plots - Performance of Semi-Active Suspension Systems. Active Automotive Suspensions - Trade-offs and Limitations - Invariant Points and Their Influence - Hydraulic Actuators for Active Suspensions

UNIT V LATERAL AND LONGITUDINAL TIRE FORCES 9

Tire Forces - Tire Structure - Longitudinal Tire Force at Small Slip Ratios - Lateral Tire Force at Small Slip Angles - Magic Formula Tire Model - Dugoff's Tire Model - Dynamic Tire Model - Development of Lateral Tire Model for Uniform Normal Force Distribution and Parabolic Normal Pressure Distribution - Combined Lateral and Longitudinal Tire Force Generation.

TOTAL: 45 PERIODS

TEXT BOOK

1. Rajesh Rajamani, “Vehicle Dynamics and Control”, Springer, 2006.

BAM 004 **TYRE TECHNOLOGY** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in fabric preparation, calendaring, thread extrusion and bead construction, tyre building, green tyre preparation & curing will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of fabric preparation
CO02 - To learn the detailed study of calendering
CO03 -To learn the detailed study of thread extrusion and bead construction
CO04 – To learn the detailed study of tyre building
CO05 - To learn the detailed study of green tyre preparation & curing

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

INTRODUCTION TO BASICS OF TYRES **5**

Types of tyres, tyre components and its role, tread patterns, outline of production of tires, Requirements and function of tyres - Major departments of a Tyre Industry – An explanation of their function and relation to other departments. Factors influencing the performance of tyre: Compound design, degree of mixing: (open mill & internal mixing), parameters (temperature, time, speed), degree of vulcanization - Testing and dispatch of mixes, Basic quality control and mill room control Laboratory.

UNIT I - FABRIC PREPARATION **8**

Fabrics of the Tyre Industry: Cotton, Rayon, Nylon & steel cords – manufacture, construction – styles and presentations. Bonding methods – Fabric bonding necessities of stronger fabrics leading to bonding methods developments. Wet & dry bonding systems – dip and hot stretch process for Nylon. REL-VP latex systems – and parameters for dip & hot stretch process for Nylon. Modified surface treatment needed for polyesters & glass fabric - Metal coating for steel cord. Recent developments in Radical Tyre fabrics – Aromatic Nylon (Kevlar) and other special fabric reinforcement systems and their use - Testing of dipped fabrics 'U', 'H' and other tests. Dip pick up and the relation to adhesion etc.

UNIT II - CALENDERING **8**

Calendering process: 3 and 4 roll calenders. Skimming & frictioning process preparation of bead wrapper and chaffer-on fabrics on 3 roll calenders. Topping process on calendar - Limitation of 3 roll calenders and advantages of 4 roll calenders-process control aspects – economics - Relation between ends per inch and calendering process. Inner, outer and breaker fabrics. Compound fabric ratios and compound design consideration for different styles of fabrics - Defects of calendered fabrics and their remedies. Parameters for scrap control in fabric processes in the tyre industry requirement of total quality control involving fabric supplier's dipping, calendering and bias cutting operations. Economics of fabric usage.

UNIT III - THREAD EXTRUSION AND BEAD CONSTRUCTION **8**

Basic concepts of Extrusion. Die swell & shrinkage phenomenon – effect of compounding parameters on these phenomenon. Die design and theoretical calculation of tread weight. Effect of viscosity & temperature on extrusion. Dimensions and weight control extusion operation parameters like feeding rate, screw speed, take off conveyor speed on tread extrusion. Extruded tread profile – critical dimensions. Duel extruder – Cap & base concept relation to tyre wear parameters like tread wear heat buildup etc. Cross head extruder wire coating process - Bias cutting and pocket making: Bias angle specification and the significance Horizontal and vertical laying of coated wore. Apex preparation on extruder and profile calender Bead wrapping and flipping operations. Single and double bead concept and preliminary calculation of bead safety factors. Width and angle adjustments splicing and identification. Bias plies pocket 3-3-2 4-4-2 ply constructions Defects of pockets wrong identification over splicing wrinkles, parallel plies etc.

UNIT IV - TYRE BUILDING **8**

Tyre building inputs: Inner liners, plies, beads, tread, side wall and gum strips – their inspection Drum inspection for drumset, drum circumference Significance of parameters for tyre building. Size making on finished tyre and the relation to building specifications. Tyre building specifications sequence of building. Intermitant consolidation use of various cements and gum strips. Impartance of the state of the Art Technology. Appraisal of Tyre building as most crucial operation correlation of some of the cured tyre & service returned

tyres to the lack of building skill. Green tyre inspection procedures weight tolerance techno-commercial impartance of green tyre weight. Green tyre storage considerations.

UNIT V - GREEN TYRE PREPARATION & CURING 8

Internal and External painting – Awling – Bagging in case of Air bag cure Bag-omatic and Air bag curing – mold lubrication- Bladder assembly bead curing rings – Dimension criticality Services to the Bag-o-matic presses Curing cycle – shaping – HPS, and hot water circulation. Dome steam cold water & vacuum cycles. Determination of optimum cure of tyres by thermocouple built tyres. Economics of curing post cure inflation of Nylon tyres cured tyre inspection. Defects of tyres – Tyre classification for defects – causes and discussions - Examination of: (i) Returned tyres (ii) Tyres for retreading - Norm of tyre adjustments for fastwear, poor retreading Bead/casing failures. Hot and cold process retreading concept of total price/km run increasing competition and future trends in the industry and open house discussion.

Total no of Periods: 45

TEXT BOOK:

1. Tom French, Tyre technology, The University of Michigan, 1989.

REFERENCES:

1. Blow. C. M, Rubber Technology and Manufacture, Butterworth- Heinemann, London, 1982.
2. Maurice Morton, “Rubber Technology”, Springer, 3rd edition, 1987.
3. Claude Hepburn, “Rubber Technology and Manufacture”, Third Edition, 2005.
4. Kovac. F. J, “Tyre Technology”, Good Year Tire & Rubber Company, 1973.
5. Different tyre manufacturer’s websites.

BAM 005 NOISE VIBRATION AND HARSHNESS L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in basics of vibration analysis, vibration control techniques, noise fundamentals, nvh measurements, automotive noise sources and control techniques will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of basics of vibration analysis
CO02 - To learn the detailed study of vibration control techniques
CO03 -To learn the detailed study of noise fundamentals
CO04 – To learn the detailed study of nvh measurements
CO05 - To learn the detailed study of automotive noise sources and control techniques

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

INTRODUCTION TO NVH

Noise, Vibration and Harshness (NVH) and its role in automotive design and development. Physiological effects of noise and vibration, sources of vibration and noise in automobiles.

UNIT I - BASICS OF VIBRATION ANALYSIS 9

Basic concepts, mathematical models, formulating the equations of motion linear and torsional system characteristics and response – damped and undamped single & two degree of freedom systems under harmonic force, coordinate coupling, generalized coordinates and modal analysis.

UNIT II - VIBRATION CONTROL TECHNIQUES 9

Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, Applications: isolation of the engine from vehicle structure and control of torsional oscillation amplitudes in engine crankshaft.

UNIT III - NOISE FUNDAMENTALS 9

Fundamentals of acoustics – general sound propagation – structure borne sound & air borne sound, Plane wave propagation - wave equation, specific acoustic impedance, acoustic intensity, Spherical wave propagation – acoustic near and far fields, Reference quantities, The decibel scale, relationship among sound power, sound intensity and sound pressure level, summation of pure tones, Decibel addition, subtraction and averaging, Effects of reflecting surfaces on sound propagation, octave band analysis, Anatomy of Human Ear, Mechanism of hearing, loudness, weighting networks, equivalent sound level.

UNIT IV - NVH MEASUREMENTS 9

Vibration and Noise Standards – Pass/Drive by noise, noise from stationary vehicles, interior noise in vehicles, NVH measurement tools and techniques, Modal parameter (natural frequency, mode shape and damping) estimation techniques, signal and system analysis.

UNIT V-AUTOMOTIVE NOISE SOURCES AND CONTROL TECHNIQUES 9

Methods for control of engine noise, Transmission Noise, Intake and Exhaust Noise, Aerodynamic Noise, Tyre Noise, Brake noise. Noise control strategy, noise control at source – along the path – isolation, damping, balancing, resonators, absorption, barriers and enclosures.

Total no of Periods: 45

TEXT BOOK:

1. Matthew Harrison, “Vehicle Refinement: Controlling Noise and Vibration in Road Vehicles”, Elsevier, 2004.

REFERENCES:

1. Bell, L. H. and Bell, D. H., “Industrial Noise Control – Fundamentals and Applications”, Marcel Dekker Inc, New York, 1994.
2. Xu Wang, “Vehicle Noise and Vibration Refinement”, CRC Press, 2010
3. Ambekar, A. G., “Mechanical Vibrations and Noise Engineering”, Prentice Hall of India, New Delhi, 2006.
4. Beranek, L. L. and Ver, I, L., “Noise and Vibration Control Engineering –Principles and Application”, John Wiley & Sons, Inc, 1 992.
5. Wilson, C. E., “Noise Control – Measurement, Analysis, and Control of Sound and Vibration”, Harper & Row Publishers, New York, 1989.
6. Thomson, W. T., “Theory of Vibrations with Applications”, CBS Publishers Delhi.

Elective-III

BAM006 RUBBER TECHNOLOGY FOR AUTOMOBILES L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction, structure-property relationship of rubber, vibration and rubber spring, fluid sailings and flexible couplings and hoses , compounding and manufacture will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction
CO02 - To learn the detailed study of structure-property relationship of rubber
CO03 -To learn the detailed study of vibration and rubber spring
CO04 – To learn the detailed study of fluid sealing's and flexible couplings and hoses
CO05 - To learn the detailed study of **,** compounding and manufacture

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION 6

Identification of plastics / rubber components in automobiles – function – selection criteria.

UNIT II STRUCTURE-PROPERTY RELATIONSHIP OF RUBBER 10

Resilience, creep, hysteresis and damping, stability, set and stress relaxation, behavior in dynamic applications.

UNIT III VIBRATION AND RUBBER SPRING 10

Principle of vibration isolation – rubber mounts – spring design – comparison with metallic springs – shape factor and its effect – forced and free vibrations with damping – typical mounts, compounding and manufacture.

UNIT IV FLUID SEALINGS AND FLEXIBLE COUPLINGS AND HOSES 10

Seals for static and dynamic applications – effect of heat / oil ageing – frictional behavior – fundamental of seal ability.

UNIT V COMPOUNDING AND MANUFACTURE 9

Types of couplings – specification and selection – torque vs. deflection relationships – brake fluid / hydraulic hoses, materials and manufacture.

TOTAL: 45 PERIODS

TEXTBOOK:

1. Freakley, P.K., and Payne, A.R., Theory and Practice of Engineering with Rubber, Applied Science Publishers Ltd.

REFERENCES:

1. Hobel, E.F., Rubber Springs Design.
2. Blow, C.M. and Hepburn, C., Rubber Technology and Manufacture.

BAM 007 **MODERN MANUFACTURING PROCESS** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in advances in casting, advanced forming and powder metallurgy processes, fabrication of microelectronic devices, manufacturing of composites, rapid prototyping will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of advances in casting
CO02 - To learn the detailed study of advanced forming and powder metallurgy processes
CO03 -To learn the detailed study of fabrication of microelectronic devices
CO04 – To learn the detailed study of manufacturing of composites
CO05 - To learn the detailed study of rapid prototyping

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I - ADVANCES IN CASTING **9**

Newer casting techniques - Expendable pattern casting - Plaster mold and ceramic mold casting – Vacuum casting - Squeeze casting - Rapid solidification for amorphous alloys – Casting techniques for single crystal components.

UNIT II -ADVANCED FORMING AND POWDER METALLURGY PROCESSES 9

High speed forging machines - Die materials - semisolid metal forming- Peen forming of sheet metals - Super plastic forming – Forming and shaping glass. Design consideration for Powder Metallurgy forming - Production of metal powders – Compaction – Sintering – Finishing of sintered parts – Secondary and finishing operations.

UNIT III - FABRICATION OF MICRO ELECTRONIC DEVICES 9

Semiconductors and silicon - Crystal growing and wafer preparation - Film deposition, Oxidation, Lithography, Etching, Diffusion and ion implantation, Metallization and testing - Bonding and packing.

UNIT IV - MANUFACTURING OF COMPOSITES 9

Introduction- Fibre reinforced, Metal matrix, Ceramics matrix composites, Nanocomposites - structure, Properties, manufacturing processes and applications.

UNIT V - RAPID PROTOTYPING 9

Rapid prototyping- overview, Techniques-Stereo lithography, Laminated object manufacturing, Selective laser sintering, fused deposition modeling, solid ground curing, 3D ink jet printing-Applications of rapid prototyping-Rapid tooling-Rapid manufacturing-Future development-Virtual prototyping.

Total no of Periods: 45

TEXT BOOKS

1. Serope Kalpakjian, “Manufacturing Engineering and Technology”, 3rd Edition, Addison-Wesley Publishing Co., Boston, 2009.
2. Madou M. J, “Fundamentals of micro fabrication and nanotechnology”, 3rd edition, CRC Press, USA, 2011.

REFERENCES

1. Amstead B. H, Ostwald Phillips and Bageman R.L, “Manufacturing Processes”, John Wiley & Sons, New York, 1987.
2. Jaeger R.C, “Introduction to microelectronic Fabrication”, Addision Wesley, Boston, 1988.
3. Chua C. K, “Rapid Prototyping - Principles and Applications”, World Scientific Publishing Company, 2010.
4. Hilton P. D and “Marcel Dekker”, Rapid Tooling, New York, 2000.

BAM 008 ROBOTICS FOR AUTOMOBILE ENGINEERS L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction to robot application, end effectors and sensors, robot cell design , robot programming, industrial applications will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction to robot application
CO02 - To learn the detailed study of end effectors and sensors
CO03 -To learn the detailed study of robot cell design
CO04 – To learn the detailed study of robot programming
CO05 - To learn the detailed study of industrial applications

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I - INTRODUCTION TO ROBOT APPLICATION 9

Basic concepts - Robot anatomy - Manipulators - kinematics: Forward and inverse kinematics - Precision movement, robot specifications and Work volume, Types of Robot drives - Basic robot motions - Point to point control, continuous path control. Robot control - unit control system concept - servo and non-servo control of robot joints, adaptive and optimal control.

UNIT II - END EFFECTORS AND SENSORS 9

End effectors - classification - mechanical, magnetic, vacuum and adhesive gripper - gripper force analysis and design. Sensor devices, Types of sensors - contact, position and

displacement sensors, Force and torque sensors - Proximity and range sensors - acoustic sensors Robot vision systems - Sensing and digitizing - Image processing and analysis.

UNIT III - ROBOT CELL DESIGN **9**

Robot work cell design and control – Safety in Robotics – Robot cell layouts – Multiple Robots and machine interference – Robot cycle time analysis.

UNIT IV - ROBOT PROGRAMMING **9**

Robot language classification - programming methods - off and on line programming - Lead through method - Teach pendent method - VAL systems and language, simple program.

UNIT V - INDUSTRIAL APPLICATIONS **9**

Application of robots - Material handling - Machine loading and unloading, Assembly, Inspection, Welding, Spray painting, Mobile robot, Microbots - Recent developments in robotics- safety considerations.

Total no of Periods: 45

TEXT BOOKS

1. Deb S. R, “Robotics technology and flexible automation”, Tata McGraw Hill publishing company limited, New Delhi, 2010.
2. Mikell P. Groover, “Industrial Robotics Technology Programming and Applications”, McGraw Hill Co., Singapore, 2008.

REFERENCES

1. Klafter, R. D, Chmielewski, T. A. and Noggins, “Robot Engineering: An Integrated Approach”, Prentice Hall of India Pvt. Ltd., New Delhi, 2011
2. Fu, K. S., Gonzalez, R. C., & Lee, C.S.G., “Robotics control, sensing, vision and intelligence”,McGraw Hill Book Co., Singapore, Digitized 2007.
3. Craig, J. J., “Introduction to Robotics mechanics and control”, AddisonWesley, London, 2008.

BAM 009 **PRODUCT DESIGN** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in project selection and evaluation, new product development, new product planning, new product development, product architecture will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of project selection and evaluation
CO02 - To learn the detailed study of new product development
CO03 -To learn the detailed study of new product planning
CO04 – To learn the detailed study of new product development
CO05 - To learn the detailed study of product architecture

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I - PROJECT SELECTION AND EVALUATION **9**

Collection of ideas and purpose of project - Selection criteria - screening ideas for new products (evaluation techniques).

UNIT II - NEW PRODUCT DEVELOPMENT **9**

Research and new product development - Patents - Patent search - Patent laws International code for patents - Intellectual property rights (IPR).

UNIT III - NEW PRODUCT PLANNING **9**

Design of prototype - testing - quality standards - marketing research introducing new products.

UNIT IV - NEW PRODUCT DEVELOPMENT **9**

Journeys in Product Development, Product Development Process Tools, Scoping Product Developments: Technical and Business Concerns. Understanding Customer Needs, Establishing Product Function.

UNIT V - PRODUCT ARCHITECTURE **9**

Product Teardown and Experimentation, Benchmarking and Establishing Engineering Specifications, Product Architecture.

Total no of Periods: 45

TEXT BOOK:

1. Barclay, Z. Dann, P. Holroyd, "New Product development I, Published by BH Butterworth-Heinemann a division of Reed Educational and professional publishing limited.

REFERENCES:

1. Harry Nystrom, "Creativity and innovation", John Wiley & Sons, 1979.
2. Brain Twiss, "Managing technological innovation", Pitman Publishing Ltd.,1992.

BAM 010 OPERATIONS REASERCH FOR ENGINEERS L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge resource scheduling and networks, resource scheduling and networks, inventory models, queuing models, decision model will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of linear programming
CO02 - To learn the detailed study of resource scheduling and networks
CO03 - To learn the detailed study of inventory models
CO04 – To learn the detailed study of queuing models
CO05 – To learn of detailed study of decision models

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I LINEAR PROGRAMMING 12

Introduction to phase of an operation research study-Linear programming-Formulation of the programming-Graphical method-Simplex method-two phase method-assignment problems-Transportation models Vogel's approximation method-MODI method-unbalanced transportation-degeneracy in transportation models. Integer programming

UNIT – II RESOURCE SCHEDULING AND NETWORKS 12

Resource scheduling-Sequence in job through 2 machines and 3 machines network: PERT AND CPM-Network diagrams-Shortest route-minimum spanning tree-probability of achieving completion date-Crash time-Cost analysis-resource smoothing and resource leveling

UNIT – III INVENTORY MODELS 12

Inventory models-deterministic models-production models-economic ordering quantity models-quantity discount model-stochastic inventory models-Multi product models-inventory control models in practice.

UNIT – IV QUEUING MODELS 12

Queuing theory-queuing system and structures-notation parameter-Poisson arrival and exponential service time-Characteristics of queuing models-Single channel and multiple models-Simulation.

UNIT – V DECISION MODELS 12

Game theory: Two person zero sum games, Replacement models: Replacement of items that deteriorate with time-equipment that fails completely and their analysis-factor for evaluation of proposals of capital expenditures and comparison of alternatives-present value average investment –rate of return-pay off period-individual and group replacement policy.Application of OR models-Case studies.

Total no of Periods: 60

TEXT BOOKS:

1. Gupta and Hira D.S. “Operation Research”, S.Chand & Sons, New Delhi,1995

REFERENCE BOOKS:

1. H.A.Taha, “Operation Research” , Prentice hall of India,1999, Sixth Edition
2. Kanti Swarup,Gupta,P.K. and Manmohan, “Operation Research”, S.Chand & Sons,1993

Elective-IV

BAM 011 TRANSPORT MANAGEMENT AND MOTOR INDUSTRY **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction on transportation modes, transport organization and development, planning for new transport organization, motor vehicle act, accident & prevention will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction on transportation modes
CO02 - To learn the detailed study of transport organization and development
CO03 -To learn the detailed study of planning for new transport organization
CO04 – To learn the detailed study of motor vehicle act
CO05 - To learn the detailed study of accident & prevention

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION ON TRANSPORTATION MODES 6

Elements of Mass Transportation, History of transport, modes of transport, types of transport systems

UNIT II TRANSPORT ORGANIZATION AND DEVELOPMENT 9

Transport organization structure, operations, General set up, transport industry, government / (STU) State Government Undertakings and private Bus transport organizations. Bus depot

organization structure. Truck fleet operators organization. Economics of Road Transport: Theory of fares and cost of services, fare charging, costing and statistics of operating cost

UNIT III PLANNING FOR NEW TRANSPORT ORGANIZATION 9

Geographical considerations, economic factors, vehicles used, planning of trips. Concept of BRTS operations. Organization of Transport Services: Records and fleet management, vehicles schedule, booking and reservation, statistical records and shipment center, recording of goods transport

UNIT IV MOTOR VEHICLE ACT 9

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. 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.

UNIT V ACCIDENT & PREVENTION 9

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

Total no of Periods: 42

TEXT BOOK:

1. Motor Vehicles Acts, Law Publishers
2. Myer Kutz, "Handbook of Transportation Engineering", Volume 1: Systems and Operations,Second Edition, Tata McGraw Hill Edition, 2011.
3. Coleman O'Flaherty, "Transport Planning and Traffic Engineering", 4th Edition, Butterworth Heinemann Publications, 2010.
4. Roger P. Roess and Elena S. Prassas, "Traffic Engineering", 4th Edition.

REFERENCES:

1. Schumer, Economics of transport, TMH
2. Fair and Williams, “Economics of transportation”, East West Press.
3. Hudson, “Motor transportation”, TMH.
4. M.V. Act 1988-RTO rules and regulation manual
5. Fuel Economy of Motor Vehicle, Allied Publishers

BAM 012 QUALITY CONTROL AND RELIABILITY L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in statistical quality control, acceptance sampling, reliability engineering, failure data analysis, reliability prediction and management will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of statistical quality control
CO02 - To learn the detailed study of acceptance sampling
CO03 -To learn the detailed study of reliability engineering
CO04 – To learn the detailed study of failure data analysis
CO05 - To learn the detailed study of reliability prediction and management

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I - STATISTICAL QUALITY CONTROL 9

Methods and Philosophy of Statistical Process Control - Control Charts for Variables and Attributes –Cumulative sum and Exponentially weighted moving average control charts - Other SPC Techniques – Process - Capability Analysis Six sigma concept.

UNIT II - ACCEPTANCE SAMPLING **9**

Acceptance Sampling Problem - Single sampling plans for attributes – double sampling - multiple sampling - sequential sampling - Military standards - The Dodge Roming sampling plans – Random sampling.

UNIT III - RELIABILITY ENGINEERING **9**

Definition of reliability – Performance and reliability - Reliability requirements – System life cycle – Mean time between failures – Mean time to failure - Mortality Curve -Availability – Maintainability.

UNIT IV - FAILURE DATA ANALYSIS **9**

Statistical failures of components – failure distributions – Bath tub curve – Negative exponential distribution – Normal distribution - log normal distribution – Gamma distribution - Weibull distribution Life distribution measurements – Accelerated life tests -Data requirements for reliability.

UNIT V - RELIABILITY PREDICTION AND MANAGEMENT **9**

Failure rate estimates - Effect of environment and stress - Series and Parallel systems -RDB analysis – Standby Systems - Complex Systems - Reliability demonstration testing- Reliability growth testing - Duane curve - Risk assessment – FMEA and Fault tree analysis.

Total no of Periods: 45

TEXT BOOKS:

1. Khanna O.P, “Statistical Quality Control”, Dhanpat Rai Publications (P) Ltd.,2001.
2. Lewis E.E, “Introduction to Reliability Engineering”, John Wiley and Sons,1987.

REFERENCES:

1. Mohamed Zairi, “Total Quality Management for Engineers”, Woodhead Publishing Limited 1991.
2. Harvid Noori and Russel, “Production and Operations Management - Total Quality and Responsiveness”, McGraw-Hill Inc, 1995.
3. Douglus C. Montgomery, “Introduction to Statistical Quality Control”, 2nd Edition, John Wiley and Sons, 1991.

BAM 013 **ADVANCED THEORY OF IC ENGINES** **L T P C** **3 0 0 3**

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction, combustion of fuels, combustion modelling, non-conventional ic engines, combustion analysis in ic engines will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction
CO02 - To learn the detailed study of combustion of fuels
CO03 - To learn the detailed study of combustion modelling
CO04 – To learn the detailed study of non-conventional ic engines
CO05 - To learn the detailed study of combustion analysis in ic engines

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **7**

Fuel air cycle and Actual cycle analysis, Properties of IC engine fuels, Refining process, chemical composition and molecular structure of fuels, octane number, cetane number. Knock rating of SI engine fuels.

UNIT – II COMBUSTION OF FUELS **12**

Combustion Stoichiometry of petrol, diesel, alcohol and hydrogen fuels – Chemical energy and heating values – Chemical equilibrium and maximum temperature – SI engine combustion – Flame velocity and area of flame front –performance number – CI engine combustion. Fuel spray characteristics – droplet size, penetration and atomization.

UNIT – III COMBUSTION MODELLING 10

Basic concepts of engine simulation – Governing equations, thermodynamic models – SI engine and CI engine models.

UNIT – IV NON-CONVENTIONAL IC ENGINES 8

Adiabatic and L.H.R. engines – Variable compression ratio engine – Wankel rotary combustion engine – Free piston engine - MAN combustion chamber and multi fuel engines – Stratified charge and lean burn engines – Locomotive and marine engines.

UNIT – V COMBUSTION ANALYSIS IN IC ENGINES 8

Photographic studies of combustion processes – P-θ diagrams in SI and CI engines, Rate of heat release – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines

TOTAL : 45 PERIODS

TEXTBOOK

1. Ganesan,V., Internal combustion engines, Tata McGraw Hill Publishing Co., 1994.
2. Heldt,P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1985.

REFERENCES

1. Ramalingam. K.K., Internal combustion engine, scitech publications, Chennai, 2003.
2. Ganesan,V., Compute Simulation of Spark Ignition engine process, Universities Press (India) Ltd., Hyderabad, 1996.
3. John,B., Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Publishing Co., New York, 1990.

BAM 014 **AUTOMOTIVE SAFETY** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in introduction, safety concepts, safety equipments, collision warning and avoidance, comfort and convenience system will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of introduction
CO02 - To learn the detailed study of safety concepts
CO03 -To learn the detailed study of safety equipments
CO04 – To learn the detailed study of collision warning and avoidance
CO05 - To learn the detailed study of comfort and convenience system

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I INTRODUCTION **9**

Design of the body for safety, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT – II SAFETY CONCEPTS **9**

Active safety: driving safety, conditional safety, perceptibility safety, operating safety-passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT – III SAFETY EQUIPMENTS 9

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, antiskid braking system, regenrative braking system, speed control devices.

UNIT – IV COLLISION WARNING AND AVOIDANCE 9

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions, driver fitness detection.

UNIT – V COMFORT AND CONVENIENCE SYSTEM 9

Steering and mirror adjustment, central locking system , Garage door opening system, tyre pressure control system, rain sensor system, environment information system, manual and automated wiper system, satellite control of vehicle operation for safe and fast travel.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Automotive Handbook" - 5th edition - SAE publication - 2000.Bosch - "

REFERENCES:

1. J.Powloski - "Vehicle Body Engineering" - Business books limited, London - 1969.
2. Ronald.K.Jurgen - "Automotive Electronics Handbook" - Second edition- McGraw-Hill Inc., - 1999.

BAM 015 **L T P C**

VEHICLE AIR-CONDITIONING SYSTEMS **3 0 0 3**

OBJECTIVE:

The main objective of this course is to impart knowledge automotive air conditioning fundamentals, refrigerant heating and air conditioning system, air routing & temperature control, heater – air conditioner trouble shooting & service will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of automotive air conditioning fundamentals
CO02 - To learn the detailed study of refrigerant
CO03 - To learn the detailed study of heating and air conditioning system
CO04 – To learn the detailed study of air routing & temperature control
CO05 – To learn of detailed study of heater – air conditioner trouble shooting & service

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS 10

Basic air conditioning system – Components – types of Compressor, Condenser, Expansion devices and Evaporators. Location of air conditioning components in a car – Schematic layout of a air conditioning system. Compressors- Types- components – Thermostatic expansion valve & orifice tube – Expansion valve calibration – Evaporator temperature control methods.

UNIT – II REFRIGERANT 9

Requirements for refrigerants – Classification of refrigerants- Refrigerant selection-Storage of refrigerants – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT – III HEATING AND AIRCONDITIONING SYSTEM 10

Manually controlled air conditioner – Automatically controlled air conditioners-Electronic automatic temperature control - Auxiliary Rear Heating and Cooling systems

UNIT – IV AIR ROUTING & TEMPERATURE CONTROL 10

Objectives – Evaporator case air flow through the Dash recirculating unit – Conditioned air distribution – Ducting system in Passenger car and Bus– Controlling flow – Air conditioner safety devices - Temperature and Pressure cutoff switches - Relief valves

UNIT – V HEATER – AIR CONDITIONER TROUBLE SHOOTING & SERVICE 6

Air conditioner maintenance and service – Safety cautions for air-conditioning service - Testing the vacuum control systems - Air conditioner performance test - Checking refrigerant system pressures - Leak detectors - Charging and Discharging.

TOTAL : 45 PERIODS

TEXT BOOK:

1. William H Crouse and Donald L Anglin, Automotive Air conditioning, McGraw Hill Inc., 1990.

REFERENCES:

1. Paul Weisler, Automotive Air Conditioing, Reston Publishing Co. Inc., 1990.
2. McDonald,K.L., Automotive Air Conditioning, Theodore Audel series, 1978.
3. Goings,L.F., Automotive Air Conditioning, American Technical services, 1974.

BAM016 **SPECIAL TYPES OF VEHICLES** **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge earth moving and constructional equipments ,power train concepts , sub systems of stv , farm equipments, military and combat vehicles ,special purpose vehicles for industrial applications will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of earth moving and constructional equipments
CO02 - To learn the detailed study of power train concepts
CO03 - To learn the detailed study of sub systems of stv
CO04 – To learn the detailed study of farm equipments, military and combat vehicles
CO05 – To learn of detailed study of special purpose vehicles for industrial applications

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I EARTH MOVING AND CONSTRUCTIONAL EQUIPMENTS 11

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

UNIT – II POWER TRAIN CONCEPTS 7

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

UNIT – III SUB SYSTEMS OF STV 11

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Tractor controls and the starting of the tractor engines – Basic notions and definition – Engine cycles – Operation of multicylinder engines – General engine design – Basic engine performance characteristics.

UNIT – IV SPECIAL PURPOSE VEHICLES FOR INDUSTRIAL APPLICATION 8

Cranes- Types, Constructional features, capacity and stability, Vibratory compactors, Material Handling vehicles- Forklift- Tippers-Others.

UNIT – V FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES 8

Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles. Classification of tractors – Main components of tractor – Safety rules. Working attachment of tractors – Farm equipment – Classification – Auxiliary equipment – Trailers and body tipping mechanism.

TOTAL : 45 PERIODS

TEXTBOOKS:

1. Abrosimov. K. Bran berg.A. and Katayer.K.,"Road making Machinery", MIR Publishers, Moscow, 1971.
2. Wong.J.T., " Theory of Ground vehicles ", John Wiley & Sons, New York, 1987.
3. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987.

REFERENCES:

1. Off the road wheeled and combined traction devices - Ashgate Publishing Co. Ltd. 1998.
2. Astokhov, Truck Cranes, MIR Publishers, Moscow.
3. Kolchin,A., and V.Demidov, Design of Automotive Engines for Tractor, MIR Publishers, 1972.

BAM 017 HYBRID ELECTRIC AND FUEL CELL VEHICLES L T P C
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in fuelcell technology, fuel cell based vehicles structure ,hybrid electric technology and electric drivetrains, hybrid electric vehicles,hybrid vehicle technology will be taught to the students.

Course Outcomes

CO01 - To learn the detailed study of fuelcell technology
CO02 - To learn the detailed study of fuel cell based vehicles structure
CO03 -To learn the detailed study of hybrid electric technology and electric drivetrains
CO04 – To learn the detailed study of hybrid electric vehicles
CO05 - To learn the detailed study of combustion analysis in hybrid vehicle technology

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I - FUELCELL TECHNOLOGY 9

Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell) -Characteristics. Electrochemical energy conversion – Theoretical efficiency – Factors affecting electrochemical energy conversion- Helmholtz double layer model.

UNIT II - FUEL CELL BASED VEHICLES STRUCTURE 9

PEMFC: Operating principle (membranes, electrodes and electrolysis, optimization of membrane and electrode assembly, impurities) – Technology development (single cell and

stacks, composite plates) – Fuel processing – Modeling studies (membrane, electrode, membrane-electrode assembly, fuel cell, stack and system) – Technology development and applications. DMFC: Operating principle – Noble metal issue – Electro-oxidation of methanol (Catalysts, oxygen electroreduction, electrolyte, non catalytic aspects) - Methanol crossover.

UNIT III - HYBRID ELECTRIC TECHNOLOGY AND ELECTRIC DRIVETRAIN 9

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental impartance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV - HYBRID ELECTRIC VEHICLES 9

Principles of Hybrid Electric Drivetrains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - (Charge Sustaining, Charge Depleting), Practical Models – Toyota Prius, Honda Insight. Hybridization Effects. 42 V System for Traction Applications - Lightly Hybridized vehicles, Low –Voltage Storage System, Low – Voltage main system with High voltage bus for propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavy duty vehicles.

UNIT V - HYBRID VEHICLE TECHNOLOGY 9

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems. Energy Management Strategies in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Total no of Periods: 45

TEXT BOOKS:

1. Basu .S, “Recent Trends in Fuel cell Science and Technology”, Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and Aulice Scibioh, M., “Fuel Cells Principles and Applications”, Universities Press (India) Pvt. Ltd., Hyderabad, 2006.
3. Hoogers, G., Edr. “Fuel Cell Technology Handbook”, CRC Press, Washington D. C,2003.

REFERENCES:

1. Larminie, J. and Dicks, A., “Fuel Cell Systems Explained” John Wiley & Sons, Ltd., New York,2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, “Vehicular Electric Power Systems”, Marcel Dekker,Inc., 2004.

BAM 018 AUTOMOTIVE MATERIALS AND PRODUCTION TECHNIQUES **L T P C**
3 0 0 3

OBJECTIVE:

The main objective of this course is to impart knowledge in Alternate Fuels and Energy Systems. The detailed concept of Classification of design and Reduction of stress concentration, Alcohols, Natural Gas, LPG, Hydrogen and Biogas, Vegetable Oils, Electric and Solar Powered Vehicles will be taught to the students.

Course Outcomes

CO01 - To learn the problem solving methods in linear differential equations
CO02 - To learn Dirichlet's condition and operations using Fourier series
CO03 - To have a clear understanding about 2nd order equations and wave equations
CO04 – Properties of Laplace transform and problem solving using it
CO05 - Properties of Fourier transform and problem solving using it

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S					M						M
CO2		W	S		M		W					
CO3		M		S				W	M			
CO4	S		M	W						M	W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Student Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I ELASTIC AND PLASTIC BEHAVIOUR OF MATERIALS 9

Elasticity-forms - Stress and strain relationship in engineering materials - Deformation mechanism -Strengthening material - Strain hardening, alloying, polyphase mixture, martensitic precipitation, dispersion, fibre and texture strengthening - iron carbon diagram.

UNIT – II HEAT TREATMENT AND SURFACE TREATMENT 10

Heat treatment of steel - Annealing - Types, normalising, Types, hardening and tempering with specific relevance to automotive components, surface hardening techniques, Induction, flame and chemical hardening, coating of wear and corrosion resistance, Electroplating. Phosphating, Anodizing, hot dipping, thermal spraying, hard facing and thin film coatings.

UNIT – III SELECTION OF MATERIALS 9

Criteria of selecting materials for automotive components viz cylinder block, Cylinder head, piston, piston ring, Gudgeon pin, connecting rod, crank shaft, crank case, cam, cam shaft, engine valve, gear wheel, clutch plate, axle, bearings, chassis, spring, body panel - radiator, brake lining etc. Application of non-metallic materials such as composite, ceramic and polymers in automobile.

UNIT – IV CASTING FOR AUTOMOTIVE ENGINE COMPONENTS 8

Sand casting of cylinder block and liners – Centrifugal casting of flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston, pressure die casting of carburetor and other small auto parts.

UNIT – V MACHINING OF AUTOMOTIVE ENGINE COMPONENTS 9

Machining of connecting rods – crank shafts – cam shafts – pistons – piston pins – piston rings- valves – front and rear axle housings – fly wheel – Honing of cylinder bores – Copy turning and profile grinding machines – Materials and properties.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Khanna.O.P., " Material Science and Metallurgy ", Dhanapal Rai & Sons, 1992.
2. Heldt,P.M., High Speed Combustion Engines, Oxford Publishing Co., New York, 1990.

REFERENCES:

1. Dieter.G.E., Mechanical Metallurgy, McGraw Hill, New York, 1972.
2. Materal and Processes in Manufacturing,DEGARMO.
3. Raghavan.V., Physical Metallurgy, Principle and Practice, Prentice Hall, 1995.
4. Manufacturing Engineering And Technology, KOSHER.