



**B.TECH – AUTOMOBILE ENGINEERING  
(FULL TIME)  
CURRICULUM & SYLLABUS  
R2015  
CHOICE BASED CREDIT SYSTEM  
(I – VIII SEMESTERS)**

**DEPARTMENT OF AUTOMOBILE ENGINEERING  
FACULTY OF ENGINEERING AND TECHNOLOGY  
BHARATH INSTITUTE OF SCIENCE AND TECHNOLOGY**

**No: 173, Agaram Road, Selaiyur,  
Chennai -600 073, Tamil Nadu.**

**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**REGULATIONS 2015**  
**CHOICE BASED CREDIT SYSTEM**  
**DEGREE OF BACHELOR OF TECHNOLOGY**  
**(EIGHT SEMESTERS)**

**(Applicable to the batches admitted from July 2015)**

**1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE**

In these Regulations, unless the context otherwise requires:

- i. **“Programme”** means Degree Programme, that is B.Tech. Degree Programme.
- ii. **“Discipline”** means specialization or discipline of B.Tech. Degree Programme, like Civil Engineering, Electrical and Electronics Engineering, information Technology, etc.
- iii. **“Course”** means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, Engineering Graphics etc.
- iv. **“Head of the Institution”** means the Dean of the Institution who is responsible for all academic activities of that College/Institution and for implementation of relevant rules of these Regulations.
- v. **“University”** means Bharath Institute of Higher Education & Research (BIHER)

**2.0 PREAMBLE**

The ‘Outcome Based Education (OBE)’ Process is introduced to ensure that the required outcomes (knowledge, skills and attitude / behavior) are acquired by the learners of a programme. With the OBE process in mind, our educational system for the Faculty of Engineering and Technology has been framed to provide the needful scope for the learners through the Choice Based Credit System (CBCS) that will pave the path to strengthen their knowledge, skills and attitude / behavior. The CBCS offers flexibility to learners which include large number of electives, flexible pace for earning credits and audit courses.

**2.1 THE OBJECTIVES OF CHOICE BASED CREDIT SYSTEM ( CBCS) :**

- To offer the right blend of Core, Humanities & Social Sciences, Engineering Sciences and Basic Science courses to facilitate the learners to acquire the needful outcomes.
- To facilitate s t u d e n t s to choose open electives of their choice to acquire knowledge in the areas of their interest.
- To elevate the level of knowledge, skills and attitude/behavior on par with the students across the globe.
- To offer programmes in an open student centric environment with purpose, needful foundations, breadth (exposure for optimal learning) and professionalism.
- To learn at students’ own pace
- To opt for additional courses and achieve more than the required credits
- To opt for interdisciplinary approach for learning
- To opt for Inter college/University migration within the country and outside with transfer of Credits.
- To have more scope to enhance students skills and more scope of taking up projects and assignments, vocational training, including entrepreneurship.

- To improve the job opportunities of students
- To enable potential employers assess the performance of students on a scientific scale.

The curriculum and syllabi for B.Tech programmes confirm to outcome based teaching-learning process based on the following Programme Educational Objectives.

## **2.2 PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

### **PEO1: PREPARATION:**

To provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the chosen field of Engineering and Technology.

### **PEO2: CORE COMPETENCE:**

To enhance the skills and experience in defining problems in the appropriate field of Engineering and Technology, designing, implementing, analyzing the experimental evaluations, and finally making appropriate decisions.

### **PEO3: PROFESSIONALISM:**

To enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

### **PEO4: SKILL:**

To provide Industry based training for developing professional skills and soft skills such as proficiency in languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

### **PEO5: ETHICS:**

Apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

In general the following Program Outcomes have been identified and the curricula have been structured in such a way that each of the courses meets these outcomes. The Programme Educational Objectives and Programme Outcomes are well defined and aligned with the Vision and Mission of each of the Department and the University.

## **2.3 PROGRAMME OUTCOMES (POs)**

### **Engineering Graduate will have**

- a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.
- b) The ability to identify, formulate, and solve engineering problems
- c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d) The ability to design and conduct experiments, as well as to analyze and interpret data
- e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

- f) The ability to apply reasoning informed by the knowledge of contemporary issues
- g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- h) The ability to understand professional and ethical responsibility and apply them in engineering practices
- i) The ability to function on multidisciplinary teams
- j) The ability to communicate effectively with the engineering community and with society at large
- k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
- l) The ability to recognize the need for, and an ability to engage in life-long learning

### **3.0 ADMISSION**

- 3.1** Candidates seeking admission to the first semester of the eight semester B.Tech. Degree Programme: shall have passed the Higher Secondary Examinations of (10+2) Curriculum (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III for Engineering group of courses and Physics, Chemistry and Biology for Bio group of courses (Industrial Bio Tech, Bio-Informatics, Genetic Engg and Bio-Medical Engg) or any examination of any other University or authority accepted by the Board of Management of University as equivalent thereto.
- 3.2** The candidates who have passed the Higher Secondary Examination (Vocational groups in Engineering/Technology) of the Government of Tamil Nadu, shall also be eligible for admission to the first 1<sup>st</sup> year programme.
- 3.3** The candidates who have passed the Diploma in Engineering / Technology, after passing 10<sup>th</sup> standard of school education conducted by the State Board of Technical Education and training, shall be eligible for admission through Lateral entry system to the third semester of the B.Tech. Degree Programmes
- 3.4** The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the Board of Management of University and UGC from time to time

### **4.0 STRUCTURE OF PROGRAMMES**

- 4.1** Every Programme will have curricula with syllabi consisting of theory and practical courses.

The curriculum is structured to achieve the Programme Educational Objectives (PEOs) and the corresponding Programme Outcomes (POs).

- 4.2** The syllabus for each course is designed based on Course Objectives and Course Outcomes (COs). COs are mapped with the POs in order to ensure the respective PO

### **4.3 Outline of Choice Based Credit System:**

- a. **Humanity and Social Studies:** Generally a course in language, value education, Personality Development, Environmental Sciences and Ethics.
- b. **Basic Sciences:** Foundation courses like Maths, Physics, Chemistry, and Biology required to understand the Engineering Courses.
- c. **Engg Sciences:** Foundation courses like Basic Civil, Mechanical, Electrical, Electronics, Computer and Cell Biology to lay foundation to understand the core and other allied engineering & technology courses.
- d. **Professional Core Courses:** Courses which should compulsorily be studied by a candidate as core requirement are termed as Professional Core courses.

- e. **Core Elective Courses:** Generally a course which can be chosen from a pool of courses for specializing in a specific area within the discipline/domain of the core curriculum.
- f. **Non Major Elective Courses:** a course which can be chosen from a pool of courses supportive to the discipline or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill.
- g. **Open Elective Courses:** a course that would improve his/her employability such as advanced technology courses offered by the industries or a course which the student thinks that would add value for his/her career.
- h. **Projects & Research:** Project work/Dissertation and Term paper, Internship, Technical Seminar and Comprehension.

Course Work – Subject Area	Credits		Suggested Distribution of Credits
	Minimum	Maximum	
<b>Humanities and Social Sciences (HSS):</b> Soft skills, Value Education & Professional Ethics, Languages, Environmental Science, Aptitude, Personality Development, NCC/NSS/NSO/ Yoga etc	19	21	20
<b>Basic Sciences (BS):</b> including Maths, Physics, Chemistry and Biology,	28	31	29
<b>Engineering Sciences (ES):</b> Basic Civil Engg, Electrical Engg, Mechanical Engg, Electronics Engg, Computer, etc.	18	20	18
<b>Professional Core (PC) &amp; Core Electives (CE):</b> subjects under Core Engg, relevant to the chosen specialization/branch	100	104	100
<b>Non Major and Open Electives (NE &amp; OE):</b> relevant to the chosen specialization/branch, other Technical, emerging subject areas, etc.	15	15	15
<b>Project Work &amp; Research (PR):</b> includes Project work, Term Paper, Seminar and/or internship in industry or elsewhere, etc.	13	17	15
Total credits for whole programmes:	174	208	197 (195-200) credits

#### 4.4 The details of credit allocation are given below in the Table

Nature of the Course	Periods / Hours per Week	Credits
<b>Theory</b>	<b>3</b>	<b>3</b>

	<b>4</b>	<b>4</b>
<b>Laboratory</b>	<b>2 or 3</b>	<b>1</b>
<b>Theory + Laboratory</b>	<b>2 + 2</b>	<b>3</b>
<b>Tutorial</b>	<b>2</b>	<b>1</b>
<b>Mini Project1</b>	<b>2</b>	<b>1</b>
<b>Term Paper</b>	<b>4</b>	<b>2</b>
<b>Tech Seminar/Industrial Training (2 weeks)</b>	<b>2</b>	<b>1</b>
<b>Project Work (Eighth Semester)</b>	<b>18 ( Minimum)</b>	<b>9</b>

**Mini project, Technical Seminar and Industrial Training are also given 1 to 2 credits depending on the amount of time allotted based on the specific requirement of the branch concerned.**

- 4.5 Each semester curriculum shall normally have a blend of theory courses not exceeding 7 and practical courses not exceeding 4. The students are permitted to register for a minimum of 16 credits and maximum of 30 credits in a semester.
- 4.6 For the award of the degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The minimum will be between 195-200 credits depending on the branch of study.
- 4.7 The medium of instruction, examinations and project report will be English, except for courses on language other than English.

## **5.0 DURATION OF THE PROGRAMME:**

A student is ordinarily expected to complete the B.Tech. Programme in 8 semesters (four academic years) but in any case not more than 14 Semesters for HSC (or equivalent) candidates and not more than 12 semesters for Lateral Entry Candidates. Each semester shall normally consist of 90 working days with 450 hours. The Head of the Institution shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught. End –Semester Examination will ordinarily be at the end of each semester.

## **6.0 ATTENDANCE REQUIREMENTS FOR COMPLETION OF THE SEMESTER**

- 6.1 A Candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester:
  - 6.1.1. Every student is expected to earn at least 75% attendance.
  - 6.1.2 However, a candidate who could secure attendance between 65% and 74% only in one particular semester due to medical reasons (hospitalization / accident / specific illness) is given exemptions of 10% of attendance on production of Medical Certificate.
  - 6.1.3 Students who go for participating in Seminar or Conference will be given on duty permission. The candidate shall submit the on duty participation certificate to the HOD

who will in turn recommend and submit to the Head of the Institution for the approval. The approved certificates will be forwarded to the Controller of Examinations for record.

- 6.2 Candidates who do not satisfy the clauses 6.1.2 and 6.1.3 will not be permitted to write the End-Semester Examinations of the subject and are not permitted to go to the next semester, the detained semester should be repeated in the next academic year. When a student fulfills the requirement of overall attendance in a semester as per the clause 6.1.2 and 6.1.3 but fails to fulfill the attendance requirement for some of the courses, such courses should be repeated in the next academic year when offered.

## **7.0 CLASS ADVISOR AND STUDENT COUNSELOR**

### **7.1 Class Advisor**

Head of the Department will allot one faculty member to each class as class advisor. The role of the class advisor is to

- i. Monitor the attendance of the class,
- ii. Class work done by the faculty,
- iii. Circulate the notices and circulars pertaining to the class, class time table, test schedule, examination time table, meeting schedule, minutes of the class committee meetings, etc.,
- iv. Maintain all important documents of the students for reference/inspection by all committees
- iv. Work closely with the student counselors on matters related to students attached to the student counselor and update the students record of the students of the class..

### **7.2 Student Counselor (Mentor)**

HOD will assign a Student Counselor (Mentor) for every 15 students at the time of admission in the first semester who will continue to be the mentor for these students till they graduate. By guiding and counseling students, teachers can create a greater sense of belongingness amongst our student community. The student counselor will monitor the courses undertaken by the students, check attendance and progress of the students and counsel them periodically. The student counselors should ensure that each student is made aware of the various options for growth and are monitored and guided to become overall performers and help the students to select and work for career choices of their interest. The student counselors shall update and maintain the record of each student attached to them. The student counselors shall also help the class advisors to update the record card of students attached to them. The student counselor may also discuss with the class advisor and HOD and parents about the progress of the students.

## **8.0 CLASS COMMITTEE**

There shall be a class committee for each class in a semester.

- 8.1 The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class of the first semester (generally common to all branches), the class committee is to be constituted by the first year class coordinator.
- 8.2 The class committee shall be constituted on the first working day of any semester or earlier.
- 8.3 At least 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee.
- 8.4 A class committee will consists of teachers of the concerned class, student representatives, class advisor, student counselors and a chairperson who is not normally teaching the class,. The function of the class committee include

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the degree programme and the details of rules
- Informing the student representatives, the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving the problems, if any.
- The committee shall devise suitable methods for improving the performance of slow learners identified.

**8.5** The Head of the Institution may participate in any class committee of the institution.

**8.6** The chairperson is required to prepare the minutes of every meeting, submit the same to Head of the Institution within two days of the meeting and arrange to circulate it among the concerned students and teachers. If there are some points in the minutes requiring action by the institution, the same shall be brought to the notice of the Head of the Institution by the chairperson of the class committee through respective HODs.

**8.7** The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

## **9.0 COURSE COMMITTEE FOR COMMON COURSES**

Each common theory course offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The nomination of the Course Coordinator shall be made by the Head of the Department / Head of the Institution depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course committee' shall meet as often as possible and ensure uniform scheme of evaluation for the test. Wherever it is feasible, the course committee may also prepare a common question paper for the test(s).

## **10.0 PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT**

**10.1** Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the Head of the department periodically (at least three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the department will put his/her signature and date after due verification. At the end of the semester, the record should be verified by the Head of the Institution who will keep this document in safe custody (for two years). Any inspection team appointed by the University may inspect the records of attendance and assessment of both current and previous semesters.

**10.1.1** The marks allocated for attendance is given in **Table .**

<b>% of Attendance</b>	<b>Marks</b>
<75	Nil
76-80	1
81-85	2



86-90	3
91-95	4
96-100	5

## 10.2 Theory Courses

There will be two periodical tests, each carrying weightage of 5 marks and one model examination carrying weightage of 10 marks. The distribution of marks for various components for the Internal Assessment is shown below in the table:

S.No	Components for Internal Assessment	Syllabus Coverage for the test / exam	Duration of the test in Minutes.	Marks (max.)
01.	Internal Test – I	2 Units of the Syllabus	90	5
02.	Internal Test – II	Next 2 Units of the Syllabus	90	5
03	Model Test	Full Syllabus	180	10
04	Seminar/Assignment/ Online Test/Quiz	-	-	5
06.	<b>Attendance</b> <b>(Refer Clause 10.1.1)</b>	-	-	5
<b>Total</b>				<b>30</b>

## 10.3 Practical Courses:

Every practical exercise / experiment in all practical courses will be evaluated based on the conduct of exercise / experiment and records maintained by the students. There will be at least **one** model practical examination.

The criteria for awarding marks for internal assessment are given in **Table below**.

Items	Marks (Maximum)
Observation	<b>7.50</b>
Record	<b>7.50</b>
Model Practical	<b>20</b>

Attendance { Refer – 10.1.1 }	<b>5</b>
<b>Total</b>	<b>40</b>

#### 10.4 Project Work

Project work may be assigned to a single student or to a group of students not exceeding 4 per group. For Project work out of 100 marks, the maximum marks for Continuous Assessment is fixed as 40. The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of 3 members in the review committee. The project Guide will be one of the members of the Review Committee.

There shall be two assessments (each 100 marks) during the semester by a review committee. The student shall make presentation on the progress made before the committee. The total marks obtained in the two assessment shall be 40 marks

The continuous assessment marks for Project Work will be distributed as given below:

Continuous Assessment 40 Marks			
Review I (20 Marks)		Review II (20 Marks)	
Review Committee (excluding guide)	Guide	Review Committee (excluding guide)	Guide
14	6	14	6

#### 10.5 Seminar / Professional Practices:

The seminar / Professional Practices shall carry 100 marks and shall be evaluated through continuous assessment only. Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar, marks can be equally apportioned. The three member committee appointed by the Head of the Department will evaluate the seminar and at the end of the semester the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper / report (40%), presentation (40%) and response to the questions asked during presentation (20%).

#### 10.6 Industrial / Practical Training / Internship / Mini Project

The Industrial / Practical Training shall carry 100 marks and shall be evaluated through continuous assessment only. At the end of Industrial / Practical training / internship / Summer Project, the student shall submit a brief report on the training undergone and a certificate from the organization concerned. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Department. Certificates (issued by the Organization) submitted by the student shall be attached to the mark list and sent to the Controller of Examinations by the Head of the Department.

#### 10.7 Term Paper

- The students shall carry out this course under the guidance / supervision of a faculty. The “Term Paper” course is individual based.

- ii. For the Term Paper course out of 100 marks, the maximum marks for Continuous Assessment is fixed as 40. The Head of the Department shall constitute a review committee for this course. There shall be two reviews and each review carries 20 marks. Every student is expected to identify a topic with substantial literature survey and the technological development of the topic and should submit a report by end of the semester and the students should also prepare a paper on the subject matter of the Term Paper and submit the same to some journal for publication or to a conference for presentation.
- iii. At the end of the semester a viva-voce examination will be conducted by an external, internal examiners and the guide on the term paper report submitted by the students. The report evaluation and Viva Voce shall carry a max mark of 30 marks and the paper prepared for the publication shall carry a max mark of 30 based on the quality.

### 10.8 Comprehension

**The comprehension course is offered as two different courses, one in the V semester and the other in the VIII semester, each carrying one credit. The comprehension courses are evaluated by Viva-Voce examination on the subjects studied till that semester of assessment**

## 11.0 END SEMESTER EXAMINATIONS:

### 11.1. Theory Courses

**The examinations** shall ordinarily be conducted between October and December during the odd semesters and between April and June in the even semesters The End Semester Examination question paper pattern is given below:

Syllabus Coverage	Duration of the Exam in Hours	Question Pattern
Full Syllabus	3	<b>Part – A, 10x2 = 20</b> Short answer Type, 10 questions each carrying 2 marks. 2 questions from each unit. <b>Part – B, 5x6 = 30</b> Para /Analytical Type, 5 questions, one from each unit EITHER - OR type. <b>Part – C, 5x10 = 50</b> Essay/Design/Analytical Type, 5 questions out of 7 covering the full syllabus
		Max mark = 100

However, the question paper pattern for courses in engineering graphics and machine drawing may be designed differently to suit the specific needs of the courses.

### 11.2. Practical Courses

End Semester examination for practical courses will be conducted jointly by one internal examiner and one external examiner appointed by the Controller of Examinations with the recommendation of the Head of the Dept.

- 11.3.** The maximum marks for each theory shall be 100 comprising of 30 marks for internal assessment and 70 marks for the end semester examinations conducted by the University. The maximum marks for each practical course (including the project Work and Viva Voce Examination in the Eighth Semester) shall be 100 comprising of 40 marks for internal assessment and 60 marks for the end semester examinations conducted by the University.

#### **11.4 PROJECT WORK**

The student(s) is expected to submit the project report on or before the last working day of the semester. The University examination for the project work shall consist of evaluation of the final project report submitted by the student or students of the project group by an external examiner followed by a viva-voce examination conducted separately for each student by a committee consisting of an external examiner and an internal examiner. The Controller of Examinations shall appoint Internal and External Examiners from the panel of examiners recommended by the Head of the Department for the End Semester Examinations of the Project Work.

The End Semester Examination marks for the Project Work and for the Viva-Voce Examination will be distributed as given below.

End Semester Examination 60 Marks		
Report Evaluation (20 Marks)	Viva – Voce (40 Marks)	
External Examiner	External Examiner	Internal Examiner
20	20	20

If the project report is not submitted on or before the specified deadline, an extension of time up to a maximum of 30 days may be given for the submission of project work with due approval obtained from the Head of the Department. If the project report is not submitted even beyond the extended time then the student(s) is deemed to have failed in the Project Work. The failed student(s) shall register for the same in the subsequent semester and repeat the project work again.

#### **12.0 SUPPLEMENTRY EXAMINATIONS.**

After the publication of eighth semester results, supplementary examinations will be conducted to the students who have failed in any of theory courses in any of the semesters with no arrears in the practical Examinations. Interested students should register for the examinations required by them. Controller of examination will schedule supplementary examinations after the last date of registering for the supplementary examinations.

Pattern of evaluation will be the same as that of the end semester examinations. For non theory examinations supplementary examinations are not applicable.

#### **13.0 MALPRACTICE**

If a student indulges in malpractice in any internal test/model examination/end semester

examination, he/she shall be liable for punitive action as recommended by the Malpractice committee.

#### **14.0 REQUIREMENTS FOR APPEARING FOR UNIVERSITY EXAMINATIONS**

A candidate shall normally be permitted to appear for the semester Examinations of the current semester if he/she has satisfied the semester completion requirements (Vide Clause 6.0) and has registered for examination in all courses of the semester

#### **15.0 PASSING REQUIREMENTS**

**15.1** A candidate who secures not less than 50% of total marks earned in the internal and end semester examination put together in theory course or practical courses or project work shall be declared to have passed the examination in that course.

**15.2** If a candidate fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course during the subsequent semester when examination is conducted in that course; he/she should continue to register and reappear for the examinations till he / she secures a pass. However the internal assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts. In exceptional cases, a candidate may be permitted by the Head of the Institution to redo the courses for improving the internal assessments marks.

#### **16.0. METHODS FOR REDRESSAL OF GRIEVANCES IN EVALUATION**

**16.1.** Students who are not satisfied with the grades awarded can seek redressal by the methods given in the Table below:

<b>Redressal Sought</b>	<b>Methodology</b>
Request for photocopy of the answer script and or request for revaluation	To apply to COE within 7 days of declaration of the result/within 7 days of obtaining the photocopy along with the payment of the prescribed fee.

These are applicable only for theory courses in regular and arrear end semester examinations.

#### **16.2 Challenge of Evaluation**

If one is not satisfied with the result, can make an appeal to the CoE for the review of answer scripts after paying the prescribed fee within 7 days after the declaration of the examination result/revaluation result.

#### **17.0 AWARD OF LETTER GRADES**

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate as detailed below:

Range of total marks	Letter Grade	Grade points
90-100	S	10

80-89	A	9
70-79	B	8
60-69	C	7
55-59	D	6
50-54	E	5
0 to 49	U	0
Incomplete	I	0
Withdrawal	W	0

“U” denotes failure in the course.

“I” denotes incomplete as per clause 7.1 and hence prevention from writing End-Semester examination.

“W” denotes withdrawal from the course.

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

The list of courses enrolled during the semester and the grade scored.

The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA for a semester is the ratio of the sum of the products of the number of credits for courses acquired and the corresponding grade points to the grades scored in those courses taken for all the courses to the sum of the number of credits of all the courses in the semester.

$$\text{GPA} = \frac{\text{Sum of (C*GP)}}{\text{Sum of C}}$$

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. “U”, “I” and “W” grades will be excluded for calculating GPA and CGPA.

## **18.0 ELIGIBILITY FOR THE AWARD OF THE DEGREE**

A student shall be declared to be eligible for the award of the B.Tech Degree provided the student has

**18.1** Successfully completed the course requirement and has passed all the prescribed examinations in all the 8 semesters (6 semesters for lateral entry) within a maximum period of 7 years (6 years for lateral entry) reckoned from the commencement of the first semester to which the candidate was admitted.

**18.2** No disciplinary action is pending against him/her.

**18.3** The award of the degree must be approved by the Board of Management of the University.

## **19.0 CLASSIFICATION OF THE DEGREE AWARDED**

- 19.1** A candidate who qualifies for the award of the degree (vide clause 15.0) having passed examination in all the courses of all the eight semesters (six semesters in the case of lateral entry) in his/her First Appearance within eight consecutive semesters (six for lateral entry) securing a CGPA of not less than 8.0 shall be declared to have passed the examination in **first class with distinction**. For this purpose the withdrawal from examination (vide clause 20.0) will not be construed as an appearance. Further authorized break of study (vide clause 21.3) will not be counted for the purpose of classification.
- 19.2** A candidate who qualifies for the award of the degree (vide clause 18.0) having passed the examination in all the courses in eight semesters (all the six semesters for lateral entry) within a maximum period of eight consecutive semesters after his/her commencement of study in the third semester (from first semester for lateral entry) securing a CGPA of not less than 6.50 shall be declared to have passed the examination in **First Class**. For this purpose the authorized break of study (vide clause 21.3) will not be counted for the purpose of classification.
- 19.3** All other candidates (not covered in clauses 19.1 and 19.2) who qualify for the award of the degree (vide Clause 18.0) shall be declared to have passed the examination in **Second Class**.
- 19.4** A candidate who is absent in semester examination in a course / project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

## **20.0 PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION**

- 20.1** A candidate may for valid reasons be granted permission to withdraw from appearing for the examination of only any one semester examination during the entire duration of the degree programme. Also only one application for withdrawal is permitted for that semester examination in which withdrawal is sought.
- 20.2** Withdrawal application shall be valid only if the candidate is otherwise eligible to write examination and if it is made within the prescribed number of days prior to the commencement of the examination in that course or courses and also recommended by the Head of the Department and the Head of the Institution.
- 20.3** Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.

## **21.0 TEMPORARY BREAK OF STUDY FROM A PROGRAMME**

- 21.1** A candidate is not normally permitted to temporarily break the study. However, if a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later semester he / she apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester in question, through the Head of the Department stating the reasons thereof.
- 21.2** The candidates permitted to rejoin the programme after break of study shall be governed by the rules and regulation in force at the time of rejoining.
- 21.3** The duration specified for passing all the courses for the purpose of classification (vide clause 19.1 and 19.2) shall be increased by the period of such break of study permitted.
- 21.4** The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5.0 irrespective of the period of break of study in order that he/she may be eligible for the award of the degree (vide clause 18.0).

- 21.5** If any student is detained for want of required attendance, progress and good conduct, the period spent in that semester shall be considered as permitted 'Break of study' and clause 21.3 is not applicable for this case.

## **22.0 INDUSTRIAL VISIT**

Every student is required to undergo one Industrial visit in every semester starting from the third semester of the Programme arranged by the Head of the Department.

## **23.0 FAST TRACK PROGRAMME**

Fast track programme is introduced as an option for the bright students enabling them to complete the course in a short duration.

### **23.1 Eligibility**

Those students who have secured CGPA of 9 and above at the end of 2<sup>nd</sup> semester are eligible to opt for the fast track scheme.

### **23.2 Structure of the Fast Track Scheme**

The curriculum is framed in such a way that the eligible students who opt for fast track scheme will be able to complete the degree course in a period of three years. There will be two summer terms conducted one after the 2<sup>nd</sup> semester and another after the 4<sup>th</sup> semester during the summer vacations. Each summer term will have maximum of three theory courses and two laboratory practical courses. However, the total number of credits to be earned for the award of degree will remain the same as that of the concerned regular programme.

## **24.0 MIGRATION/TRANSFER OF CANDIDATES**

- 24.1** Migration/Transfer of candidates from another University approved by UGC shall be granted.

- 24.2** All Migrations/Transfers are subject to the approval of the Vice Chancellor

## **25.0 DISCIPLINE**

Every student is required to observe disciplined and decorous behavior both inside and outside the Institute and not to indulge in any activity which will tend to bring down the prestige of the University/Institute. The Dean shall constitute a disciplinary committee consisting of Dean, Head of the departments to which the student concerned belongs, and the Head of another department to enquire into acts of indiscipline and notify the University about the disciplinary action recommended for approval.

## **26.0 REVISION OF REGULATIONS AND CURRICULUM**

The University may from time to time revise, amend or change the Regulations, Curricula, Syllabi and scheme of examinations through the Academic Council with the approval of Board of Management.





**B.TECH – AUTOMOBILE ENGINEERING**  
**CURRICULUM AND SYLLABUS**  
**CHOICE BASED CREDIT SYSTEM**  
**I – VIII SEMESTERS**

<b>I-SEMESTER</b>						
<b>THEORY</b>						
<b>Sub Code</b>	<b>Category</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BEN101	HS	English – I	3	1	0	3
BMA101	BS	Mathematics – I	3	1	0	3
BPH101	BS	Engineering Physics – I	3	0	0	3
BCH101	BS	Engineering Chemistry – I	3	0	0	3
BCS101	ES	Fundamentals of Computing and Programming	3	0	0	3
BBA101	HS	Personality Development (Civil, Mechanical and Bio branches)	1	2	0	2
BBT 102	BS	Biology for Engineers (Civil & Mechanical branches)	2	0	0	2
BCE101	ES	Basic Civil Engineering (Mechanical & Bio Engineering Branches)	2	0	0	2
BME102	ES	Engineering Graphics – E (Civil, Mechanical & Aeronautical Engineering)	2	4	0	4
<b>PRACTICAL</b>						
BCM1L1	ES	Basic Civil and Mechanical Engineering Practices Laboratory (Civil, Mechanical and Bio Branches)	0	0	3	1
BSS1L4/1L5 /1L6	HS	NCC/NSS/NSO to be conducted during weekends				1
<b>Total No. of Contact Hours: 33</b>			<b>Total No. of Credits: 27</b>			

II-SEMESTER						
THEORY						
Sub Code	Category	Subject	L	T	P	C
BEN201	HS	English – II	3	1	0	3
BMA201	BS	Mathematics – II	3	1	0	3
BPH201	BS	Engineering physics – II	3	0	0	3
BCH201	BS	Engineering Chemistry – II	3	0	0	3
BFI201#	HS	Foreign/Indian Language	3	0	0	3
BME202	ES	Engineering Mechanics (Civil & Mechanical Branches)	3	1	0	3
BEE201*	ES	Basics Electrical and Electronics Engineering (Civil, Mechanical & Bio Engineering Branches)	2	0	0	2
PRACTICAL						
BCS2L2	ES	Computer Practices Lab (Civil, Mech & Bio)	0	0	3	1
BEE2L1	ES	Basic Electrical and Electronics Engineering Practices	0	0	3	1
BPC2L1	BS	Physics and Chemistry Laboratory	0	0	3/3	1
BSS2L7	HS	Yoga to be conducted during weekends				1
<b>Total No. of Contact Hours: 32</b>			<b>Total No. of Credits: 24</b>			
# 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)						

III SEMESTER						
THEORY						
Sub. Code	Category	Subject Name	L	T	P	C
BMA301	BS	Mathematics – III	3	2	0	4
BAM301	PC	Solid Mechanics	4	0	0	4
BAM302	PC	Automotive Petrol engines	3	0	0	3
BAM303	PC	Engineering Thermodynamics	4	0	0	4
BAM304	PC	Engineering Fluid Mechanics	3	0	0	3
BAM305	PC	Production Technology	3	0	0	3
PRACTICAL						
BAM 3L1	PC	Automotive Parts and Assembly Drawing	0	0	3	2
BCE3L2	PC	Fluid Mechanics and Strength of Materials Lab	0	0	3	2
<b>Total No. of Contact Hours: 28</b>			<b>Total No. of Credits: 25</b>			

IV SEMESTER						
THEORY						
Sub. Code	Category	Subject Name	L	T	P	C
BMA402	BS	Numerical Methods	3	2	0	4
BAM401	PC	Theory of Machines	4	0	0	4
BAM402	PC	Automotive Chassis	3	0	0	3
BAM403	PC	Automotive Diesel Engines	3	0	0	3
BAM404	PC	Automotive Electrical Systems	3	0	0	3
BCE406	HS	Environmental Studies	3	0	0	3
PRACTICAL						
BAM4L1	PC	Automotive Engine Components Laboratory	0	0	3	2
BAM4L2	PC	Engine Testing and Emission Measurement Lab	0	0	3	2
BAM4L3	PC	Automotive Electrical Lab	0	0	3	2
BAM4S1	PR	Technical Seminar- I	0	0	2	1
<b>Total No. of Contact Hours: 32</b>			<b>Total No. of Credits: 27</b>			

<b>V SEMESTER</b>						
<b>THEORY</b>						
<b>Sub. Code</b>	<b>Category</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BAM501	PC	Computer Control of Vehicle Systems	3	0	0	3
BAM503	PC	Automotive Transmission	4	0	0	4
BAM504	PC	Electronics & Instrumentation	3	0	0	3
BAM505	PC	Engineering Design for Automobile Engineers	4	0	0	4
BBA501	HS	Value Education and Professional Ethics	3	0	0	3
	CE	Core Elective-I	3	0	0	3
<b>PRACTICAL</b>						
BAM5L1	PC	Automotive Chassis Components Laboratory	0	0	3	2
BME5L1	PC	Machine Shop Practice	0	0	3	2
BEC5L1	PC	Automotive Electronics and Microprocessor Lab	0	0	3	2
BAM5C1	PR	Comprehension I	0	0	0	1
<b>Total No. of Contact Hours: 29</b>			<b>Total No. of Credits: 27</b>			

<b>VI SEMESTER</b>						
<b>THEORY</b>						
<b>Sub. Code</b>	<b>Category</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BAM601	PC	Vehicle Dynamics	4	0	0	4
BAM602	PC	Electronic Engine Management System	3	0	0	3
BAM603	PC	Instrumentation and Experimental Techniques	3	0	0	3
BAM604	PC	Automotive Aerodynamics	4	0	0	4
	CE	Core Elective-II	3	0	0	3
	NE	Non Major Elective-I	3	0	0	3
<b>PRACTICAL</b>						
BAM6L1	PC	Autotronics Lab	0	0	3	2
BAM6L2	PC	Vehicle Dynamics Lab	0	0	3	2
BAM6S1	PR	Technical Seminar II	0	0	2	1
<b>Total No. of Contact Hours: 28</b>			<b>Total No. of Credits: 25</b>			

<b>VII SEMESTER</b>						
<b>THEORY</b>						
<b>Sub. Code</b>	<b>Category</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BAM701	PC	Vehicle Maintenance	3	0	0	3
BAM702	PC	Vehicle Body Engineering	3	0	0	3
BAM703	PC	Vehicle Design	4	0	0	4
	CE	Core Elective-III	3	0	0	3
	NE	Non Major Elective-II	3	0	0	3
	OE	Open Elective-I	3	0	0	3
<b>PRACTICAL</b>						
BAM7L1	PC	Vehicle Maintenance Lab	0	0	3	2
BME7L2	PC	CAD/CAM Lab	0	0	3	2
BAM7P1	PR	Term Paper	0	0	4	2
BAM7V1	PR	Inplant Training [End of 6th Semester 15 Days]	0	0	0	1
<b>Total No. of Contact Hours: 29</b>			<b>Total No. of Credits: 26</b>			

<b>VIII SEMESTER</b>						
<b>THEORY</b>						
<b>Sub. Code</b>	<b>Category</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
BAM8E1	NE	Non Major Elective-III	3	0	0	3
BAM8E2	OE	Open Elective-II	3	0	0	3
<b>PRACTICAL</b>						
BAM8C1	PR	Comprehension II	0	0	0	1
BAM8P1	PR	Project Work	0	0	18	9
<b>Total No. of Contact Hours: 24</b>			<b>Total No. of Credits: 16</b>			

**OVERALL CREDITS: 197**

**SUMMARY OF CURRICULUM STRUCTURE AND CREDIT & CONTACT  
HOUR DISTRIBUTION**

S.No	Sub Area	Credit As per Semester								No. of Credit	% of credit
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences (HS)	6	7	-	3	3	-		-	19	9.64
2	Basic Sciences (BS)	11	10	4	4	-	-	-	-	29	14.72
3	Engineering Sciences (ES)	10	7	-		-	-	-	-	17	8.63
4	Professional Core (PC)	-	-	21	19	20	18	14		92	46.70
5	Core Electives (CE)	-	-	-	-	3	3	3		9	4.57
6	Non major Electives (NE)	-	-	-	-	-	3	3	3	9	4.57
7	Open Electives (OE)	-	-	-	-	-	-	3	3	6	3.05
8	Project Work, Seminar, Internship, Term Paper, etc. (PR)	-	-		1	1	1	3	10	16	8.12
	<b>Total Credit</b>	<b>27</b>	<b>24</b>	<b>25</b>	<b>27</b>	<b>27</b>	<b>25</b>	<b>26</b>	<b>16</b>	<b>197</b>	<b>100%</b>
	<b>Total Contact Hour</b>	<b>33</b>	<b>32</b>	<b>28</b>	<b>32</b>	<b>29</b>	<b>28</b>	<b>29</b>	<b>24</b>	<b>235 Hrs</b>	

## LIST OF ELECTIVES

Code No.	Course Title	L	T	P	C
<b>Core Elective (CE)-I</b>					
BAM014	Advanced Theory of IC Engines	3	0	0	3
BAM002	Finite Element Methods	3	0	0	3
BAM017	Special Type of Vehicles	3	0	0	3
<b>Core Elective (CE)-II</b>					<b>C</b>
BAM001	Computer Simulation of IC Engine Processes	3	0	0	3
BAM010	Product Design	3	0	0	3
BAM003	Two and Three Wheelers	3	0	0	3
<b>Core Elective (CE)-III</b>					
BAM004	Simulation of Vehicle Systems	3	0	0	3
BAM019	Computer Aided Design and Drafting	3	0	0	3
BAM018	Hybrid Electric and Fuel cell vehicles	3	0	0	3
<b>Non Major Elective (NE)-I</b>					
BAM008	Modern Manufacturing Process	3	0	0	3
BAM006	Noise Vibration and Harshness	3	0	0	3
BAM021	Industrial Engineering	3	0	0	3
BAM016	Vehicle Air Conditioning Systems	3	0	0	3
<b>Non Major Elective (NE)-II</b>					
BAM007	Computer Integrated Manufacturing Systems	3	0	0	3
BAM015	Automotive Safety	3	0	0	3
BAM013	Quality Control and Reliability Engineering	3	0	0	3
BAM020	Measurements & Metrology	3	0	0	3
<b>Non Major Elective (NE)-III</b>					
BAM009	Robotics for Automobile Engineers	3	0	0	3
BAM005	Tyre Technology	3	0	0	3
BAM011	Operation Research for Automobile Engineers	3	0	0	3
BAM012	Transport management and Motor Industry	3	0	0	3
<b>Open Elective (OE)-I</b>					
BBA001	Principles of Management and Organizational Behaviour	3	0	0	3
BBA002	Entrepreneurship Development	3	0	0	3
BBA003	Marketing Management	3	0	0	3
<b>Open Elective (OE)- II</b>					
BBA004	Engineering Economics and Financial Accounting	3	0	0	3
BBA005	Total Quality Management and Reliability Engineering	3	0	0	3
BBA006	Indian Constitution and Society	3	0	0	3



<b>BEN101</b>	<b>ENGLISH - I</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>						
	Total Contact Hours – 60							3	1	0	3						
	Prerequisite – +2 Level English																
	Course Designed by – Dept of English																
<b>OBJECTIVES</b>																	
To make the students learn the basic modes of communication for fluency and attainment of confidence in speech, reading and writing.																	
<b>COURSE OUTCOMES (COs)</b>																	
CO1	Understand the importance of being responsible, logical, and thorough.																
CO2	Respond to the situations where short reports and instructions are required.																
CO3	Explain “how things work”, and what to suggest when “things don’t work																
CO4	Develop our confidence and authority in the practical use of language.																
CO5	Understand the importance of being responsible, logical, and thorough.																
CO6	e to Face interviews and competitive examinations																
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	H	H	H	H	M	L	L	H	H	H	H				
	CO2							L									
	CO3	H						H		H			H				
	CO4	H	M				M	L	H	H			H				
	CO5							L									
	CO6	H		H	H	H	H	L		H	H	M	H				
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/ Term Paper Seminar/ Internship (PR)	
		√															
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## UNIT I STRUCTURES 12

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 TRANSCODING

12

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 REPORTING

12

Degrees of comparison – Positive, Comparative, Superlative - questions- SI units -Lab reports - Physics chemistry, workshop and Survey report for introducing new product in the market.

**UNIT IV FORMAL DOCUMENTATION****12**

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

**UNIT V METHODOLOGY****12**

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

**TEXT BOOK**

1. Department Of Humanities and Social Sciences Division, Anna University, Oxford University Press, 2013.

**REFERENCES:**

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. Murali Krishna and Sunitha Moishra, Communication Skills for Engineers . Pearson, New Delhi, 2011.

<b>BMA101</b>	<b>MATHEMATICS I</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 60							3	1	0	3		
	Prerequisite – + 2 Level Mathematics												
	Course Designed by – Dept of Mathematics												
<b>OBJECTIVES</b>													
To make the students learn Mathematics in order to formulate and solve problems effectively in t respective fields of engineering.													
<b>COURSE OUTCOMES (COs)</b>													
CO1	Study the fundamentals of mathematics												
CO2	Students learn multiple integral techniques												
CO3	Students gain knowledge in application of variables												
CO4	Find area and volume based on a function with one or more variables.												
CO5	Apply matrix operations to solve relevant real life problems in engineering.												
CO6	Formulate a mathematical model for three dimensional objects and solve												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2			M		H							
	CO3		H				M						
	CO4								L				
	CO5							H			L		

	CO6										L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper Seminar/ Internship (PR)			
			√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015										

### UNIT-1 MATRICES

1

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

12

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

12

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

### UNIT IV FUNCTIONS OF SEVERAL VARIABLES

12

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

12

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.

### 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<sup>th</sup> 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<sup>th</sup> Edition, Pearson Education, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley 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.

PH101	ENGINEERING PHYSICS I								L	T	P	C	
	Total Contact Hours - 45								3	0	0	3	
	Prerequisite – +2 level Physics												
	Course Designed by – Department of Physics												
OBJECTIVES: To enhance the fundamental knowledge in Physics and its applications relevant to various stream Engineering and Technology													
COURSE OUTCOMES (COs)													
CO1	Understand the Principles and Laws of Physics												
CO2	To understand the impact of Crystal Physics												
CO3	Learn the Properties of Elasticity and Heat transfer.												
CO4	Acquire Knowledge on Quantum Physics.												
CO5	Understand the concepts on Laser & Ultrasonic’s and its Applications												
CO6	Understand the Principle of Laser and its Applications in Engineering and Medicine.												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	A	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H						M			H		
	CO2		L	H		M				M		L	H
	CO3												
	CO4	H		M	L						L		M
	CO5		L	L								L	L
	CO6												
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper Seminar/ Internship (PR)				
			√										
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT I CRYSTAL PHYSICS

9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment)- Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

## UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS

9

Elasticity-Hooke's law - Relationship between three moduli of elasticity (qualitative) – stress - strain diagram – Poisson's ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young's modulus by uniform bending- I-shaped girders Modes of heat transfer- thermal conductivity- Newton's law of cooling - Linear heat flow – Lee's disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel).

### UNIT III QUANTUM PHYSICS

9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect. Theory and experimental verification – Properties of Matter waves – G.P Thomson experiment-Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

### UNIT IV ACOUSTICS AND ULTRASONICS

9

Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications – Sonogram.

### UNIT V PHOTONICS AND FIBRE OPTICS

9

Spontaneous and stimulated emission- Population inversion –Einstein's A and B coefficients - derivation. Types of lasers – Nd:YAG, CO<sub>2</sub>, Semiconductor lasers (homo junction & hetero junction)- Industrial and Medical Applications. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

#### TEXT BOOKS:

1. Jayaraman D Engineering Physics I. Global Publishing House, 2014.
2. Arumugam M. Engineering Physics. Anuradha publishers, 2010.
3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai Publishers, 2009.
4. Mani Naidu S. Engineering Physics, Second Edition, PEARSON Publishing, 2011.

#### REFERENCES:

1. Searls and Zemansky. University Physics, 2009
2. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009.
3. Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
4. <http://ocw.mit.edu/courses/find-by-topic>
5. <http://nptel.ac.in/course.php?disciplineId=122>
6. [https://en.wikipedia.org/wiki/Engineering\\_physics](https://en.wikipedia.org/wiki/Engineering_physics)

BCH101	ENGINEERING CHEMISTRY - I	L	T	P	C
		3	0	0	3
	Prerequisite – +2 Level Chemistry				
	Course Designed by – Department of Chemistry				
OBJECTIVES					
To impart a sound knowledge on the principles of chemistry involving the different					

application oriented topics required for all engineering branches.														
COURSE OUTCOMES (COs)														
CO1	Understand the principles of water characterization and treatment for portable and industrial purposes.													
CO2	To impart knowledge on the essential aspects of Principles of polymer chemistry and engineering applications of polymers													
CO3	Having a sound knowledge in the Field of the Conventional and non-Conventional energy													
CO4	To impart knowledge on the essential aspects of electrochemical cells, emf and applications of EMF measurements													
CO5	To make the students understand the Principles of corrosion and corrosion control .													
CO6	To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/Pos	a	b	c	d	e	f	g	h	i	J	k	l	
2	CO1	H						H						
	CO2		L	H		M								
	CO3		M		H									
	CO4	H		M	L			H						
	CO5		L	L										
	CO6	H						H						
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)	Project/ Term Paper Seminar/ Internship (PR)
			√											
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015												

## 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 polymerization - types of polymerization– Addition polymerization and Condensation polymerization – Mechanism of Polymerization - 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 -  $\text{Fe}^{2+}$  vs dichromate titrations) Conduct metric titrations (acid-base – HCl 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 control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints– constituents of the paint and their functions Metallic coatings – electroplating of Gold and electro less 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

#### 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).
3. <http://ocw.mit.edu/courses/find-by-topic>
4. <http://nptel.ac.in/course.php?disciplineId=122>
5. <https://en.wikipedia.org/wiki/Electrochemistry>

BCS101	FUNDAMENTALS OF COMPUTING AND PROGRAMMING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 level Physics				
	Course Designed by – Department of Physics				
<b>OBJECTIVES</b> Students will understand the basics of computers and solve computer oriented problems using various computing tools.					

COURSE OUTCOMES (COs)													
CO1	Learn the fundamental principles in computing.												
CO2	Learn to write simple programs using computer language												
CO3	To enable the student to learn the major components of a computer system.												
CO4	Computing problems												
CO5	To learn to use office automation tools.												
CO6	To interpret and relate programs												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	H						H					
	CO2		L	H		M							
	CO3		M		H								
	CO4	H		M	L			H					
	CO5		L	L									
	CO6	H						H					
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)	Project/ Term Paper/ Seminar/ Internship (PR)
			√										
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## **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-Keywods-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.

**TEXT BOOKS:**

1. Ashok, N.Kamthane,"Computer Programming", Pearson Education (2012).
2. Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling V 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. Pradip Dey, Manas Ghosh, Fundamentals of Computing and Programming in 'C' First Edition, Oxford University Press(2009).
4. The C++ Programming Language , 4<sup>th</sup> Edition, Bjarne Stroustrup, Addison-Wesley Publishing Company (2013).

<b>BSS101</b>		<b>PERSONALITY DEVELOPMENT</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
		Total Contact Hours - 30							1	1	0	2	
		Prerequisite – +2 Level Knowledge											
		Course Designed by – Department of Management Studies											
<b>OBJECTIVES</b>													
To make students groom their personality and prove themselves as good Samaritans of the society.													
<b>COURSE OUTCOMES (COs)</b>													
CO1		Individual or in-group class presentations pertaining to the applications of concepts theories or issues in human development..											
CO2		Scores obtained from essay and or objective tests.											
CO3		Attendance, classroom participation, small group interactions.											
CO4		Research and write about relevant topics.											
CO5		Design and complete a research project that can take the form of a development interview, an observation or assessment through service learning.											
CO6		Develop and maintain a Reflection											
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	L		H				M					
	CO2		H	H				M					
	CO3							M	H				
	CO4									H	H		
	CO5							M			H	H	
	CO6							M					L

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper/ Seminar/ Internship (PR)
		√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

## **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 6**

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.

### **TEXT BOOKS:**

1. Hurlock, E.B (2006). Personality Development, 28<sup>th</sup> Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16<sup>th</sup> 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
		Total Contact Hours – 30								2	0	0	2
		Prerequisite – Basic Science											
		Course Designed by – Department of Industrial Bio Technology											
OBJECTIVES													
Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system.													
COURSE OUTCOMES (COs)													
CO1	Graduates within the first five years will be able to grasp and apply biological engineering principles, procedures needed to solve real-world problems.												
CO2	To understand the fundamentals of living things, their classification, cell structure and biochemical constituents												
CO3	To apply the concept of plant, animal and microbial systems and growth in real life situations												
CO4	To comprehend genetics and the immune system												
CO5	To know the cause, symptoms, diagnosis and treatment of common diseases												
CO6	To give a basic knowledge of the applications of biological systems in relevant industries												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H						M					
	CO2		H							H			
	CO3			H							M		
	CO4										H		
	CO5												
	CO6						H						M
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
	√												
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT I INTRODUCTION TO LIFE

6

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****6**

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****6**

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

**UNIT V BIOLOGY AND ITS INDUSTRIAL APPLICATION****6**

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.

**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

<b>BCE 101</b>	<b>BASIC CIVIL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours – 30	2	0	0	2
	Prerequisite – +2 Level Maths & Physical Science				
	Course Designed by – Department of Civil Engineering				
<b>OBJECTIVES:</b> Understand the basic concepts of civil engineering.					
<b>COURSE OUTCOMES (COs)</b>					
CO1	Will gain knowledge in Design, concept preparation				
CO2	Loading calculation				
CO3	Structural component design				
CO4	Drawing and chart preparation				

CO5	Will understand the components of buildings.												
CO6	Will learn the engineering aspects to dams , water supply and sewage disposal.												
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H			H		L					
	CO2					H	H						
	CO3							H	L				
	CO4									L			
	CO5										H	L	
	CO6												
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
				√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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 III FOUNDATION 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 V MISCELLANEOUS 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)

### TEXT BOOKS:

1. Raju.K.V.B, Ravichandran .P.T, “Basics of Civil Engineering”, Ayyappa Publications,

Chennai, 2012.

2. SeetharamanS., “Basic Civil Engineering”, Anuradha Agencies, (1<sup>st</sup> ed. 2005).
3. Dr.M.SPalanisamy, “Basic Civil Engineering” (3<sup>rd</sup>ed. 2000), TUG Publishers, New Delhi/Tata McGrawHill Publication Co., New Delhi

### REFERENCE BOOKS:

1. Rangwala.S.C, "Engineering Materials", 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. (1999).

<b>BME 101</b>	<b>ENGINEERING GRAPHICS- E</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	Total Contact Hours - 60								2	0	3	4	
	Prerequisite – +2 Level Maths & Physical Science												
	Course Designed by – Department of Mechanical Engineering												
<b>OBJECTIVES</b>													
<b>To understand techniques of drawings in various fields of engineering</b>													
<b>COURSE OUTCOMES (COs)</b>													
CO1	To know about different types of lines & use of different types of pencils in an Engineering Drawing												
CO2	To know how to represents letters & numbers in drawing sheet												
CO3	To know about different types of projection												
CO4	To know projection of points ,straight lines, solids etc.												
CO5	To know development of different types of surfaces.												
CO6	To know about isometric projection.												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	H											H
	CO2	M	H										M
	CO3			L									M
	CO4						L		H	H			L
	CO5			L						H			L
	CO6			L							H		L
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## **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, tetrahedron 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 & FREEHAND 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.

### **TEXT BOOKS:**

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> 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. Prabhu Raja, "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	BASIC CIVIL & MECHANICALENGINEERING PRACTICES LABORATORY										L	T	P	C
	Total Contact Hours - 30										0	0	2	1
	Prerequisite – Basic Civil and Mechanical Engineering													
	Course Designed by – Department of Mechanical Engineering& Civil Engineering													
OBJECTIVES														
To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.														
COURSE OUTCOMES (COs)														
CO1	Learn Basic concepts													
CO2	Students will get exposure regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furniture’s.													
CO3	Students will get exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,													
CO4	Students will get hands on experience on basic welding techniques, machining and sheet metal works.													
CO5	Students will get hands on experience on basic machining techniques													
CO6	Students will get hands on experience on basic sheet metal techniques													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l	
2	CO1	H	L											
	CO2				H									
	CO3					H	L	L						
	CO4		H				M		L			H		
	CO5		H				M		L			H		
	CO6		H				M		L			H		
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper Seminar/ Internship (PR)			
						√								
4	Approval			37 <sup>th</sup> Meeting of Academic Council, May 2015										

### LIST OF EXPERIMENTS

#### I. CIVIL ENGINEERING PRACTICE



**Buildings:**

- a) 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 connection of 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, planing and cutting.
- c) Preparation of half joints, Mortise and Tenon joints.

**II MECHANICAL ENGINEERING PRACTICE****Welding:**

- a) 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
- e) Preparation of butt joints, lap joints and tee joints by arc welding

**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:**

- a) Moulding operations like mould preparation for gear and step cone pulley etc

**Fitting:**

- a) 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. Jeyapooan, 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”, Sci tech Publication, (1999).

BEN 201	ENGLISH II								L	T	P	C				
	Total Contact Hours – 60								3	1	0	3				
	Prerequisite – English I															
	Course Designed by – Department of English															
OBJECTIVES																
Students will be able to actively participate in group discussions. Students will have Telephone Skills, Giving Directions and Information Transfer																
COURSE OUTCOMES (COs)																
CO1	To make the students aware to different kinds of Learner-friendly modes of language variety of self- instructional learning (Computer based)															
CO2	To make students comprehend the habit of intelligent Reading as well as Computer- based competitive exams glob															
CO3	To achieve a reasonably good level of competency in Report Writing.															
CO4	To make the students aware to different kinds of Learner-friendly modes of language variety of self- instructional learning (Computer based)															
CO5	To achieve a reasonably good level of competency in group discussions															
CO6	To achieve a reasonably good level of competency in public speaking															
	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low															
1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l			
2	CO1	M	L	H	L	M			H		M	L				
	CO2			H	L				H		M	L				
	CO3			H	L	M			H		H	L				
	CO4			H	L	M			H		M	L				
	CO5			H	L	M			H		M	L				
	CO6			H	L	M			H		M	L				
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (PR)	
		√														
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015														

## UNIT I ORIENTATION

12

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

12

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.



	CO2		H				H		L	L		M	
	CO3		H				H		L	L		M	
	CO4					M						M	
	CO5										M	M	
	CO6										M		
3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/Seminar/ Dissertation (DD)				
			✓										
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT I ORDINARY DIFFERENTIAL EQUATION

12

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

## UNIT II VECTOR CALCULUS

12

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

12

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

12

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 poles on boundaries).

## UNIT V STATISTICS

12

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

### TEXT BOOK:

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

### REFERENCES :

1. Ramana.B.V, “Higher Engineering Mathematic“, Tata McGraw Hill Publishing Company,

New Delhi, 2007.

- Gupta SC, and VK.Kapoor, "Fundamentals Mathematical Statistics", 11<sup>th</sup> edition, Sultan Chand Sons, New Delhi, 2014.

BPH201	ENGINEERING PHYSICS -II							L	T	P	C		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – ENGINEERING PHYSICS -I												
	Course Designed by – Department of Physics												
OBJECTIVES													
<ul style="list-style-type: none"><li>To expose the students to multiple areas of science of engineering materials which have direct relevance to different Engineering applications</li><li>To understand the concepts and applications of conducting, Semiconducting, magnetic &amp; dielectric materials as well as their optical properties.</li></ul>													
COURSE OUTCOMES (COs)													
CO1	Understand about properties and advancements of conducting materials.												
CO2	Understand 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 modern materials in technical uses.												
CO6	Learn new engineering materials and its characteristics												
	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		L	H		M							
	CO3		M		H								
	CO4	H		M	L								
	CO5		L	L									
	CO6	H											
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
			√										
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT I CONDUCTING MATERIALS

9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum

theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

## **UNIT II SEMICONDUCTING MATERIALS**

**9**

Intrinsic semiconductor – carrier concentration derivation Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications.

## **UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS**

**9**

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High T<sub>c</sub> superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

## **UNIT IV DIELECTRIC MATERIALS**

**9**

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

## **UNIT V ADVANCED ENGINEERING MATERIALS**

**9**

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials – Birefringence- optical Kerr effect – Classification of Biomaterials and its applications.

### **TEXT BOOKS:**

1. Jayaraman D Engineering Physics II. Global Publishing House, 2014.
2. Palanisamy P.K. Materials Science. SCITECH Publishers, 2011.
3. Senthilkumar G. Engineering Physics II. VRB Publishers, 2011.

### **REFERENCES:**

- 1.Arumugam M., Materials Science. Anuradha publishers, 2010
2. Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009
3. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009
- 4 <http://ocw.mit.edu/courses/find-by-topic>
- 5 <http://nptel.ac.in/course.php?disciplineId=122>
- 6 [https://en.wikipedia.org/wiki/Engineering\\_physics](https://en.wikipedia.org/wiki/Engineering_physics)

BCH 201	ENGINEERING CHEMISTRY-II	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – ENGINEERING CHEMISTRY –I				
	Course Designed by – Department of Chemistry				
OBJECTIVES					
To impart a sound knowledge on the principles of chemistry involving application orien					

topics required for all engineering branches.													
COURSE OUTCOMES (COs)													
CO1		Students will understand the concepts and further industrial applications of surface chemis											
CO2		To impart knowledge about the Industrial importance of Phase rule and alloys											
CO3		To make the students to be conversant with Analytical techniques of chemistry and t importance											
CO4		To have an idea and knowledge about the Chemistry of Fuels and											
CO5		Understanding of engineering materials											
CO6		All about bonding and molecular structures											
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L		H		H				M	
	CO2		H			H		H					
	CO3	H		L		H		H				M	
	CO4			L		H		H					
	CO5			L		H		H					
	CO6			L		H		H		H		M	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
											√		
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## 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 - nit riding . 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:** Refractory's – classification – acidic, basic and neutral refractory's – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractory's: 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, oiliness) Solid lubricants – graphite and molybdenum sulphide

#### 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).
3. <http://ocw.mit.edu/courses/find-by-topic>
4. <http://nptel.ac.in/course.php?disciplineId=122>
5. <https://en.wikipedia.org/wiki/Spectroscopy>

BFR 201	FRENCH	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				
<b>OBJECTIVES</b>					
Language gives access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.					
<b>COURSE OUTCOMES (COs)</b>					
CO1	Introduce the basics of the language to beginners				
CO2	Understand a dialogue and dialogue presentation				
CO3	To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.				



CO4	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.																
CO5	Grammatical and lexical notions as well as activities required for communication are learnt by the students.																
CO6	Interpreting skills and confidence in the language.																
CO6	Interpreting skills and confidence in the language.																
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/Po s	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	L														
	CO2			H	L				H	H	M	L	L				
	CO3			H	L				H	H	M	L	L				
	CO4			H					H	H	M	L	L				
	CO5			H	L				H	H	M		L				
	CO6			H					H	H	M		L				
3	Categor y	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (PR)	
		√															
4	Approv al	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## UNIT I INTRODUCTION

8

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 GRAMMAR

8

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 CONVERSATION

8

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 PROPOSAL WRITING

7

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

## UNIT V FORMAL LETTERS

7

<b>BGM 201</b>	<b>GERMAN</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours – 45							3	0	0	3		
	Prerequisite +2 Level English												
	Course Designed by – Department of English												
<b>OBJECTIVES</b>													
At the end of this course, students shall be able to obtain good knowledge of the language, to read and write and speak German, whereby the emphasis is laid on speech.													
<b>COURSE OUTCOMES (COs)</b>													
CO1	Will have a basic knowledge of the language												
CO2	Will acquire reading and writing skills.												
CO3	Will develop basic conversational skills.												
CO4	Will understand German lifestyle												
CO5	Will gain confidence to survive in a global environment												
CO6	Will have attained to survive and adopt change in a foreign culture .												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
		√											
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

**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 PRONUNCIATION****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 SELF INTRODUCTION****9**

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

**UNIT III TRAINING****9**

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

**UNIT IV ORAL****9**

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

**UNIT V NARRATION****9**

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

**RESOURCES:**

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

BJP 201	JAPANESE							L	T	P	C		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – +2 Level English												
	Course Designed by – Department of English												
OBJECTIVES													
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 OUTCOMES (COs)													
CO1	Will have a basic knowledge of the language												
CO2	Will acquire reading and writing skills.												
CO3	Will develop basic conversational skills.												
CO4	Will understand Japanese lifestyle												
CO5	Will gain confidence to survive in a global environment												
CO6	Will have attained to survive and adopt change in a foreign culture .												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L

	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
		√											
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### UNIT ICULTURAL HERITAGE

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 IUSAGE

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 IIORAL

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 IVART AND CULTURE

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 VDRILLS AND PRACTICE

9

Vocabulary 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

### 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 beginners through advanced course, Living Language, 2012

<b>BKR 201</b>	<b>KOREAN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	1	0	3

		Prerequisite – +2 Level English															
		Course Designed by – Department of English															
<b>OBJECTIVES</b>																	
To have a basic knowledge of Korean language, Korean culture and heritage																	
To impart knowledge on Korean lifestyle and heritage.																	
<b>COURSE OUTCOMES (COs)</b>																	
CO1	Will have a basic knowledge of the language																
CO2	Will acquire reading and writing skills.																
CO3	Will develop basic conversational skills.																
CO4	Will understand Korean lifestyle																
CO5	Will gain confidence to survive in a global environment																
CO6	Will have attained to survive and adopt change in a foreign culture .																
Mapping of Course Outcomes with Program outcomes (POs)																	
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	L														
	CO2			H	L				H	H	M	L	L				
	CO3			H	L				H	H	M	L	L				
	CO4			H					H	H	M	L	L				
	CO5			H	L				H	H	M		L				
	CO6			H					H	H	M		L				
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (PR)	
		√															
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## UNIT I PLANNING

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 MODIFIERS

9

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

## UNIT III PLACING ORDERS

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 DESCRIPTIONS

9

BCN 201		CHINESE							L	T	P	C	
		Total Contact Hours - 60							3	0	0	3	
		Prerequisite – +2 Level English											
		Course Designed by – Department of English											
OBJECTIVES													
To have a basic knowledge of Chinese language, Chinese culture and heritage													
To impart knowledge on Chinese lifestyle and heritage.													
COURSE OUTCOMES (COs)													
CO1		Will have a basic knowledge of the language											
CO2		Will acquire reading and writing skills.											
CO3		Will develop basic conversational skills.											
CO4		Will understand Chinese lifestyle											
CO5		Will gain confidence to survive in a global environment											
CO6		Will have attained to survive and adopt change in a foreign culture											
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
		√											
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

<b>UNIT IRISE OF DIALECTS</b>	<b>9</b>
History, Origins, Old and middle Chinese, Rise of northern dialects	
<b>UNIT IIVARIETIES</b>	<b>9</b>
Influences 3 Varieties of Chinese. 1.Classification 2.Standard Chinese and 3.Nomenclature	
<b>UNIT III CHARACTERS</b>	<b>9</b>
Chinese characters, Homophones, Phonology	
<b>UNIT IV TRANSCRIPTIONS</b>	<b>9</b>
Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions	
<b>UNIT VGRAMMAR</b>	<b>9</b>
Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords	

#### REFERENCES:

1. Hannas, William C. (1997), Asia's Orthographic Dilemma, University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0" 978-0-8248- 1892-0.
2. 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.
3. Ramsey, S. Robert (1987), The Languages of China, Princeton University Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5" 978-0-691-01468-5.
4. Schuessler, Axel (2007), ABC Etymological Dictionary of Old Chinese, Honolulu: University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-2975-9"978-0-8248-2975-9.
5. R. L. G. " Language borrowing Why so little Chinese in English?" The Economist. June 6, 201

<b>BME 202</b>	<b>ENGINEERING MECHANICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours – 60	3	1	0	3
	Prerequisite – Engineering Mathematics I , II, Engg. Physics				
	Course Designed by – Department of Mechanical Engineering				
<b>OBJECTIVES:</b> To understand the concept of basic engineering mechanism					
<b>COURSE OUTCOMES (COs)</b>					
CO1	Students will understand the concepts of engineering mechanics				
CO2	Students will understand the vectorial representation of forces and moments				
CO3	Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.				
CO4	Students will gain knowledge regarding various types of forces and reactions and tom draw free body diagram to quicker solutions for complicated problems.				

CO5	Student will gain knowledge in solving problems involving work and energy												
CO6	Student will gain knowledge on friction on equilibrium and its application.												
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L	H		H		L		H	H	
	CO2						H	H	L				
	CO3						H	H	L		M		
	CO4						H	H	L		M		
	CO5						H	H	L		M		
	CO6						H	H	L		M		
3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## 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

12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – 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.

## UNITIII PROPERTIES OF SURFACES AND SOLIDS

12

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.

## UNITIV FRICTION

12

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**

12

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	
		Total Contact Hours - 30							2	0	0	2	
		Prerequisite – Engineering Mathematics, Engineering Physics-I & II											
		Course Designed by – Department of Electrical & Electronics Engineering											
OBJECTIVES: To understand the laws of electrical engineering.													
COURSE OUTCOMES (COs)													
CO1	Students will gain knowledge regarding the various laws and principles associated with electrical systems.												
CO2	Students will gain knowledge regarding electrical machines and apply them for practical problems.												
CO3	Students will gain knowledge regarding various types semiconductors.												
CO4	Student will gain knowledge digital electronics.												
CO5	Student will gain knowledge on electronic systems.												
CO6	Students will acquire knowledge in using the concepts in the field of electrical engg. projects and research.												
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/Pos	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	M	H	M			L		L	L			
	CO2		H	M			L		L	L			
	CO3		H	M			L		L				
	CO4	M	H	M			L		L	L			
	CO5	M	H	M			L		L				
	CO6		H				L		L	H			

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)
				√					
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

## UNIT I ELECTRIC 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 MEASUREMENT 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 Applications – HWR, FWR –Zener Diode – BJT (CB, CE, CC) configuration & Characteristics.

## UNIT V DIGITAL ELECTRONICS

6

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

### TEXT BOOKS:

1. N.Mittal "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. McGrawHill Book Company, 2<sup>nd</sup> Edition, 1983.
2. Hyatt W.H and Kemmerly J.E. "Engineering Circuit Analysis", McGraw Hill International Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric Machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 2004.

BCS 2L2		COMPUTER PRACTICE LABORATORY						L	T	P	C		
		Total Contact Hours - 45						0	0	3	1		
		Prerequisite – Fundamentals of Computer											
		Course Designed by – Department of Computer Science &Engineering											
OBJECTIVES: To impart basic computer knowledge													
COURSE OUTCOMES (COs)													
CO1		Demonstrate major algorithms and data											
CO2		Implementation of array operations											
CO3		Implementation of binary tree.											
CO4		Implementation of linked list											
CO5		Students will able to do analyse data using spread sheet											
CO6		Student will able to understand the basics of C programming.											
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L	H		H		L		H	H	H
	CO2						H	H	L				
	CO3						H	H	L		M		
	CO4						H	H	L		M		
	CO5						H	H	L		M		
	CO6						H	H	L		M		
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)				
				√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

#### A) WORD PROCESSING

6

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

#### B) SPREAD SHEET

9

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\*

15

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

#### D) SIMPLE C++ PROGRAMMING

15

- Classes and Objects
- Constructor and Destructor

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

BEE2L1	BASIC ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICES LABORATORY										L	T	P	C			
	Total Contact Hours – 45										0	0	3	1			
	Prerequisite – Basic Electrical and Electronics Engineering																
	Course Designed by – Department of Electrical & Electronics Engineering																
OBJECTIVES: To enhance the student with knowledge on electrical and electronic equipments.																	
COURSE OUTCOMES (COs)																	
CO1	Students will able to handle basic electrical equipments.																
CO2	Students will able to do staircase wiring.																
CO3	Students will able to understand domestic wiring procedures practically.																
CO4	Student will able to assemble electronic systems.																
CO5	Students will understand all the fundamental concepts involving electrical engineering																
CO6	Students will understand all the fundamental concepts involving electronics engineering																
	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H- High, M- Medium, L-Low																
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	M	H	M			L		L	L	M	H					
	CO2		H	M			L		L	L		H					
	CO3		H	M			L		L			H					
	CO4	M	H	M			L		L	L	M	H					
	CO5	M	H	M			L		L		M	H					
	CO6		H				L		L	H		H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (PR)	
						✓											
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## **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

## II 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.

<b>BPC 2L1</b>		<b>PHYSICS AND CHEMISTRY LABORATORY</b>									<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		Total Contact Hours – 45									0	0	3	1
		Prerequisite – Physics and Chemistry												
		Course Designed by – Department of Physics & Chemistry												
<b>OBJECTIVES:</b> To impart knowledge to the students in practical physics and chemistry														
<b>COURSE OUTCOMES (COs)</b>														
CO1		Students will understand the concept of hall effect												
CO2		Students will understand the concept of semiconductors. .												
CO3		Student will understand the working of spectrometer.												
CO4		Student will able practically understand the chemical reactions.												
CO5		Students will Study the magnetic hysteresis and energy product												
CO6		Students understand the Determination of Band gap of a semiconductor												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	M	H	M			L		L	L	M	H	M	
	CO2		H	M			L		L	L		H		
	CO3		H	M			L		L			H		
	CO4	M	H	M			L		L	L	M	H	M	
	CO6		H				L		L	H		H		
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)	Engg Sciences (ES)		Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (PR)		
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015												

## I -LIST OF EXPERIMENTS – PHYSICS

1. Determination of Wavelength, and particle size using Laser

- Determination of acceptance angle in an optical fiber.
- Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
- Determination of wavelength of mercury spectrum – spectrometer grating
- Determination of thermal conductivity of a bad conductor – Lee's Disc method.
- Determination of Young's modulus by Non uniform bending method
- Determination of specific resistance of a given coil of wire – Carey Foster's Bridge
- Determination of Young's modulus by uniform bending method
- Determination of band gap of a semiconductor
- Determination of Coefficient of viscosity of a liquid –Poiseuille's method
- Determination of Dispersive power of a prism - Spectrometer
- Determination of thickness of a thin wire – Air wedge method
- Determination of Rigidity modulus – Torsion pendulum

## II-LIST OF EXPERIMENTS – CHEMISTRY

- Estimation of hardness of Water by EDTA
- Estimation of Copper in brass by EDTA
- Determination of DO in water (Winkler's method)
- Estimation of Chloride in Water sample (Argento metry)
- Estimation of alkalinity of Water sample
- Determination of molecular weight
- Conduct metric titration (Simple acid base)
- Conduct metric titration (Mixture of weak and strong acids)
- Conduct metric titration using  $\text{BaCl}_2$  vs  $\text{Na}_2\text{SO}_4$
- Potentiometric Titration ( $\text{Fe}^{2+}$  /  $\text{KMnO}_4$  or  $\text{K}_2\text{Cr}_2\text{O}_7$ )
- pH titration (acid & base)
- Determination of water of crystallization of a crystalline salt (Copper Sulphate)
- Estimation of Ferric iron by spectrophotometer.

<b>BMA301</b>	<b>MATHEMATICS – III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 75	3	2	0	4
	Prerequisite – Engineering Mathematics-I, Engineering Mathematics -II,				
	Course Designed by – Dept of Mathematics				
<b>OBJECTIVES</b>					
To understands the concepts of Fourier series analysis, Fourier transform techniques and Z transform techniques					
<b>COURSE OUTCOMES (COs)</b>					
CO1	To learn the problem solving methods in linear differential equations				
CO2	To learn Dirichlet’s condition and operations using Fourier series				
CO3	To have a clear understanding about 2nd order equations and wave equations				
CO4	Properties of Laplace transform and problem solving using it				
CO5	Properties of Fourier transform and problem solving using it				

CO6	To understand the concepts of various transform and partial differential equation technique
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### **UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+6**

Formation-solutions of standard types of first order equations-LaGrange's equation-linear partial differential equations of second and higher order with constant coefficients.

### **UNIT II FOURIER SERIES 9+6**

Dirichlet's condition-General Fourier series-half range sine and cosine series-Parseval's identity. Harmonic Analysis.

### **UNIT III BOUNDARY VALUE PROBLEMS 9+6**

Classification of second order linear partial differential equations-Solutions of one-Dimensional wave equations, one-dimensional heat equations.

### **UNIT IV LAPLACE TRANSFORMS 9+6**

Transforms of simple functions-basic operational properties-transforms of derivatives and integrals-Initial and Final value theorems-Inverse transforms-Convolution theorem. Periodic functions. Applications of Laplace Transforms for solving linear ordinary differential equations up to second order with constant coefficients and integral equations.

### **UNIT V FOURIER TRANSFORMS 9+6**

Statement of Fourier integral theory-Fourier transforms pairs-Fourier Sine Cosine transforms-Properties-Transforms of simple functions-Convolution theory-Parseval's identity.

#### **TEXT BOOKS:**

1. Kreyszig, E."Advanced Engineering Mathematics"8<sup>th</sup> Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2006.
2. Grewal, B.S., "Higher Engineering Mathematics" (35<sup>th</sup> Edition), Khanna Publishers, Delhi 2000.

#### **REFERENCES:**

1. Kandasamy, P., Thilakavathy, K., and Gunavathy, K. "Engineering Mathematics", Volumes 1 and 3(4<sup>th</sup> Edition) S Chand and Co., New.
2. Narayanan, S. Manicavachangam Pillay, T.K. Ramanaiah, G. "Advanced mathematics for Engineering Students", Volume 2 and 3(2<sup>nd</sup> Edition), S. Viswanathan (printers & publishers Pte, Ltd.,) 1992.
3. Venkataraman, M.K. "Engineering Mathematics" Volumes 3-A&B, 13<sup>th</sup> Edition National Publishing Company, Chennai, 1998.
4. Shanmugam, T.N.: <http://www.annauniv.edu/shan/trans.html>.

<b>BAM301</b>	<b>SOLID MECHANICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Strength of materials, Mechanics of Machines				
	Course Designed by- Department of Automobile Engineering				
<b>OBJECTIVE:</b>					
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.					
<b>Course Outcomes</b>					

CO1 - To learn the statically determinate and indeterminate problems in tension & compression																	
CO2 -To learn Shear force & bending moment diagrams – bending stresses – shear stress Variation in beams of symmetric sections – beams of uniform strength.																	
CO3 -To learn deflection of beams strain energy by Macaulay’s method in axial Bending, torsion and shear loadings																	
CO4 -To learn Torsion of solid and hollow circular shaft.																	
CO5 -To learn biaxial stress and determination of principal stresses.																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	H	M		H	M	M	M	H	H	H	H				
	CO2									M							
	CO3		H	H	M	H		H		H		H	H				
	CO4	H					L		M		H						
	CO5			M		H		M		M		M	M				
	CO6	L	M	M		M	H		L	M	M	H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
								√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

### 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



<b>BAM302</b>		<b>AUTOMOTIVE PETROL ENGINES</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>					
		Total Contact Hours - 45							3	0	0	3					
		Prerequisite – IC Engines, Thermal Engineering															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn Engine Construction and Operation																	
<b>CO2</b> - To learn Fuel supply system (Carburetor type) and electronic Fuel Injection system																	
<b>CO3</b> - To learn different cooling and types lubrication system																	
<b>CO4</b> – To learn detailed combustion system																	
<b>CO5</b> – To learn other petrol engines																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	M		H	M	M	M	H	H	H	H				
	CO2		M				M			M			M				
	CO3		H		M	H		M		H		H	H				
	CO4	H				H	L		M		H						
	CO5			M		H		M		H		M	H				
	CO6	L	M	M		M	H		L	M	M	H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
								√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

- 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 Propagation- 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.

**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
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – IC Engines, Thermal Engineering and Heat Transfer				
	Course Designed by- Department of Automobile Engineering				
<b>OBJECTIVE:</b>					
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.					
<b>Course Outcomes</b>					
<b>CO1</b> –To learn the detailed study of zeroth and first law of thermodynamics					
<b>CO2</b> – To learn detailed study of Air cycle and Compressors					
<b>CO3</b> – To learn detailed study and types of Refrigeration and Air conditioning					
<b>CO4</b> – To learn detailed study of Heat Transfer					
<b>CO5</b> – To learn detailed study of Heat exchangers and its types					

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M			M			M
	CO3		H		M	H		M		H		H	H
	CO4	H				H	M		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	M	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### UNIT – I BASIC THERMODYNAMICS

16

Systems, Zeroth law, 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 – Intercooling – Minimum work requirement.

### UNIT – III REFRIGERATION AND AIR-CONDITIONING

10

Principles of Psychrometry 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.

(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.

- Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall India, 2005.

#### REFERENCES:

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

<b>BAM304</b>		<b>ENGINEERING FLUID MECHANICS</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>				
		Total Contact Hours - 60								3	0	0	3				
		Prerequisite – Mechanics of materials, Thermal and Fluid Power engineering															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the basic theory of engineering fluid mechanics																	
<b>CO2</b> - To learn basic Equations of fluid Flow Analysis																	
<b>CO3</b> - To learn Incompressible in viscid flow																	
<b>CO4</b> – To learn Incompressible viscous flow																	
<b>CO5</b> – To learn different types of Fluid Machinery and Turbines																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	M	H	H	H	H	M				
	CO2		M				M		L	M			M				
	CO3		H		M	H		M		H		H	H				
	CO4	H				M	M		M		H						
	CO5			M		H		M	M	H		M	H				
	CO6	L	M	M		M	H		L	H	M	H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
								√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

#### UNIT – I BASIC CONCEPTS

9

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 10**

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 10**

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.

**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

<b>BAM305</b>	<b>PRODUCTION TECHNOLOGY</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	Total Contact Hours - 45								3	0	0	3	
	Prerequisite – Engineering Materials and Metallurgy, Engineering Metrology, Tribology												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO01</b> - To learn the detailed study of casting and types.													
<b>CO02</b> - To learn the detailed study of metal forming & powder metallurgy.													
<b>CO03</b> - To learn the detailed study of welding and types.													
<b>CO04</b> – To learn the study of theory of metal cutting & machining process.													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M		M		M		L	M		H	M
	CO3		H		M	H	H	M		H		H	H

	CO4	H		H		M	M		H		H		L
	CO5			H		H		M	M	L		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### UNIT – I CASTING

9

Casting types, procedure to make sand mould, types of core making, moulding tools, Machine moulding, Special moulding processes-CO<sub>2</sub> 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.

### TEXTBOOKS:

1. Hajra Choudhury, “Elements of Workshop Technology”, Vol. I & II, Media Promoters and Publishers Pvt., Ltd., Mumbai, 2005
2. Nagendra Parashar B.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, 16<sup>th</sup> 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.

BAM3L1	AUTOMOTIVE PARTS AND ASSEMBLY DRAWING								L	T	P	C	
	Total Contact Hours - 45								0	0	3	2	
	Prerequisite – Engineering Graphics, Engineering and Technical Drawing												
	Course Designed by- Department of Automobile Engineering												
OBJECTIVES													
The main objective of this Study is to Design and drawing practice of Automotive Parts.													
Course Outcomes													
CO1 - To learn the Design and drawing practiceof machine and production drawing													
CO2 - To learn the Design and drawing practice concepts of limits, tolerance, fits													
CO3 - To learn the Design and drawing practice of Machine element joints													
CO4 – To learn the detailed part drawing and assembly drawings and Computer aided design and drafting													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H		H		H		H	H
	CO4	H					L		M		M		
	CO5			M		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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.

## 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. Satche Singh & P.L. Shah – Fundamentals of Machine Drawing, Prentice Hall India, 2003.

BCE3L2		FLUID MECHANICS & STRENGTH OF MATERIALS LAB								L	T	P	C
		Total Contact Hours - 45								0	0	3	2
		Prerequisite – Solid Mechanics, Mechanics of Machines, Fluid Power systems and Hydraulic Engineering											
		Course Designed by- Department of Automobile Engineering											
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 venture meter.													
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													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H		H		H		H	H
	CO4	H					L		M		M		
	CO5			M		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	



3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

## LIST OF EXPERIMENTS

### FLUID MECHANICS LAB

1. Determination of flow through pipes, losses in pipes.
2. Calibration of orificemeter and venture meter.
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

<b>BMA402</b>	<b>NUMERICAL METHODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 75	3	2	0	4
	Prerequisite – +2 Mathematics, Engineering mathematics I and II				
	Course Designed by- Department of Mathematics				
<b>OBJECTIVE:</b>					
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													
CO1 - To learn the detailed study of Solution of Equations and Eigen Value Problem													
CO2 - To learn the detailed study of Interpolation (Finite Differences)													
CO3 - To learn the detailed study of Numerical Differentiation and Integration													
CO4 – To learn the detailed study of Initial Value Problems for ordinary Differential Equations													
CO5 - To learn the detailed study of Boundary Value Problems for ODE and PDE													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	H	M
	CO2		M				M		L	M			M
	CO3		H		M	H		H		H		H	H
	CO4	H		M		M	M		H	M			
	CO5			M		H		H	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)	
						√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### **UNIT- I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEM 9+6**

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 9+6**

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 9+6**

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 DIFFERENTIAL EQUATIONS 9+6**

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****9+6**

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

**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", (3<sup>rd</sup> edition, New age International Pub,Co(1993))
2. Grewal.B.S."Higher Engineering Mathematics" (6<sup>th</sup> edition)Khanna Publisher, Delhi,2004.

<b>BAM401</b>	<b>THEORY OF MACHINES</b>									<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 60									4	0	0	4
	Prerequisite – Kinematics and Mechanics of Machines, Strength of Materials and Behavior of metals												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO01</b> - To learn the detailed study of machines and structure													
<b>CO02</b> - To learn the detailed study of friction and types													
<b>CO03</b> - To learn the detailed study of gearing and cams													
<b>CO04</b> - To learn the detailed study of balancing													
<b>CO05</b> – To learn the detailed study of vibration													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	M			M
	CO3		H		M	H		M		H		H	H
	CO4	H				M	M		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)
					√								
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

**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.

### **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 Dukkupati 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

<b>BAM402</b>	<b>AUTOMOTIVE CHASSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Automotive Technology, Automotive Braking and Suspension Systems				
	Course Designed by- Department of Automobile Engineering				
<b>OBJECTIVE:</b>					
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													
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		H	M		M	M
	CO3		H		M	H		M		H			H
	CO4	H		H		H	M		M		L	M	
	CO5			M		H	H	M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## **UNIT – I INTRODUCTION, FRAME, STEERING SYSTEM**

**9**

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**

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**

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**

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

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.

### TEXTBOOKS:

1. Kirpal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2006
2. R.K. Rajput, A TextBook of Automobile Engineering, Laxmi Publications Private Limited, 2007.
3. N.K. Giri, Automotive Mechanics, Khanna 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.

<b>BAM403</b>		<b>AUTOMOTIVE DIESEL ENGINES</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
		Total Contact Hours - 45						3	0	0	3		
		Prerequisite – Internal Combustion Engines, Automotive Engines											
		Course Designed by- Department of Automobile Engineering											
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of Basic Theory of Diesel Engine													
<b>CO2</b> - To learn the detailed study of Fuel Injection System and types													
<b>CO3</b> - To learn the detailed study of AirMotion Combustion and Combustionchambers													
<b>CO4</b> – To learn the detailed study of supercharging and Turbo charging													
<b>CO5</b> - To learn study of Engine performance and Evolution													
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		H	M		M	M
	CO3		H		M	H		M		H			H
	CO4	H		H		H	L		M		L	M	
	CO5			M		H	H	M	M	H		L	H
	CO6	L	M	M		M	H		L	H	M	H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### 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

Importance of air motion – Swirl, squish and turbulence, Swirl ratio. Fuel air mixing. Stages of combustion. Delay period – factors affecting delay period. Knock in CI engines. 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.

#### TEXT BOOKS:

1. K. K. Ramalingam, 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.

<b>BAM404</b>	<b>AUTOMOTIVE ELECTRICAL SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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		Total Contact Hours - 45							3	0	0	3					
		Prerequisite – Automobile Electricity, Basic Electrical and Electronics															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study of Batteries,																	
<b>CO2</b> - To learn the detailed study of Starting system																	
<b>CO3</b> - To learn the detailed study of charging system																	
<b>CO4</b> – To learn the detailed study of Ignition system																	
<b>CO5</b> - To learn the detailed study of Lighting system & Accessories																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	M	H	H	H	H	M				
	CO2		M			H	H		M	M		M	M				
	CO3		H		M	H		M		H			H				
	CO4	H		H		H	H		M		L	M					
	CO5			M		H	H	M	M	H		L	H				
	CO6	L	M	L		M	M		L	H	M	H					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
								√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

### 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



## 10

## UNIT – V LIGHTING SYSTEM & ACCESSORIES

9

**TEXT BOOK:**

- ### REFERENCES:

- |   |   |  |          |          |          |          |
|---|---|--|----------|----------|----------|----------|
| <b>BCE406</b>   | <b>ENVIRONMENTAL STUDIES</b>  |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | Total Contact Hours - 45  |  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |
|   | Prerequisite – Physical Sciences  |  |          |          |          |          |
|   | Course Designed by – Dept of Civil Engineering  |  |          |          |          |          |
| <b>OBJECTIVES</b>   |   |  |          |          |          |          |
| <ol style="list-style-type: none"> <li>1. To study the nature and facts about environment.</li> <li>2. To find and implement scientific, technological, economic and political solutions to environmental problems.</li> <li>3. To study the interrelationship between living organism and environment.</li> <li>4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.</li> <li>5. To study the dynamic processes and understand the features of the earth's interior and surface.</li> <li>6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.</li> </ol> |   |  |          |          |          |          |
| <b>COURSE OUTCOMES (COs)</b>  |   |  |          |          |          |          |
| CO1   | Play an important role in transferring a healthy environment for future generations   |  |          |          |          |          |
| CO2   | Analyze the impact of engineering solutions in a global and societal context  |  |          |          |          |          |
| CO3   | Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems |  |          |          |          |          |
| CO4   | Ability to consider issues of environment and sustainable development in his personal and professional undertakings                     |  |          |          |          |          |
| CO5   | Highlight the importance of ecosystem and biodiversity  |  |          |          |          |          |
| <p>Mapping of Course Outcomes with Program outcomes (POs)<br/>         (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low</p>  |   |  |          |          |          |          |

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M			H	H		H	M		H	M
	CO3		H		M	H		M		H			H
	CO4	H		H		H	H		M		L	M	
	CO5			H		H	H	M	M	H		L	H
	CO6	L	M	L		M	L		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
											√		
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 9

Definition, scope and importance, 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 effect on forests and tribal people.
- Water resources : Use and over-utilization of surface and ground water, flood, drought conflicts over water, dams-benefits and problems.
- Mineral resources : Uses and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food 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 non renewable energy sources, use of alternate energy sources, case studies.
- Land resources : Land as a resource, Land degradation, man induced landslides, soil erosion and desertification

Role of an individual in conversation of natural resources, Equitable use of resources for sustainable lifestyles.

## UNIT II ECOSYSTEMS

8

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

Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues and possible Solutions, Climate change, global warming, acid rain, ozone layer depletion.

## UNIT III BIODIVERSITY AND ITS CONSERVATION

7

Introduction and Definition - genetic, species and ecosystems diversity, Biogeographical classification of India - Value 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, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

### **Environmental Pollution**

**7**

Definition, Causes, effects and control measures of :- Air Pollution, Water pollution, Soil Pollution, Marine Pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management : Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster Management : floods earthquake, cyclone and landslides.

### **UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**

**8**

From Unsustainable to Sustainable development, Urban problems related to energy, nuclear accident and holocaust, case studies, wasteland reclamation, Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental Legislation, public awareness –

Fireworks and its impact on the Environment – Chemicals used in Fireworks – (Fuel – oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder- Regulator) – Harmful nature of ingredients – chemical effects on health due to inhaling fumes – Noise produced by fire crackers – Noise pollution – Noise level standards for fire crackers – Intensity of sound – Impact on hearing – Safety measures.

### **UNIT V HUMAN POPULATION AND THE ENVIRONMENT**

**6**

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

### **TEXTBOOKS:**

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, 1989.
4. Benny Joseph, “Environmental Studies”, TATA McGraw Hill, 2010

### **REFERENCES**

1. Trivedi R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol.I and II, EnviroMedia 2009
2. Cunningham, W.P.Cooper, T.H.Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
3. Wager K.D. “Environmental Management”, W.B. Saunders Co., Philadelphia, USA, 1998.
4. Trivedi R.K. and P.K. Goel, “Introduction to Air Pollution”, Techno Science Publications 2013
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB),2001.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment &

- Security. Stockholm Env. Institute Oxford Univ. Press. 473p
8. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
  9. McKinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
  10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
  11. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publish Co. Pvt. Ltd. 345p.
  12. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
  13. <http://eng.mft.info/uploadedfiles/gfiles/c8e31c9e52d84c3.pdf>

<b>BAM4L1</b>	<b>AUTOMOTIVE ENGINE OMPONENTS LAB</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 45							0	0	3	2		
	Prerequisite – Automotive Technology, IC Engines												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE</b>													
Study of the following engines and its components by Dismantling, Comparing with Recent Engine Components and Assembling Various Parts.													
<b>Course Outcomes</b>													
<b>CO01</b> – Dismantling procedure of LCV													
<b>CO02</b> – Dismantling procedure of HCV													
<b>CO03</b> – Study and Readings													
<b>CO04</b> – Assembling procedure of LCV and HCV													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H		H		H		H	H
	CO4	H					L		M		M		
	CO5			M		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
												√	
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### LIST OF EXPERIMENTS

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 converter
  - i) Muffler

BAM4L2		ENGINE TESTING & EMISSION MEASUREMENT LAB									L	T	P	C
		Total Contact Hours - 45									0	0	3	2
		Prerequisite – Automotive Engines and Emission, IC Engines, Alternate Fuels												
		Course Designed by- Department of Automobile Engineering												
OBJECTIVE														
Performance study of Petrol and Diesel engines. Heat balance Test and Emission Measurements														
Course Outcomes														
CO1 – Study of Dynamometers														
CO2 – Performance study of Petrol and Diesel engines														
CO3 – Study of balance Test														
CO4 – Study of Emission Test and Exhaust gas Analyzer														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	H	M		H	M	M	M	H	H	H	H	
	CO2									M				
	CO3		H	H	M	H	H	H		H		M	H	
	CO4	H					L		M		M			
	CO5			H		H		M		M		M	M	
	CO6	L	M	M		M	L		L	M	M	H		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### LIST OF EXPERIMENTS

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 Chemiluminescent NO<sub>x</sub> analyzer.
12. Measurement of HC, CO, CO<sub>2</sub>, O<sub>2</sub> and NO<sub>x</sub> using exhaust gas analyzer.
13. Diesel smoke measurement.

<b>BAM4L3</b>		<b>AUTOMOTIVE ELECTRICAL LABORATORY</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
		Total Contact Hours - 45							0	0	3	2	
		Prerequisite – Basic Electrical and Electronics, Automotive Electrical Technology											
		Course Designed by- Department of Automobile Engineering											
<b>OBJECTIVE</b>													
Laboratory study of Starting, Charging systems and Performance study of Alternator.													
<b>Course Outcomes</b>													
<b>CO1</b> – Study of various types of Batteries													
<b>CO2</b> – Study of Automotive Electric system and Lighting Accessories													
<b>CO3</b> –Study of Starting, Charging systems													
<b>CO4</b> – Study of Electrical assisted power steering													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H	H	H		H		M	H
	CO4	H					L		M		M		
	CO5			H		H		M		M		M	M

	CO6	L	M	M		M	L		L	M	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### LIST OF EXPERIMENTS

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.

BAM4S1		TECHNICAL SEMINAR-I							L	T	P	C	
		Total Contact Hours - 45							0	0	3	2	
		Prerequisite – Basic Engineering Sciences, Automotive Technology and Engineering Basics											
		Course Designed by- Department of Automobile Engineering											
OBJECTIVE													
The students know about the recent techniques in Automobile Evaluation will be made based on the reports, the presentations and the interactions during the question answer sessions.													
Course Outcomes													
CO1 –Ability and Skills to be improved													
CO2 – self confidence to be improved													
CO3 –leadership quality to be improved													
CO4 –innovative ideas will be generated													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H	H	H		H		M	H
	CO4	H					L		M		M		
	CO5			H		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
									√
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

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.

<b>BAM501</b>	<b>COMPUTER CONTROL OF VEHICLE SYSTEMS</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	Total Contact Hours - 45								3	0	0	3	
	Prerequisite – Basic Electronic Engineering, Sensors and Actuators, Robotics and Automation												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of Components of chassis management system													
<b>CO2</b> - To learn the detailed study of Driveline control system													
<b>CO3</b> - To learn the detailed study of Safety and Security system													
<b>CO4</b> – To learn the detailed study of Comfort System													
<b>CO5</b> - To learn the detailed study of Intelligent Transportation System													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M			H	H		M	M		H	M
	CO3		H		M	H		M		H			H
	CO4	H		H		H	H		H		L	M	
	CO5			M		H	H	L	M	H		L	H
	CO6	L	M	L		M	M		L	H	M	H	



3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### **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.

### **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.

<b>BAM503</b>	<b>AUTOMOTIVE TRANSMISSION</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	Total Contact Hours - 60								4	0	0	4	
	Prerequisite – Automotive technology, Automotive Braking and Suspension Systems												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of Clutch and Gear Box													
<b>CO2</b> - To learn the detailed study of Hydrodynamic Drive													
<b>CO3</b> - To learn the detailed study of Planetary Gear Boxes													
<b>CO4</b> – To learn the detailed study of Automatic Transmission Applications													
<b>CO5</b> - To learn the detailed study of Hydrostatic and Electric Drive													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	M			M
	CO3		H		M	H		M		H		H	H
	CO4	H				M	M		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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.

**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.

<b>BAM504</b>		<b>ELECTRONICS AND INSTRUMENTATION</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
		Total Contact Hours - 45							3	0	0	3	
		Prerequisite – Basic Electrical and Electronics, Electronics and Instrumental Techniques											
		Course Designed by- Department of Automobile Engineering											
<b>OBJECTIVE</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of Classification of design & Reduction of Stress Concentration.													
<b>CO2</b> - To learn the detailed study of Design of analog and digital circuits													
<b>CO3</b> - To learn the detailed study of Automatic Control System													
<b>CO4</b> – To learn the detailed study of Application and Control system													
<b>CO5</b> – To learn the detailed study of Microprocessors and Applications													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	M			M
	CO3		H		H	H		M		H	L	H	H
	CO4	H				M	M		M		H		L

	CO5			M		M		M	H	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### **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, Photo detectors.

### **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.

#### **TEXT BOOKS:**

1. Millman.J. and Grabel.S., Integrated Electronics, Tata McGraw Hill, 1995.
2. M.Gopal, Automatic Control 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.

<b>BAM505</b>	<b>ENGINEERING DESIGN FOR AUTOMOBILEENGINEERS</b>											<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 60											4	0	0	4
	Prerequisite – Engineering Graphics, Machine and Component Drawing, Machine Deign														
	Course Designed by- Department of Automobile Engineering														
<b>OBJECTIVE</b>															
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.															
<b>Course Outcomes</b>															
<b>CO1</b> - To learn the detailed study of Classificationof design and Reduction of Stress concentration															
<b>CO2</b> - To learn the detailed study of Design of shafts and springs															
<b>CO3</b> - To learn the detailed study of Gear Design															
<b>CO4</b> – To learn the detailed study of Flywheels															
<b>CO5</b> – To learn of detailed study of Design of Bearings															
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low															
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l		
2	CO1	H	M	H		H	M	M	H	H	H	H	M		
	CO2		M				M		L	M			M		
	CO3		H		M	H		M		H		H	H		
	CO4	H				M	M		M		H				
	CO5			M		H		M	M	H		M	H		
	CO6	L	M	M		M	H		L	H	M	H			
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)						
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015													

## 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

12

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**

**12**

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**

**12**

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**

**12**

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.

### **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.

<b>BBA501</b>	<b>VALUE EDUCATION AND PROFESSIONAL ETHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Dept of Management Studies				
<b>OBJECTIVES</b>					
<ul style="list-style-type: none"><li>- To teach the philosophy of Life, personal value, social value, mind cultural value and personal health</li><li>- To teach professional ethical values, codes of ethics, responsibilities, safety, rights and related global issues.</li></ul>					
<b>COURSE OUTCOMES (COs)</b>					
CO1	To learn about philosophy of Life and Individual qualities				
CO2	To learn and practice social values and responsibilities				
CO3	To learn and practice mind culture, forces acting on the body and causes of diseases and their curing				
CO4	To learn more of Engineer as Responsible Experimenter.				
CO5	To learn more of Risk and Safety assessment with case studies.				
CO6	To learn more of Responsibilities and Rights as Professional and facing Global Challenges				

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1			M		H		M	H	M	L	L	M				
	CO2			M		H		M	H	M	L	L	M				
	CO3			M		H		M	H	M	L	L	M				
	CO4			H		H		M	H	M	L	L	M				
	CO5			H		H		M	H	M	L	L	M				
	CO6			H		H		M	H	M	L	L	M				
3	Category	Humanities & Social Studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (GOE)		Project/Term paper/ Seminar/ Internship (PR)	
		√															
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

### UNIT I : PHILOSOPHY OF LIFE AND INDIVIDUAL QUALITIES

9

Human Life on Earth - Purpose of Life, Meaning and Philosophy of Life. The Law of Nature – Protecting Nature /Universe. Basic Culture - Thought Analysis - Regulating desire - Guarding against anger - To get rid of Anxiety – The Rewards of Blessing - Benevolence of Friendship - Love and Charity - Self – tranquility/Peace

### UNIT II : SOCIAL VALUES (INDIVIDUAL AND SOCIAL WELFARE)

9

Family - Peace in Family, Society, The Law of Life Brotherhood - The Pride of Womanhood – Five responsibilities/duties of Man : - a) to himself, b) to his family, c) to his environment, d) to his society, e) to the Universe in his lives, Thriftiness (Thrift)/Economics. Health - Education - Governance - People's Responsibility / duties of the community, World peace.

### UNIT III: MIND CULTURE & TENDING PERSONAL HEALTH

9

Mind Culture - Life and Mind - Bio - magnetism, Universal Magnetism (God –Realization and Self Realization) - Genetic Centre – Thought Action – Short term Memory – Expansiveness – Thought – Waves, Channelising the Mind, Stages - Meditation, Spiritual Value. Structure of the body - the three forces of the body- life body relation, natural causes and unnatural causes for diseases, Methods in Curing diseases

### UNIT IV: ENGINEERING AS SOCIAL EXPERIMENTATION AND ENGINEERS'S RESPONSIBILITIES FOR SAFETY

9

Engineering as Experimentation – Engineer as Responsible Experimenters – Codes of Ethics – The Challenger, case study. Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl case studies.

### UNIT V: ENGINEERS'S RESPONSIBILITIES FOR RIGHTS AND GLOBAL ISSUES

9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Whistle Blowing – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Eye Witnesses and Advisors – Moral Leadership

### TEXT BOOKS:

1. Value Education for Health, Happiness and Harmony, The World Community Service, Centre Vethathiri Publications (Unit 1 – III).
2. Mike W Martin and Roland Schinzinger, Ethics In Engineering, Tata Mcgraw Hill, Newyork 2005 (Units IV & V)

### REFERENCE:

1. Philosophy of Universal Magnetism (Bio - magnetism, Universal Magnetism) The World Community Service Centre Vethathiri Publications (for Unit III)
2. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004 (for Units I - III)
3. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006 (for Units IV-V)
4. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 2004 (for Units IV-V)

<b>BAM5L1</b>		<b>AUTOMOTIVE CHASSIS COMPONENTS LAB</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		Total Contact Hours - 45								0	0	3	1
		Prerequisite – Automotive Technology, Automotive Braking and Suspension Systems, Vehicle Body Engineering and Chassis Management systems											
		Course Designed by- Department of Automobile Engineering											
<b>OBJECTIVE</b>													
Study of the Following Engines and Its Components by Dismantling, Comparing With Recent Engine Components and Assembling Various Parts													
<b>Course Outcomes</b>													
<b>CO1</b> – Dismantling procedure of Clutch, Gear Box, Brake system													
<b>CO2</b> – Dismantling procedure of Differential Unit													
<b>CO3</b> – Study and Propeller Shaft Unit													
<b>CO4</b> – Assembling procedure of Clutch, Gear Box, Brake system, Differential Unit													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H	H	H		H		M	H
	CO4	H					L		M		M		
	CO5			H		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	



3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### LIST OF EXPERIMENTS

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

<b>BME5L1</b>	<b>MACHINE SHOP PRACTICE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Production Engineering, Lathe Technology, Mechanical Measurements and Tribological practices, Metrology sciences				
	Course Designed by- Department of Automobile Engineering				

### OBJECTIVE

Exercise on production process of using different machines.

### Course Outcomes

**CO1** – Exercise on Plane turning, taper turning, thread cutting and Eccentric turning

**CO2** – Exercise on drilling, reaming and tapping and Welding

**CO3** – Study & Exercise on Slotting (Both internal & external keyway cutting)

**CO4** – Exercise in Surface Grinding.

Mapping of Course Outcomes with Program outcomes (POs)  
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H	H	H		H		M	H
	CO4	H					L		M		M		
	CO5			H		H		M		M		M	M

	CO6	L	M	M		M	L		L	M	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## LIST OF EXPERIMENTS

### Part-A

1. Exercise on Plane turning, taper turning, thread cutting and Eccentric turning.
2. Exercise on drilling, reaming and tapping.
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

#### Welding Practice

1. Arc welding
2. Gas welding

BEC5L1		AUTOMOTIVE ELECTRONICS &MICROPROCESSOR LAB								L	T	P	C
		Total Contact Hours - 45								0	0	3	2
		Prerequisite – Automotive Electrical and Electronic Systems, Basic Electrical and Electronics, Microprocessor and its applications											
		Course Designed by- Department of Automobile Engineering											
OBJECTIVE													
Laboratory study of Automotive Electronics and Microprocessor													
Course Outcomes													
CO1 – Verification of truth table of Logic Gates,													
CO2 – Characteristics of rectifiers – Half wave & Full wave													
CO3 – Characteristics of SCR.													
CO4 – Assembly language programming exercise													
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	M		H	M	M	M	H	H	H	H
	CO2									M			
	CO3		H	H	M	H	H	H		H		M	H
	CO4	H					L		M		M		
	CO5			H		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### LIST OF EXPERIMENTS

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.

BAM5C1	COMPREHENSION I	L	T	P	C
	Total Contact Hours : Test will be conducted at the end of the semester	0	0	0	1
	Prerequisite – All the courses up to fifth semester				
	Course Designed by – Dept. Automobile Engineering				
OBJECTIVES					
<ul style="list-style-type: none"><li>• To provide a complete review of Automobile Engineering topics covered up to fifth semesters, so that a comprehensive understanding is achieved.</li><li>• It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.</li><li>• To provide overview of all topics covered and to assess the overall knowledge level up to fifth semester.</li></ul>					

<b>BAM601</b>	<b>VEHICLE DYNAMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Computer aided vehicle Design data characteristics, Vehicle Design systems, Vehicle Handling and Stability control				
	Course Designed by- Department of Automobile Engineering				
<b>OBJECTIVE:</b>					
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.					
<b>Course Outcomes</b>					

CO1 - To learn the detailed study of introduction vehicle dynamics													
CO2 - To learn the detailed study of multi degree freedom introduction vehicle dynamics systems													
CO3 - To learn the detailed study of numerical methods													
CO4 – To learn the detailed study of vehicle handling and stability of vehicles													
CO5 – To learn of detailed study of suspension, tyres													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	M			M
	CO3		H		M	H		M		L		H	H
	CO4	H				M	M		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		H	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## 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.

**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”, Illiffe Books Ltd,London,1960
2. Heldt,P.M., Automotive Chassis, Chilton Co., New York, 1992.
3. Giri N.K – Automotive Mechanics, Khanna Publishers, 2007.

<b>BAM602</b>		<b>ELECTRONIC ENGINE MANAGEMENT SYSTEM</b>									<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		Total Contact Hours - 45									3	0	0	3
		Prerequisite – Sensors and Actuators, Hydraulic and Pneumatic Systems, Engine Management and Control												
		Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>														
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.														
<b>Course Outcomes</b>														
<b>CO01</b> - To learn the detailed study offundamentals of automotive electronics														
<b>CO02</b> - To learn the detailed study of sensors and actuators														
<b>CO03</b> - To learn the detailed study of SI engine management														
<b>CO04</b> – To learn the detailed study of CI engine management														
<b>C005</b> – To learn of detailed study ofdigital engine control system														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	M	H		H	M	M	H	H	H	H	M	
	CO2		M				M		L	H			M	
	CO3		H		M	H		M		H		H	H	
	CO4	H				M	H		M		H			
	CO5			M		H		M	M	H		M	H	
	CO6	L	M	M		M	H		L	H	M	H		
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)					
											√			
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015												

**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.

**TEXT BOOKS:**

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

**REFERENCES:**

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

BAM603	INSTRUMENTATION AND EXPERIMENTAL TECHNIQUES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Basic Electrical and Electronics, Instrumentation Engineering and applied sciences				
	Course Designed by- Department of Automobile Engineering				
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					
CO1 - To learn the detailed study offundamentals of measurement systems					
CO2 - To learn the detailed study of transducers, modifiers and terminating devices					

CO3 – To learn the detailed study of mechanical measurement													
CO4 – To learn the detailed study of engine experimental techniques													
CO5 – To learn of detailed study of vehicle experimental techniques													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	H			M
	CO3		H		M	H		M		H		H	H
	CO4	H				M	H		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
					√								
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## **UNIT – I MEASUREMENT SYSTEMS 6**

Static and Dynamic Measurement systems- Requirement and characteristics- 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.

### **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, "Principles 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.

<b>BAM604</b>		<b>AUTOMOTIVE AERODYNAMICS</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>				
		Total Contact Hours - 45								3	0	0	3				
		Prerequisite – Race car Aerodynamics, Vehicle Handling Characteristics and Stability control, Ground Vehicle Structure and Body design															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
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 and wind tunnels for automotive aerodynamics systems concentration will be taught to the students.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study of introduction																	
<b>CO2</b> - To learn the detailed study of aerodynamic drag of cabs																	
<b>CO3</b> - To learn the detailed study of shape optimization of cabs																	
<b>CO4</b> – To learn the detailed study of vehicle handling																	
<b>CO5</b> – To learn of detailed study of wind tunnels for automotive aerodynamics																	
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low															
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	M	H	H	H	H	M				
	CO2		M				M		L	H			M				
	CO3		H		H	H		M		H		H	H				
	CO4	H				M	H		M		H						
	CO5			M		H		M	M	H		M	H				
	CO6	L	M	M		M	H		L	H	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## 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.

**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

<b>BAM6L1</b>		<b>AUTOTRONICS LABORATORY</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		Total Contact Hours - 45								0	0	3	2
		Prerequisite – Basic Mechanical Engineering, Hydraulics and Pneumatics, Fluid Power Systems.											
		Course Designed by- Department of Automobile and Mechatronics Engineering											
<b>OBJECTIVE</b>													
Study and performance of pneumatic and hydraulic applications in automobiles													
<b>Course Outcomes</b>													
<b>CO1</b> –Design and testing of hydraulic circuits													
<b>CO2</b> – Design and testing of pneumatic circuits													
<b>CO3</b> – Design of speed control circuits and Design of synchronizing circuit													
<b>CO4</b> – Design of sequence circuit													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		H		M	H
	CO4	H				M	H		M		H		
	CO5			M		H		M	M	H		M	H

	CO6	L	M	M		M	H		L	H	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### LIST OF EXPERIMENTS

- Design and testing of hydraulic circuits such as
  - Pressure control
  - Flow control
  - Direction control
  - Design of circuit with programmed logic sequence, using an optional PLC in hydraulic Electro hydraulic Trainer.
- Design and testing of pneumatic circuits such as
  - Pressure control
  - Flow control
  - Direction control
  - Circuits with logic controls
  - Circuits with timers
  - Circuits with multiple cylinder sequences in Pneumatic Electro pneumatic Trainer.
- Design of speed control circuits
  - Meter – In Circuit
  - Meter – Out Circuit
- Design of continuous cycle circuit
- Design of synchronizing circuit
- Design of sequence circuit

BAM6L2	VEHICLE DYNAMICS LAB										L	T	P	C
	Total Contact Hours - 45										0	0	3	2
	Prerequisite – Computer aided Vehicle Design Data Characteristics, Vehicle Stability and Control, Body Building Technology													
	Course Designed by- Department of Automobile and Mechatronics Engineering													
OBJECTIVE														
Study and performance of stability of vehicle under test conditions														
Course Outcomes														
CO1 –Total Resistance for various Vehicles.														
CO2 – Find the displacement velocity, acceleration and inertia force.														
CO3 – Determine the Pressure distribution over a car model.														
CO4 – Determine the Pressure distribution in a 2D spoiler.														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	M	H		H	M	M	H	H	H	H	M	

	CO2		M				M		L	H			M
	CO3		H		H	H		H		H		M	H
	CO4	H				M	H		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/Seminar/Internship (H)				
					√								
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## LIST OF EXPERIMENTS

### 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.

<b>BAM5S1</b>	<b>TECHNICAL SEMINAR-II</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45										0	0	3	1
	Prerequisite – Basic Engineering Sciences, Automotive Technology and Engineering Basics													
	Course Designed by- Department of Automobile Engineering													
<b>OBJECTIVE</b>														
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.														
<b>Course Outcomes</b>														
<b>CO1</b> –Ability and Skills to be improved														
<b>CO2</b> – self confidents to be improved														
<b>CO3</b> –leadership quality to be improved														
<b>CO4</b> –innovative ideas will be generated														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	H	M		H	M	M	M	H	H	H	H	
	CO2									M				
	CO3		H	H	M	H	H	H		H		M	H	
	CO4	H					L		M		M			

	CO5			H		H		M		M		M	M
	CO6	L	M	M		M	L		L	M	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
													√
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

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.

<b>BAM701</b>	<b>VEHICLE MAINTENANCE</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	Total Contact Hours - 45								3	0	0	3	
	Prerequisite – Basic Mechanical Engineering, Automotive systems with Maintenance and repair, Automotive technology												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of maintenance records and schedule													
<b>CO2</b> - To learn the detailed study of maintenance, repair and overhauling of engine													
<b>CO3</b> - To learn the detailed study of maintenance, repair and overhauling of chassis drive line components													
<b>CO4</b> – To learn the detailed study of maintenance, repair and servicing of electrical systems													
<b>CO5</b> – To learn of detailed study of maintenance, repair and servicing of cooling lubrication system, fuel system and body													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	H	M
	CO2		M				H		L	H			M
	CO3		H		M	H		H		M		M	H
	CO4	H				M	M		H		H		
	CO5			M		H		H	M	H		M	H
	CO6	L	M	M		L	H		H	L	M	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### **UNIT – I MAINTENANCE RECORDS AND SCHEDULE 9**

Importance 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.

#### **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.

<b>BAM702</b>		<b>VEHICLE BODY ENGINEERING</b>									<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		Total Contact Hours - 45									3	0	0	3
		Prerequisite – Body Building Technology, Aerodynamics of Cars												
		Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>														
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.														
<b>Course Outcomes</b>														
<b>CO1</b> - To learn the detailed study of car body details														
<b>CO2</b> - To learn the detailed study of vehicle aerodynamics														
<b>CO3</b> - To learn the detailed study of bus body details														
<b>CO4</b> – To learn the detailed study of commercial vehicle details														
<b>CO5</b> – To learn of detailed study of body materials, trim and mechanisms														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	M	H		H	M	M	H	H	H	H	M	
	CO2		M				M		L	H			M	
	CO3		H		H	H		H		H		M	H	
	CO4	H				M	H		H		H			
	CO5			M		H		M	M	H		M	H	
	CO6	L	M	M		M	H		L	H	M	L		
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)					
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015												

## 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.

#### TEXTBOOK:

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

#### REFERENCES:

1. Giles, G.J., Body construction and design, Iliffe 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.

<b>BAM703</b>	<b>VEHICLE DESIGN</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 60										4	0	0	4
	Prerequisite – Basic Mechanical Engineering, Engineering Design, Machine and Component Drawing													
	Course Designed by- Department of Automobile Engineering													
<b>OBJECTIVE:</b>														
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.														
<b>Course Outcomes</b>														
<b>CO1</b> - To learn the detailed study of vehicle frame and suspension														
<b>CO2</b> - To learn the detailed study of front axle and steering systems														
<b>CO3</b> - To learn the detailed study of gear box														
<b>CO4</b> – To learn the detailed study of drive line and rear axle														
<b>CO5</b> – To learn of detailed study of drive line and rear axle														
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	M	H		H	M	M	H	H	H	H	M	
	CO2		M				H		L	H			M	
	CO3		H		H	H		H		H		M	H	
	CO4	H				M	H		H		H			

	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		L	H		H	H	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
					√								
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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 synchro 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.

### 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", Iliffe Books Ltd, London, 1990.

<b>BAM7L1</b>	<b>VEHICLE MAINTENANCE LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Basic Mechanical Engineering, Vehicle Maintenance and repair, Automotive technology				



		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE</b>																	
Study of an automobile repair, service and maintenance shop.																	
<b>Course Outcomes</b>																	
<b>CO1</b> –Engine tune up for Diesel and Petrol Engines.																	
<b>CO2</b> – Study of fuel filters and air cleaners.																	
<b>CO3</b> – Fault diagnosis in electrical ignition system, gasoline fuel system, diesel Fuel system.																	
<b>CO4</b> – Removal and fitting of tires and tubes.																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	M	H	H	H	H	M				
	CO2		M				H		L	H			M				
	CO3		H		M	H		H		M		M	H				
	CO4	H				M	H		H		H						
	CO5			M		H		M	M	H		M	H				
	CO6	L	M	M		L	H		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
								√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

### LIST OF EXPERIMENTS

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.

<b>BAM7L2</b>	<b>COMPUTER AIDED DRAFTING AND</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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		<b>MANUFACTURING LAB</b>															
		Total Contact Hours - 45										0	0	3	2		
		Prerequisite – Technical and Machine Drawing, Engineering Graphics, Computer Integrated Manufacturing, CAD-CAM, AutoCAD and Pro-E Basics															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
Study of Computer aided drafting and manufacturing																	
<b>Course Outcomes</b>																	
<b>CO1</b> –CNC milling machines; Production of various contour shapes.																	
<b>CO2</b> – Introduction to component modeling.																	
<b>CO3</b> – NC code generation using CAD/CAM software																	
<b>CO4</b> – Manual Part programming for CNC machines using a standard G-codes and M-codes.																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	H	M				
	CO2		M				H		L	H			M				
	CO3		H		M	H		H		M		M	H				
	CO4	H				M	M		H		H						
	CO5			M		H		H	M	H		M	H				
	CO6	L	M	M		L	H		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
								√									
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## LIST OF EXPERIMENTS

### 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

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

BAM7P1	TERM PAPER								L	T	P	C	
	Total Contact Hours – 60								0	0	4	2	
	Prerequisite – Professional Courses												
	Lab Manual Prepared by – Dept of Automobile Engineering												
OBJECTIVES													
To teach the student the procedures and methodologies for understanding the literature survey and preparation for research paper.													
COURSE OUTCOMES (COs)													
CO1	To identify the area of research.												
CO2	To prepare list of literatures in the relevant area.												
CO3	Compile the abstract from the literatures.												
CO4	Focus the search to a well defined theme and title.												
CO5	Make and exhaustive report by compiling all the literatures that students surveyed.												
CO6	To prepare a research paper for publications in journal/conference proceedings.												
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	H	M
	CO2		M				H		L	H			M
	CO3		H		M	H		H		M		M	H
	CO4	H				M	M		H		M		
	CO5			H		H		H	M	H		M	H
	CO6	L	M	M		L	H		H	L	M	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
									✓
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

## LIST OF TASKS

### 1. PREPARING PROPOSAL

Proposed Research Topic

Purposes

Background

Method: (suggested methods – develop your own to suit your research topic)

### 2. CONDUCTING LITERATURE REVIEW

Exploring and Sharpening your Topic

Evaluating Information

Taking Notes and Keeping Records

### 3. COMPLETING ANNOTATED BIBLIOGRAPHY

Citing Your Sources and Avoiding Plagiarism

Writing and Annotated Bibliography

### 4. IDENTIFYING PROBLEM STATEMENT

Meeting the Challenges of Research

Developing New Information

### 5. COMPLETING OUTLINE FOR THE RESEARCH

Organizing Your Project into an outline

Pick up your critique paper and begin editing and incorporate the suggestions from guide

### 6. SUBMITTING FIRST DRAFT

Drafting your Project

Entering Conversations and Supporting Your Claims

### 7. SUBMITTING WORKS CITED

Create the individual citations

Apply the formatting rules

### 8. SUBMITTING FULL PAPER

Revising, Editing, and Proofreading

Designing and Presenting Your Project

Conducting Research in the Disciplines

Documenting Sources

1. Website.
2. Printed Journals.

<b>BAM7V1</b>	<b>INPLANT TRAINING</b>									<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
										0	0	0	1
	Prerequisite – Automotive Design and Service Engineering, Vehicle Maintenance and Repair Course Designed by- Department of Automobile Engineering												
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.													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	H	M
	CO2		M				H		L	H			M
	CO3		H		M	H		H		M		M	H
	CO4	H				M	M		H		M		
	CO5			H		H		H	M	H		M	H
	CO6	L	M	M		L	H		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
										✓			
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

<b>BAM8C1</b>	<b>COMPREHENSION II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours : Test will be conducted at the end of the semester	0	0	0	1
	Prerequisite – All the courses up to eighth semester				
	Course Designed by – Dept. of Automobile Engineering				
<b>OBJECTIVES</b>					
<ul style="list-style-type: none"> <li>• To provide a complete review of Automobile Engineering topics covered up to eighth semesters, so that a comprehensive understanding is achieved.</li> <li>• It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.</li> <li>• To provide overview of all topics covered and to assess the overall knowledge level up to eighth semester.</li> </ul>					

BAM8P1	PROJECT WORK									L	T	P	C
	Total Contact Hours – 18 Periods Per Week									0	0	18	6
	Prerequisite – Design and Fabrication with Analysis, Research article writing and Literature Survey												
	Course Designed by- Department of Automobile Engineering												
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													
CO1 –comprehensive report													
CO2 – literature survey													
CO3 – problem statement, project work details													
CO4– project work details, estimation of cost and conclusions													
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	H	M
	CO2		M				H		L	H			M
	CO3		H		M	H		H		M		M	H
	CO4	H				M	M		H		M		
	CO5			H		H		H	M	H		M	H
	CO6	L	M	M		L	H		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)				Project/Term paper/ Seminar/ Internship (H)	
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

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.

### CORE ELECTIVE (CE)-I

<b>BAM014</b>	<b>ADVANCED THEORY OF IC ENGINES</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>					
	Total Contact Hours - 45								3	0	0	3					
	Prerequisite – IC engines, Automotive Pollution and Control, Environment and Ecosystems																
	Course Designed by- Department of Automobile Engineering																
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO01</b> - To learn the detailed study of introduction																	
<b>CO02</b> - To learn the detailed study of combustion of fuels																	
<b>CO03</b> - To learn the detailed study of combustion modelling																	
<b>CO04</b> – To learn the detailed study of non-conventional IC engines																	
<b>CO05</b> - To learn the detailed study of combustion analysis in IC engines																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	H	M				
	CO2		M				H		L	H			M				
	CO3		H		M	H		H		H		M	H				
	CO4	H				M	M		H		H						
	CO5			M		H		H	M	H		M	H				
	CO6	L	M	H		L	H		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

#### 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

### 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.

<b>BME002</b>		<b>FINITE ELEMENT METHODS</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
		Total Contact Hours - 45							3	0	0	3	
		Prerequisite – Numerical Methods, Engineering Mathematics-I and II, Kinematics of Machines											
		Course Designed by- Department of Mechanical Engineering											
<b>OBJECTIVE:</b>													
The main objective of this course is to impart knowledge in introduction, discrete elements, continuum elements, isoparametric elements, field problem will be taught to the students.													
<b>Course Outcomes</b>													
CO1 - To learn the detailed study of introduction													
CO2 - To learn the detailed study of discrete elements													
CO3 - To learn the detailed study of continuum elements													
CO4 – To learn the detailed study of iso parametric elements													
CO5 - To learn the detailed study of field problem													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		H	M
	CO4	H				M	H		H		M		



	CO5			H		H		H	M	H		M	H
	CO6	L	M	M		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
							√						
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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

### 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.

<b>BAM017</b>	<b>SPECIAL TYPES OF VEHICLES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3

		Prerequisite – Tractors and Farm Equipment’s, Automotive Engines and Emissions, Two and Three Wheeler Systems											
		Course Designed by- Department of Automobile Engineering											
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study ofearth moving and constructional equipment’s													
<b>CO2</b> - To learn the detailed study of power train concepts													
<b>CO3</b> - To learn the detailed study of sub systems of stv													
<b>CO4</b> – To learn the detailed study offarm equipments, military and combat vehicles													
<b>CO5</b> – To learn of detailed study ofspecial purpose vehicles for industrial applications													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		H	M
	CO4	H				H	H		H		M		
	CO5			H		H		H	H	H		M	H
	CO6	L	M	M		L	L		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT – I EARTH MOVING AND CONSTRUCTIONAL EQUIPMENTS 11

Construction layout, capacity and applications of earthmovers like dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrapers, motor graders, and Water sprinklers etc. criteria for selection of prime mover for 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.

#### **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.

### **CORE ELECTIVE (CE)-II**

<b>BAM001</b>	<b>COMPUTER SIMULATION OF IC ENGINE PROCESSES</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45										3	0	0	3
	Prerequisite – IC Engines and Emissions, Automotive Engines and Combustion Characteristics,													
	Course Designed by- Department of Automobile Engineering													
<b>OBJECTIVE:</b>														
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.														
<b>Course Outcomes</b>														
<b>CO1</b> - To learn the detailed study of introduction														
<b>CO2</b> - To learn the detailed study of adiabatic flame temperature														
<b>CO3</b> - To learn the detailed study of spark ignition engines														
<b>CO4</b> – To learn the detailed study of <b>SI</b> engine simulation with adiabatic combustion														
<b>CO5</b> - To learn the detailed study of <b>SI</b> engine simulation with gas exchange process														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	M	H		H	M	H	H	H	H	M	M	
	CO2		M				H		L	H			M	
	CO3		H		M	H		H		M		M	H	

	CO4	H				M	M		H		H		
	CO5			M		H		H	M	H		M	H
	CO6	L	M	H		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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.

### 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.

<b>BAM010</b>		<b>PRODUCT DESIGN</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>				
		Total Contact Hours - 45								3	0	0	3				
		Prerequisite – Product design and Development, Process Planning And Control, Product Architecture and New product Development															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study of project selection and evaluation																	
<b>CO2</b> - To learn the detailed study of new product development																	
<b>CO3</b> -To learn the detailed study of new product planning																	
<b>CO4</b> – To learn the detailed study of new product development																	
<b>CO5</b> - To learn the detailed study of product architecture																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				M		L	H			M				
	CO3		H		H	H		H		M		H	M				
	CO4	H				M	H		H		M						
	CO5			H		H		H	H	H		M	H				
	CO6	L	M	M		L	L		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
										√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

### 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.

**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.

<b>BAM025</b>		<b>TWO AND THREE WHEELERS</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>				
		Total Contact Hours - 45								3	0	0	3				
		Prerequisite – Automotive Engines and Sub Systems, Automotive Technology- Service and Repair.															
		Course Designed by- Department of Automobile Engineering															
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study of the power unit																	
<b>CO2</b> - To learn the detailed study of chassis and sub-systems																	
<b>CO3</b> - To learn the detailed study of brakes and wheels																	
<b>CO4</b> – To learn the detailed study of two wheelers																	
<b>CO5</b> - To learn the detailed study of three wheelers																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				M		L	L			M				
	CO3		H		H	H		H		M		H	M				
	CO4	H				H	H		M		M						
	CO5			H		H		H	H	H		M	H				
	CO6	L	M	M		L	H		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	

							√		
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

#### **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.

#### **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.

<b>BAM003</b>	<b>ALTERNATE FUELS AND ENERGY SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Alternate Fuels and Jet Propulsion, Internal Combustion Engines and Emissions, Environment Pollution and Control				
	Course Designed by- Department of Automobile Engineering				
<b>OBJECTIVE</b>					
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.					
<b>Course Outcomes</b>					
<b>CO1</b> -To learn the detailed study of Availability of alternate fuels and other alternate Energy sources					
<b>CO2</b> -To learn the detailed study of Alcohols					
<b>CO3</b> -To learn the detailed study of Natural Gas, LPG, Hydrogen and Biogas					

**CO4-To learn the detailed study of Vegetable Oils**

**CO5 -To learn of detailed study of Electric and Solar Powered Vehicles**

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				H		L	H			M				
	CO3		H		H	H		H		M		M	H				
	CO4	H				M	M		H		M						
	CO5			M		H		M	M	H		M	H				
	CO6	L	M	H		L	M		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
										√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## 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.

### 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.

<b>BAM018</b>	<b>HYBRID ELECTRIC AND FUEL CELL VEHICLES</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – Hybrid Technology and Fuel cells, Basic Electrical and Electronics, Alternate Energy resources												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
The main objective of this course is to impart knowledge in fuel cell technology, fuel cell based vehicles structure, hybrid electric technology and electric drivetrains, hybrid electric vehicles, hybrid vehicle technology will be taught to the students.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of fuel cell technology													
<b>CO2</b> - To learn the detailed study of fuel cell based vehicles structure													
<b>CO3</b> -To learn the detailed study of hybrid electric technology and electric drivetrains													
<b>CO4</b> –To learn the detailed study of hybrid electric vehicles													
<b>CO5</b> - To learn the detailed study of combustion analysis in hybrid vehicle technology													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				H		L	H			M
	CO3		H		H	H		H		M		M	H
	CO4	H				M	M		H		M		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	H		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

**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 importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

## **UNIT IV - HYBRID ELECTRIC VEHICLES**

**9**

Principles of Hybrid Electric Drive trains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - (Charge Sustaining, Charge Depleting), Practical Models – Toyota Prius, Honda Insight. Hybridization Effects. 42 V System for Traction Applications - Lightly Hybridized vehicles, Low –Voltage Storage System, Low – Voltage main system with High voltage bus for propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavy duty vehicles.

## **UNIT V - HYBRID VEHICLE TECHNOLOGY**

**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).

### **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.

## **CORE ELECTIVE III**

<b>BAM004</b>	<b>SIMULATION OF VEHICLE SYSTEMS</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – Vehicle Technology and Body Engineering, CIM, Vehicle stability and Control												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
The main objective of this course is to impart knowledge in longitudinal dynamics and control, lateral dynamics and electronic stability control, modelling of passive automotive suspensions, modelling of semi active and active automotive Suspensions, lateral and longitudinal tire forces will be taught to the students.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of longitudinal dynamics and control													
<b>CO2</b> - To learn the detailed study of lateral dynamics and electronic stability control													
<b>CO3</b> -To learn the detailed study of modelling of passive automotive suspensions													
<b>CO4</b> – To learn the detailed study of modelling of semi active and active automotive Suspensions													
<b>CO5</b> - To learn the detailed study of lateral and longitudinal tire forces													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		M	H
	CO4	H				M	M		H		M		
	CO5			M		H		H	M	H		M	H
	CO6	L	M	H		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
						√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## **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.

**TEXT BOOK**

1. Rajesh Rajamani, "Vehicle Dynamics and Control", Springer, 2006.

<b>BAM019</b>		<b>COMPUTER AIDED DESIGN AND DRAFTING</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
		Total Contact Hours - 45							3	0	0	3	
		Prerequisite – Machine Drawing, Automotive Parts and Assembly drawing,CIM											
		Course Designed by- Department of Automobile Engineering											
<b>OBJECTIVE:</b>													
The main objective of this course is to impart knowledge in computer aided design and drafting, transformation and modelling of curves and surfaces with automation techniques. It also deals with FMS and CAPP.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of CAD/CAM													
<b>CO2</b> - To learn the detailed study on CIM													
<b>CO3</b> - To learn the detailed study on surface and curve modeling													
<b>CO4</b> – To learn the detailed study on CAPP and Automation													
<b>CO5</b> - To learn the detailed study on Flexible manufacturing System													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		H				M		L	H			M
	CO3		H		H	H		H		M		M	H
	CO4	H				M	M		H		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	H		L	M		H	L	M	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
						√			
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### **UNIT I INTRODUCTION**

**9**

Introduction to CAD/CAM, Historical developments, Industrial look at CAD/CAM, Comparison of CAD with traditional designing, Introduction to CIM; Basics of geometric and solid modeling, Packages for CAD/CAM/CAE/CAPP.

### **UNIT II TRANSFORMATIONS**

**9**

Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, orthographic and perspective projections, reconstruction of 3-D objects.

### **UNIT III MODELING OF CURVES & SURFACES**

**9**

Algebraic and geometric forms, tangents and normal, blending functions reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves. Plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, bezier surface, B-spline surfaces and their modeling techniques.

### **UNIT IV AUTOMATION AND NUMERICAL CONTROL AND APPLICATIONS OF CAD**

**9**

Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming.

Introduction, Need and importance of solid and surface models for Interference detection, Assembly modeling, finite element analysis, and computer aided part programming, computer aided process planning, automated layout and drafting and computer aided manufacturing.

### **UNITV FLEXIBLE MANUFACTURING SYSTEMS & COMPUTER AIDED PROCESS PLANNING**

**9**

Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, advantages and applications Conventional process planning, types of CAPP, Steps in variant process planning, planning for CAPP.

### **TEXT BOOKS**

1. CAD/ CAM by Groover and Zimmer, Prentice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
3. Numerical Control and Computer Aided Manufacturing by Kundra, Rao & Tiwari, TMH.

## REFERENCE BOOKS

- 1 CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan & Jimmie Browne, Published by Addison- Wesley.

<b>BAM018</b>	<b>HYBRID ELECTRIC AND FUEL CELL VEHICLES</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
	Total Contact Hours - 45										3	0	0	3			
	Prerequisite – Hybrid Technology and Fuel cells, Basic Electrical and Electronics, Alternate Energy resources																
	Course Designed by- Department of Automobile Engineering																
<b>OBJECTIVE:</b>																	
The main objective of this course is to impart knowledge in fuel cell technology, fuel cell based vehicles structure, hybrid electric technology and electric drive trains, hybrid electric vehicles, hybrid vehicle technology will be taught to the students.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study of fuel cell technology																	
<b>CO2</b> - To learn the detailed study offuel cell based vehicles structure																	
<b>CO3</b> -To learn the detailed study of hybrid electric technology and electric drive trains																	
<b>CO4</b> –To learn the detailed study of hybrid electric vehicles																	
<b>CO5</b> - To learn the detailed study of combustion analysis inhybrid vehicle technology																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				H		L	H			M				
	CO3		H		H	H		H		M		M	H				
	CO4	H				M	M		H		M						
	CO5			M		H		M	M	H		M	H				
	CO6	L	M	H		L	M		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## 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 importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

### **UNIT IV - HYBRID ELECTRIC VEHICLES 9**

Principles of Hybrid Electric Drive trains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - (Charge Sustaining, Charge Depleting), Practical Models – Toyota Prius, Honda Insight. Hybridization Effects. 42 V System for Traction Applications - Lightly Hybridized vehicles, Low –Voltage Storage System, Low – Voltage main system with High voltage bus for propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavy duty vehicles.

### **UNIT V - HYBRID VEHICLE TECHNOLOGY 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).

#### **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.

<b>BAM008</b>	<b>MODERN MANUFACTURING PROCESS</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>					
	Total Contact Hours - 45								3	0	0	3					
	Prerequisite – Production Engineering, Automotive Manufacturing Systems, Modern Vehicle Technology, Process Planning and Control																
	Course Designed by- Department of Automobile Engineering																
<b>OBJECTIVE:</b>																	
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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study of advances in casting <b>CO2</b> - To learn the detailed study of advanced forming and powder metallurgy processes <b>CO3</b> -To learn the detailed study of fabrication of microelectronic devices <b>CO4</b> – To learn the detailed study of manufacturing of composites <b>CO5</b> - To learn the detailed study of rapid prototyping																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				M		L	H			M				
	CO3		H		L	H		H		M		H	M				
	CO4	H				M	H		H		M						
	CO5			H		H		H	H	H		M	H				
	CO6	L	M	M		L	M		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
												√					
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## 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.

### 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", 3<sup>rd</sup> 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", Addison 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.

BAM006	NOISE VIBRATION AND HARSHNESS						L	T	P	C			
	Total Contact Hours - 45						3	0	0	3			
	Prerequisite – Mechanical Vibration and Control Techniques, Industrial Automation												
	Course Designed by- Department of Automobile Engineering												
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													
CO1 - To learn the detailed study of basics of vibration analysis CO2 - To learn the detailed study ofvibration control techniques CO3 -To learn the detailed study of noise fundamentals CO4 – To learn the detailed study of nvh measurements CO5 - To learn the detailed study of automotive noise sources and control techniques													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l

2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		H	M
	CO4	H				M	H		H		M		
	CO5			H		H		H	M	H		M	H
	CO6	L	M	M		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
													✓
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## 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.

### 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.

<b>BAM026</b>	<b>INDUSTRIAL ENGINEERING</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
	Total Contact Hours - 45								3	0	0	3	
	Prerequisite – Basic Engineering Sciences, Human Values and Professional Ethics, Statistical Quality and Control, Reliability engineering												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study ofproduction, productivity and efficiency													
<b>CO2</b> - To learn the detailed study ofplant layout													
<b>CO3</b> -To learn the detailed study of group technology and material handling/ loading and scheduling													
<b>CO4</b> – To learn the detailed study ofstatistical quality control													
<b>CO5</b> - To learn the detailed study of work study													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		H		M	H
	CO4	H				M	H		M		H		
	CO5			M		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
					√				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### **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

### **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.

<b>BAM016</b>	<b>VEHICLE AIR-CONDITIONING SYSTEMS</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
	Total Contact Hours - 45										3	0	0	3			
	Prerequisite – Automotive Air-conditioning, Automotive Technology, Engines and Emissions, Thermodynamics and Heat Transfer																
	Course Designed by- Department of Automobile Engineering																
<b>OBJECTIVE:</b>																	
The main objective of this course is to impart knowledgeautomotive 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.																	
<b>Course Outcomes</b>																	
<b>CO1</b> - To learn the detailed study ofautomotive air conditioning fundamentals																	
<b>CO2</b> - To learn the detailed study of refrigerant																	
<b>CO3</b> - To learn the detailed study of heating and air conditioning system																	
<b>CO4</b> – To learn the detailed study ofair routing & temperature control																	
<b>CO5</b> – To learn of detailed study ofheater – air conditioner trouble shooting & service																	
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				H		L	H			M				
	CO3		H		M	H		H		M		M	H				
	CO4	H				M	M		H		H						
	CO5			M		H		H	M	H		M	H				
	CO6	L	M	H		L	M		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
										√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

**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.

#### **TEXT BOOK:**

1. William H Crouse and Donald L Anglin, Automotive Air conditioning, McGraw Hill Inc., 1990.

#### **REFERENCES:**

1. Paul Weisler, Automotive Air Conditioning, 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.

### **NON MAJOR ELECTIVE (NE)-II**

<b>BAM005</b>	<b>COMPUTER INTEGRATED MANUFACTURING SYSTEMS</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – Flexible manufacturing system, CAPP, CAD/CAM												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study on CAD Basics													
<b>CO2</b> - To learn the detailed study on Flexible manufacturing System													
<b>CO3</b> - To learn the detailed study on CAPP and its control													
<b>CO4</b> – To learn the detailed study on CIM concept and CNC													
<b>CO5</b> – To learn the detailed study on Product and Tolerance modeling													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				H		L	H			H

	CO3		H		M	H		H		M		M	H
	CO4	H				M	H		H		H		
	CO5			M		H		H	M	H		M	H
	CO6	L	M	H		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
						√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### **UNIT – I INTRODUCTION TO CAD**

**9**

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**

**9**

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.

### **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. S.Kant Vajpayee, , " Principles of Computer Integrated Manufacturing ", Prentice Hall of India Ltd., 1999
3. Barry Hawker, CAD/CAM Processes, Pitman, 1988

BAM015	AUTOMOTIVE SAFETY										L	T	P	C
	Total Contact Hours - 45										3	0	0	3
	Prerequisite – Vehicle Safety and Comfort systems, Computer control of vehicle Systems. Sensors and Actuators													
	Course Designed by- Department of Automobile Engineering													
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														
CO1 - To learn the detailed study of introduction														
CO2 - To learn the detailed study of safety concepts														
CO3 - To learn the detailed study of safety equipment's														
CO4 – To learn the detailed study of collision warning and avoidance														
CO5 - To learn the detailed study of comfort and convenience system														
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low														
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l	
2	CO1	H	M	H		H	M	H	H	H	H	H	M	
	CO2		M				H		L	H			M	
	CO3		H		M	H		H		H		M	H	
	CO4	H				M	M		H		H			
	CO5			M		H		H	M	H		M	H	
	CO6	L	M	H		L	H		H	L	M	L		
3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (IP)					
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015												

## 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 crumple 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, regenerative 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.

### **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.

<b>BAM013</b>	<b>QUALITY CONTROL AND RELIABILITY</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – Industrial Engineering, Statistical Quality and Control, Reliability Engineering												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn the detailed study of statistical quality control <b>CO2</b> - To learn the detailed study of acceptance sampling <b>CO3</b> -To learn the detailed study of reliability engineering <b>CO4</b> – To learn the detailed study of failure data analysis <b>CO5</b> - To learn the detailed study of reliability prediction and management													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		H	M
	CO4	H				M	H		H		M		

	CO5			H		H		H	H	H		M	H
	CO6	L	M	M		L	L		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### **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.

### **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 Limited1991.
2. Harvid Noori and Russel, “Production and Operations Management - Total Quality and Responsiveness”, McGraw-Hill Inc, 1995.
3. Dougus C. Montgomery, “Introduction to Statistical Quality Control”, 2nd Edition, John Wiley and Sons, 1991.

BAM020	MEASUREMENTS AND METROLOGY								L	T	P	C	
	Total Contact Hours - 45								3	0	0	3	
	Prerequisite – Engineering Materials and Metallurgy, Production Engineering, Tribology and Measurements												
	Course Designed by- Department of Automobile Engineering												
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													
CO1 - To learn the detailed concept of linear measurement.													
CO2 - To learn the detailed study of Pressure measurement and types.													
CO3 - To learn the detailed of flow and temperature measurement.													
CO4 – To learn the detailed of force and torque measurement and types.													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	M	H	H	H	H	M
	CO2		M		M		H		L	M		L	M
	CO3		H		M	H		M		H		H	H
	CO4	H		H		M	M		H		H		L
	CO5			H		H		M	M	H		M	H
	CO6	L	M	M		M	H		L	H	M	H	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

### 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 McLeod 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, fluted 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.

#### **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

### **NON MAJOR ELECTIVE (NE)-III**

<b>BAM009</b>	<b>ROBOTICS FOR AUTOMOBILE ENGINEERS</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
	Total Contact Hours - 45							3	0	0	3		
	Prerequisite – Engineering Design, Industrial automation and its application												
	Course Designed by- Department of Automobile Engineering												
<b>OBJECTIVE:</b>													
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.													
<b>Course Outcomes</b>													
CO1 - To learn the detailed study of introduction to robot application													
CO2 - To learn the detailed study of end effectors and sensors													
CO3 -To learn the detailed study of robot cell design													
CO4 – To learn the detailed study of robot programming													
CO5 - To learn the detailed study of industrial applications													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		L	H		H		M		H	M
	CO4	H				M	H		H		M		
	CO5			H		H		H	H	H		M	H
	CO6	L	M	M		L	M		H	L	M	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)
							√		
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### **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-safetyconsiderations.

### **TEXT BOOKS:**

1. Deb S. R, “Robotics technology and flexible automation”, Tata McGraw Hill publishingcompany 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.

BAM005		TYRE TECHNOLOGY								L	T	P	C
		Total Contact Hours - 45								3	0	0	3
		Prerequisite – Automotive Chassis Systems, Braking and Suspension Systems, Automotive Tyre manufacturing											
		Course Designed by- Department of Automobile Engineering											
OBJECTIVE:													
The main objective of this course is to impart knowledge infabric preparation, calendaring, thread extrusion and bead construction, tyre building, green tyre preparation & curing will be taught to the students.													
Course Outcomes													
CO1 - To learn the detailed study of fabric preparation													
CO2 - To learn the detailed study of calendering													
CO3 -To learn the detailed study of thread extrusion and bead construction													
CO4 – To learn the detailed study of tyre building													
CO5 - To learn the detailed study of green tyre preparation & curing													
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		M	M
	CO4	H				M	M		H		M		
	CO5			M		H		H	M	H		M	H
	CO6	L	M	M		L	M		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## 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 extrusion operation parameters like feeding rate, screw speed, take off conveyor speed on tread extrusion. Extruded tread profile – critical dimensions. Dual 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. Importance of the state of the Art Technology. Appraisal of Tyre building as most crucial operation correlation of some of the cured tyre & service returned tyres to the lack of building skill. Green tyre inspection procedures weight tolerance techno-commercial importance of green tyre weight. Green tyre storage considerations.

## **UNIT V - GREEN TYRE PREPARATION & CURING**

**8**

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.

**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.

BAM011		OPERATIONS REASERCH FOR AUTOMOBILE ENGINEERS							L	T	P	C	
		Total Contact Hours - 45							3	0	0	3	
		Prerequisite – Numerical Methods, Engineering Mathematics-I and II, Research Methodology											
		Course Designed by- Department of Mathematics											
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													
CO1 - To learn the detailed study of linear programming													
CO2 - To learn the detailed study of resource scheduling and networks													
CO3- To learn the detailed study of inventory models													
CO4 – To learn the detailed study of queuing models													
CO5 – To learn of detailed study of decision models													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				H		L	H			M
	CO3		H		H	H		H		M		H	H
	CO4	H				M	H		H		M		
	CO5			H		H		H	H	M		M	H
	CO6	L	M	M		L	L		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
													✓



4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015
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#### **UNIT – I      LINEAR PROGRAMMING      9**

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      9**

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      9**

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      9**

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      9**

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.

#### **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.

<b>BAM012</b>	<b>TRANSPORT MANAGEMENT AND MOTOR INDUSTRY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Road Transport Management, Traffic Engineering, Inventory and Shop Control, Managerial Principles and Industrial Engineering				
	Course Designed by- Department of Automobile Engineering				
<b>OBJECTIVE:</b>					
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.					
<b>Course Outcomes</b>					

CO1 - To learn the detailed study of introduction on transportation modes																	
CO2 - To learn the detailed study of transport organization and development																	
CO3 -To learn the detailed study of planning for new transport organization																	
CO4 – To learn the detailed study of motor vehicle act																	
CO5 - To learn the detailed study of accident & prevention																	
		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low															
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				M		L	H			M				
	CO3		H		H	H		H		M		H	M				
	CO4	H				M	H		H		M						
	CO5			H		H		H	M	H		M	H				
	CO6	L	M	M		L	M		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
										√							
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## **UNIT I INTRODUCTION ON TRANSPORTATION MODES 9**

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 taxis 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.

### 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

BBA001	<b>PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR</b>		L	T	P	C
	Total Contact Hours – 45		3	0	0	3
	Prerequisite – Professional Courses					
	Course Designed by – Department of Management Studies					
<b>OBJECTIVES</b>						
Familiarize the students with the fundamental concepts of Management and to highlight the approaches in organization behavior						
<b>COURSE OUTCOMES (COs)</b>						
CO1	Understanding the concepts of Management					
CO2	Knowledge on Management Functions					
CO3	Understanding the Organization Theory & Approach.					
CO4	Knowledge on the Concepts of Motivation					
CO5	Clear insight on the factors contributing to discipline					
CO6	In-depth Understanding about the concepts of Group Behavior					

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	L			M
	CO3		H		H	H		H		M		H	M
	CO4	H				H	H		M		M		
	CO5			H		H		H	H	H		M	H
	CO6	L	M	M		L	H		H	L	M	L	

3	Category	Humanities and Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper/Comprehension/Seminar/Internship (PR)
								✓	
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015							

### **UNIT -I NATURE OF MANAGEMENT**

9

Definition – theory and practice – effective management – Management : Science of Art – Management in India. Development of Management thoughts – Taylor’s – Henry Fayol – Hawthorne experiment – Barnard & Social system – Herbert Simon – Peter Drucker – Various approaches – Management thoughts.

### **UNIT- II MANAGEMENT PROCESS**

9

Co-ordination – Functions of management – Managers and environment – External and internal Business Ethics – Planning – Fundamentals – Definitions & Features – Steps in planning – types of planning – Objectives – Concepts and features – Hierarchy of objectives – role – Process of MBO – Policy & Strategy – Decision making process – Individual Vs Group Decisions.

### **UNIT- III ORGANIZATION STRUCTURE**

9

Organizing – Theory & Approach – Authority & Responsibility – Delegation – Centralization & Decentralization – Line & Staff Relationship – Staffing – Fundamentals – System approach – Manpower Planning – Recruitment & Selection – Training and development – Performance appraisal – Direction – Fundamentals Motivation – Theories of Motivation- Maslow’s Hersberg’s MacClelland’s theory X,Y & Z leadership – Theories and Styles – Communication – Type – Controlling – System and Process.

### **UNIT- IV ORGANIZATIONAL BEHAVIOUR**

9

Definition – Organization – Managerial Role and Functions – Organizational Approaches, Individual behaviour – Causes – Environmental effect – Behaviour and performance, perception – Organizational implications, Personality – Contributing factors – Dimension, Motivation – Need Theories – Process Theories – Job satisfaction, Learning and Behaviour – Learning Curves, Work Design and Approaches.

### **UNIT -V GROUP BEHAVIOUR**

9

Groups – Contributing factors – Group Norms, types – Causes – Intergroup relations – Conflict and Resolution – Change Process – Resistance to change.

### **TEXT BOOKS:**

1. Herald Knootz and Heinz weihrich, ‘Essentials of Management’, McGraw Hill publishing Company, Singapore International Edition, 2004.
2. Ties AF, Stoner and R. Edward Freeman, “Management” Prentice Hall of India Pvt. Ltd., New Delhi -110011, 1995.

### **REFERENCE BOOKS :**

1. Joseph I. Massie 'Essentials of Management', Prentice Hall of India Pvt. Ltd., New Delhi -110011, 2004.
2. L.M. Prasad "Principles and Practice of Management", Sultan Chand & Sons.2001
3. Uma Sekaran, "Organizational Behaviour", Tata McGraw Hill, 2007.

<b>BBA002</b>		<b>ENTREPRENEURSHIP DEVELOPMENT</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
		Total Contact Hours - 45						3	0	0	3		
		Prerequisite – Professional Courses											
		Course Designed by- Department of Business Administration											
<b>OBJECTIVE:</b>													
<ul style="list-style-type: none"><li>To learn about types of entrepreneurship.</li></ul>													
<ul style="list-style-type: none"><li>To study about major motivation methods.</li></ul>													
<ul style="list-style-type: none"><li>To study about government policies for small scale industries.</li></ul>													
<b>Course Outcomes</b>													
<b>CO1</b> - To learn difference between entrepreneur and interpreneur.													
<b>CO2</b> – To learn about entrepreneurship development programs.													
<b>CO3</b> – To study about economic feasibility methods.													
<b>CO4</b> – To learn about taxation.													
<b>CO5</b> – To study about corrective measures methods.													
Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H		H	M	H	H	H	H	M	M
	CO2		M				M		L	H			M
	CO3		H		H	H		H		M		H	M
	CO4	H				H	H		H		M		
	CO5			H		H		H	H	H		M	H
	CO6	L	M	M		L	H		H	L	M	L	
3	Category	Humanities & Social Studies (HS)	Basic Sciences(BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term paper/ Seminar/ Internship (H)				
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT I ENTREPRENEURSHIP

8

Entrepreneur- Types of Entrepreneurs - Difference Between Entrepreneur and Interpreneur- Role of Entrepreneurship in Economic Growth- Women and Rural Entrepreneurship - Factors Affecting Entrepreneurial Growth.

## UNIT II MOTIVATION

8

Major Motives Influencing Entrepreneur – Achievement Motivation Training, Self Rating – Business Game – Thematic Apperception Test – Stress Management – Entrepreneurship Development Programs – Need, Objectives.

### **UNIT III BUSINESS**

**9**

Small Enterprise – Definition, Classification – Characteristics- Ownership Structure – Project Formulation – Steps Involved in Setting up a Business – Identifying, Selecting a Good Business Opportunity- Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports- Project Appraisal- Sources of Information- Classification of Needs and Agencies.

### **UNIT IV FINANCING AND ACCOUNTING**

**10**

Need – Sources of Finance- Terms Loans, Capital Structure- Financial Institutions, Management of Working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/ CPM –Taxation – Income Tax – Excise Duty – Sales Tax.

### **UNIT V SUPPORT TO ENTREPRENEURS**

**10**

Sickness in Small Business- Concept, Magnitude, Causes and Consequences, Corrective Measures- Government Policy for Small Scale Enterprises- Growth Strategies in Small Industry – Expansion- Diversification, Joint Venture, Merger, Sub Contracting.

#### **TEXT BOOKS:**

1. S.S.Khanka, “Entrepreneurial Development”, S. Chand & Co. Ltd., Ram Nagar, New Delhi, 1999.
2. Hisrich RD and Peters MP, “Entrepreneurship”, 5<sup>th</sup> Edition, Tata McGraw Hill, 2002.

#### **REFERENCES:**

1. Rabindra Kanungo, “Entrepreneurship and Innovation” , Sage Publications, New Delhi, 1999
2. ED II. Faculty & External Experts-A Hand book for New Entrepreneurs Publishers: Entrepreneurial Development, Institute Of India, and Ahmedabad, 1986.

<b>BBA003</b>	<b>MARKETING MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Marketing Principles and Evolution, Managerial Techniques and Entrepreneurship development				
	Course Designed by- Department of Business Administration				
<b>OBJECTIVE:</b>					
<ul style="list-style-type: none"><li>To learn about consumer marketing.</li></ul>					
<ul style="list-style-type: none"><li>To study about demographic factors.</li></ul>					
<ul style="list-style-type: none"><li>To study about retailing process.</li></ul>					
<b>Course Outcomes</b>					
<b>CO1</b> - To learn marketing concepts between industry and consumer.					
<b>CO2</b> – To learn about demographic factors.					
<b>CO3</b> – To study about pricing methods.					
<b>CO4</b> – To learn about portfolio analysis.					
<b>CO5</b> – To study about advertising and sales methods.					

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low																	
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l				
2	CO1	H	M	H		H	M	H	H	H	H	M	M				
	CO2		M				M		H	H			M				
	CO3		H		L	H		H	H	M		H	M				
	CO4	H				H	H		H		M						
	CO5			M		H		H	H	H		L	H				
	CO6	L	M	M		L	H		H	L	M	L					
3	Category	Humanities & Social Studies (HS)		Basic Sciences(BS)		Engg Sciences (ES)		Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)		Project/Term paper/ Seminar/ Internship (H)	
												√					
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015															

## **UNIT I INTRODUCTION 9**

Definition- Marketing Process- Dynamics- Needs- Wants and demands-Marketing Concepts- Environment- Mix- Types- Philosophies- Selling Vs Marketing- Organizational- Industrial Vs Consumer Marketing- Consumer Goods- Industrial Goods- Product Hierarchy.

## **UNIT II BUYING BEHAVIOUR & MARKET SEGMENTATION 9**

Cultural- Demographic Factors- Motives- Types- Buying Decisions- Segmentation factors- Demographic- Psychographic & Geographic Segmentation- Process- Patterns.

## **UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9**

Objectives- Pricing- Decisions & Pricing Methods- Pricing Management- Introduction- Uses- Process of Marketing Research.

## **UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9**

Components of marketing plan- Strategy formulation and marketing process- Implementation- Portfolio analysis- BCG- GEC grids.

## **UNIT- V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9**

Characteristics- Impact- Goals- Types- Sales promotion- Point of Purchase- Unique selling proposition- Characteristics- Whole selling- Retailing- Channel Design- Logistics- Modern trends in retailing.

### **TEXT BOOKS:**

1. Ramasamy and Nama Kumari, "Marketing Environment: Planning, implementation and control the Indian context", 2002
2. Govindarajan.M, "Industrial marketing management:", Vikas Publishing Pvt. Ltd, 2003

### **REFERENCES:**

1. Philip Kotler, Marketing Management, Analysis, Planning, Implementation and

control, 1998.

1. Khanna O.P. – Industrial Engineering and Management, Khanna Publishers, New Delhi, 2000.
2. Green Paul.E and Donald Tull, “Research for marketing decisions”, Prentice Hall of India. 1995
- 4 .Donald S. Tull and Hawkins, “Marketing Research”, Prentice Hall of India- 1997

BBA 004	ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT									L	T	P	C
	Total Contact Hours - 45									3	0	0	3
	Prerequisite – Professional Courses												
	Course Designed by – Dept. of Management Studies												
OBJECTIVES													
Acquire knowledge of economics to facilitate the process of economic decision making													
Acquire knowledge on basic financial management aspects													
Develop the skills to analyze financial statements													
COURSE OUTCOMES (COs)													
CO1	Evaluate the economic theories, cost concepts and pricing policies												
CO2	Understand the market structures and integration concepts												
CO3	Understand the measures of national income, the functions of banks and concepts of globalization												
CO4	Apply the concepts of financial management for project appraisal												
CO5	Understand accounting systems												
CO6	analyze financial statements using ratio analysis												
Mapping of Course Outcomes with Program outcomes (POs)													
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low1													
1	COs/POs	a	b	c	d	e	F	g	h	i	j	K	l
2	CO1												
	CO2	M			M				M				H
	CO3							H			H		H
	CO4					L			M				H
	CO5		L								H		
	CO6	L				L							
3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/Term Paper Seminar/ Internship (PR)				
								√					
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											

## UNIT- I ECONOMICS, COST AND PRICING CONCEPTS

9

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and



variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and breakeven chart – Limitations of break even chart – Interpretation of break even chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods.

## **UNIT –II CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES 9**

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration

## **UNIT-III NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT 9**

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

## **UNIT- IV CONCEPTS OF FINANCIAL MANAGEMENT 9**

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

## **UNIT- V ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS 9**

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations

### **TEXT BOOKS:**

1. Prasanna Chandra, — Financial Management (Theory & Practice) TMH
2. Weston & Brigham, — Essentials of Managerial Finance

### **REFERENCES:**

1. Pandey, I. M., — Financial Management
2. Fundamentals of Financial Management - James C. Van Horne.
3. <http://stanford.edu/dept/MSandE>

<b>BBA008</b>	<b>TOTAL QUALITY MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Dept of Mechanical Engineering				
<b>OBJECTIVES</b>					
To introduce to the student about the basic terms related to quality and concepts of quality management					
To familiarize the student about the basic principles of total quality management					
To acquaint the student with the basic statistical tools used in process control					
To introduce to the student about the various tools used in implementing and checking total quality management					
To familiarize the student about the different quality systems used in auditing the quality of a company/industry/organization					
<b>COURSE OUTCOMES (COs)</b>					
<b>CO1</b>	By understanding about various quality terms, it will be helpful for the student to maintain quality in his/her organization				

CO2	The student will be able to formulate new plans/procedures to be implemented to achieve the desired quality status by knowing about the various principles of quality management
CO3	The student will be able to analyze the periodical data in quality control using statistical tools
CO4	The total quality management tools will help the student to understand the procedures in measuring the quality of the organization/process and will also enable him/her to identify the parameters that are improving/depriving the quality
CO5	By knowing about the quality ISO systems, the student will be maintain processes/documentation properly so that the quality maintained by his/her organization gets recognized

Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low													
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1			M		H		M	H	M	L	L	M
	CO2			M		H		M	H	M	L	L	M
	CO3			M		H		M	H	M	L	L	M
	CO4			H		H		M	H	M	L	L	M
	CO5			H		H		M	H	M	L	L	M
	CO6			H		H		M	H	M	L	L	M
3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (GOE)	Project/Term Paper Seminar/ Internship (PR)				
										√			
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015											
CO6	As a whole the students will understand the importance of quality in all the fields of engineering and the social circle.												

## UNIT I INTRODUCTION

9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation

## UNIT II TQM PRINCIPLES

9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership –Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

**UNIT III STATISTICAL PROCESS CONTROL (SPC) 9**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

**UNIT IV TQM TOOLS 9**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

**UNIT V QUALITY SYSTEMS 9**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System –Elements, Implementation of Quality System, Documentation, Quality Auditing, TS16949, ISO 14000 – Concept, Requirements and Benefits

**TEXT BOOKS:**

3. Dale H.Besterfield, et al., “Total Quality Management”, Pearson Education, Inc.2003. (Indian reprint 2004). ISBN 81-297-0260-6.

**REFERENCE BOOKS:**

1. Evans. J. R. & Lindsay. W,M “The Management and Control of Quality”, (5th Edition),South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland.J.S. “Total Quality Management”, Butterworth Heinemann Ltd., Oxford,1989.
4. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”,New Age International 1996.
5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.
6. [freecomputerbooks.com/Total-Quality-Management-](http://freecomputerbooks.com/Total-Quality-Management-)

<b>BBA006</b>	<b>INDIAN CONSTITUTION AND SOCIETY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management studies				
<b>OBJECTIVES</b>					
To know about Indian constitution. To know about central and state government functionalities in India. To know about Indian society.					
<b>COURSE OUTCOMES (COs)</b>					
CO1	To understand the historical background and fundamental rights				
CO2	To understand the structure and functions of governments				
CO3	To understand the Indian social structure				
CO4	To gain knowledge in Indian federal system				
CO5	To gain knowledge Indian social structure				
CO6	To gain knowledge the right of women, children and SC&ST				

Mapping of Course Outcomes with Program outcomes (POs)  
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l		
2	CO1	L		H											
	CO2					H			M	L					
	CO3	L					H			L					
	CO4							M		L			L		
	CO5	L					M		M				L		
	CO6														
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)		Non-Major Elective (NE)		Open Elective (OE)	Project/Term Paper Seminar/ Internship (PR)	
													√		
4	Approval	37 <sup>th</sup> Meeting of Academic Council, May 2015													

## UNIT I HISTORY

9

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

## UNIT II CENTRAL STRUCTURE

9

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

## UNIT III STATE STRUCTURE

9

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

## UNIT IV PARLIAMENTARY SYSTEM

9

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

## UNIT V SOCIAL STRUCTURE

9

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

### TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, "(1997) Indian Political System", S.Chand and Company, New Delhi.

### REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India:", Prentice Hall of India, New Delhi.

2. U.R.Gahai, “(1998) Indian Political System “, New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, “Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, “(1997) Social Stratification and Charge in India “, Manohar, New Delhi
5. Maciver and Page, “Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.
6. K.L.Sharma, “ (1997) Social Stratification in India: Issues and Themes “, Jawaharlal Nehru University, New Delhi.
7. [www.cgsird.gov.in/constitution.pdf](http://www.cgsird.gov.in/constitution.pdf)