DDU – KAUSHAL Kendra
Bharathidasan University
Khajamalai Campus, Tiruchirappalli-23

B.Voc., RULES AND REGULATIONS

INTRODUCTION

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF (National skill Qualifications framework).

The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education.

This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

THE MAIN OBJECTIVES OF THE SCHEME ARE:

- To provide judicious mix of skills relating to a profession and appropriate content of General Education & Skill Component.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industrial requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of 10+2 with vocational subjects.

ELIGIBILITY FOR ADMISSION

A pass in Plus Two or equivalent examination or an examination recognized as equivalent thereto by this University.

A pass in 10+2 years in ITI (Two Years) in relevant trade role.

Those who passed Vocational Higher Secondary course will get an additional weightage.

LATERAL ENTRY:

Candidate seeking admission directly in Second year of Bachelor of Vocation – Automobile Technology must have passed Examination of either Diploma in relevant trade roles.

MEDIUM OF INSTRUCTIONS

Medium of instruction shall be English.

PROGRAMME STRUCTURE

The B.Voc. Automobile Technology shall include:

- General Education
- Skill Components

S.No.	Type of the Courses	Number of Courses	Total Courses	Credits	Total Credits
General Components					
1	A. Humanities and Social Courses	5	21	12	72
	B. Basic Courses	6		20	
	C. Basic Skill Courses	4		16	
	D. Applied Courses	3		12	
	E. Elective Courses	2		8	
	F. Entrepreneurship Development and Business Plan	1		4	
Skill Components					
2	A. Applied Skill Courses	5	18	20	96
	B. Practical Courses	8		48	
	C. Skill Elective Courses	2		8	
	D. Industrial Training/Concurrent Field Practicum Course	2		20	
3	**Industrial Training/Concurrent Field Practicum Course/Project**	1	1	12	12
	Total	**39**	**39**	**180**	**180**

CURRICULUM

The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components with 40:60.

DURATION

The Programme is for a period of three years. Each academic year shall comprise two Semesters viz. Odd and Even semesters. Odd Semester shall be from June / July to October / November and Even Semester shall be from November / December to April / May. There shall be not less than 90 working days which shall comprise 450 teaching clock hours for each Semester (Exclusive of the days for the conduct of University End-Semester Examinations).

SPAN OF PERIOD

a) Time = N+2 years for the completion of programme. Where 'N' stands for the normal or minimum duration prescribed for completion of the programme.

b) In exceptional circumstance a further extension of one more year may be granted.

The exceptional circumstances be spelt out clearly by the relevant statutory body concerned of the University.

c) During the extended period the student shall be considered as a private candidate and also not be eligible for ranking.

The above conditions are applicable to the Redo/Transfer/Readmission Candidates.

THE CBCS-LOCF SYSTEM

All Programmes (named after the Core subjects) mentioned earlier shall be conducted through Choice Based Credit System (CBCS) and Learning Outcomes Based Curriculum Framework (LOCF). It is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

COURSES IN PROGRAMMES

The UG Programme consists of a number of Courses. The term "course" is applied to indicate a logical part of the subject matter of the programme and is invariably equivalent to the subject matter of a "paper" in the conventional sense. The following are the various categories of Courses suggested for the UG programmes:Language Courses (LC) (any one of the languages from Tamil, Hindi, Sanskrit, French, Arabic, Urdu, etc), English Language Courses (ELC), Core Courses (CC), Core Practical (CP), Allied Courses (AC), Allied Practical (AP), Elective Courses (EC). Skill Based Elective (SBE) and Non-Major Elective (NME) and Project.

The Language Courses and English Language Courses are Four each in number and the LC and the ELC are meant to develop the students' communicative skill at the UG level. Core Courses are the basic courses which are compulsorily required for each of the Programme of study. These will be related to the subject of the Programme in which the candidate gets his/her degree. The total number of Core Courses shall be for Arts -15 papers (only Theory) and for science 10 papers (Theory) and 5 (Practical's). Allied Courses cover two disciplines that are generally related to the main subject of the programme. There shall be Two Allied Courses (Allied I – Two Papers & Allied II – Two papers) for Arts (only theory) and for Science (i.e. 2 Theory + 2 Practical) for first IV semesters.

A student shall choose at least two Non-major Elective Courses (NME) from outside his/her department. Major Based Elective Courses and Skill Based Elective Courses (SBE) are also open to a student to choose from his/her department. The student can choose any one and write 2 papers under the same title.

SELECTION OF STUDENTS TO THE ELECTIVE COURSE (EC)

a) The Department Committee shall follow a selection procedure on a first-come-first-served basis, fixing the maximum number of students, giving counseling to the students etc. to avoid overcrowding to particular course(s) at the expense of some other courses.
b) The Colleges shall provide all information relating to the ECs in each programme to all the students so as to enable them to choose their ECs.
    - Part IV - Value Education is offered in the 1st Semester in all U.G. Courses (2 hours - 2 credits).
    - Part IV - Environmental Studies course is offered in the 2nd semester in all
    - UG Programmes as per the recommendation of the UGC (2 hours – 2 credits).
    - Part IV - Soft Skills is offered in the 5th Semester in all U.G. Programmes. (2 hours – 2 credits).
    - Part V - Extension Activities should be carried out apart from the regular class hours (1credit).
    - Part V - Gender Studies is offered in the 6th Semester in all U.G. Programmes (1 hour-1 credit).

PROJECT

The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Vivavoce.

SEMESTERS

An academic year is divided into two Semesters. In each Semester, Courses are offered in 15 teaching weeks with 30 hours per week and the remaining weeks are to be utilized for conduct of examinations and evaluation purposes.

CREDITS

The term “Credit” refers to the weightage given to a Course, usually in relation to the instructional hours assigned to it. For instance, a six-hour Course per week is assigned four to six credits, four/five-hour course per week is assigned three to five credits and two hour Course per week is given two credits. However, in no instance the credits of a Course can be greater than the hours allotted to it.

The total minimum credits, required for completing a B.Voc., Programme is 180. The details of credits for individual components and individual Courses are given in Below Table.

Years	Skill Component Credits	General Education Credits	Normal calendar duration	Exit Points / Awards
Year 3	36	24	Six Semester	B.Voc
Year 2	36	24	Four Semester	Advanced Diploma
Year 1	36	24	Two Semester	Diploma
Total	**108**	**72**		

As per the UGC guidelines, there are multiple exit points for a candidate admitted in this course. If he/she is completing all the six semester successfully, he/she will get B. Voc. Degree in Automobile Technology. If he/she is completing the first four semesters successfully, he/she will get an Advanced Diploma in Automobile Technology. If he/she is completing the first two semesters successfully, he/she will get a Diploma in Automobile Technology.

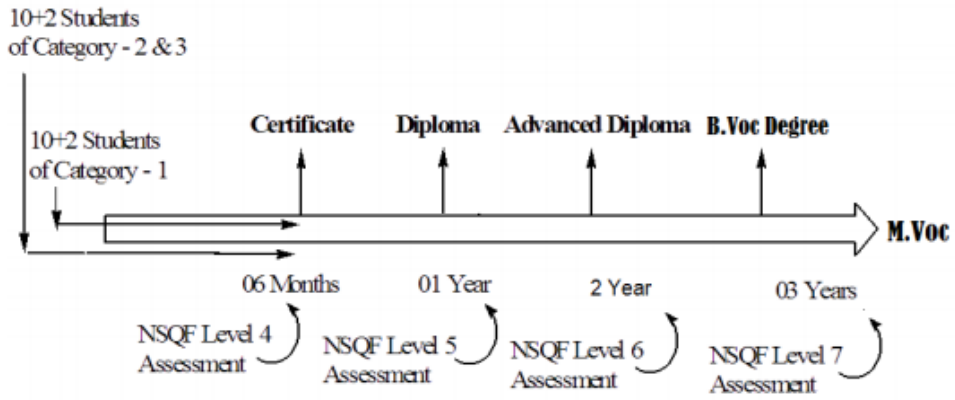

Fig. 1: Assessment of Skill Component under NSQF in Vocational Courses

COURSE

Each Course is designed with lectures/tutorials/laboratory or field work/seminar/ Projects/practical training/Assignments/Term paper or Report writing etc., to meet effective teaching and learning requirements.

EXAMINATIONS

A.

i. There shall be examinations at the end of each semester, for odd semesters in the month of October/November; for even semesters in April/May.
ii. A candidate who does not pass the examination in any course(s) may be permitted to appear in such failed course(s) in the subsequent examinations to be held in October/November or April/May. However, candidates who have arrears in Practicals shall be permitted to appear for their arrears in Practical examination only along with Regular Practical examination in the respective semester.
iii. A candidate should get registered for the first semester examination. If registration is not possible owing to shortage of attendance beyond condonation limit/regulation prescribed or belated joining or on medical grounds, the candidates are permitted to

move to the next semester. Such candidates shall re-do the missed semester after completion of the course.

iv. Viva-voce: Each candidate shall be required to appear for Viva-voce Examination in defence of the Project only.

v. For the Project Report, the maximum marks will be 80 percent and for the Viva-voce is 20 percent.

vi. The results of all the examinations will be published through the College where the student underwent the Course as well as through University Website. In the case of private candidates, the results will be published through the Centres in which they appeared for the examinations as well as through University Website.

B. Candidates studying Sanskrit under LCs and Programme in Sanskrit (CCs, ACs and ECs) are permitted to write the Examinations in Sanskrit or English or Tamil. While answering in Sanskrit "Devanagari Script" alone be used.

CONDONATION

Students must have 75% of attendance in each semester to appear for the examination. Students who have attendance between 65% and 74% shall apply for condonation in the prescribed form with the prescribed fee. Students who have attendance between 50% and 64% shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate.

Students who have attendance below 50% are not eligible to appear for the examination. They shall re-do the semester(s) after completion of the Programme.

QUESTION PAPER PATTERN

Section A: For 20 Marks

(i): 10 Questions x 1 Marks = 10 Marks.

a. 5 questions for Multiple choice/

b. 5 questions fill in the blanks

(ONE questions from each unit).

(ii): 5 questions x 2 Marks = 10 Marks.

(Descriptive type/one question from each Unit)

Section B: For 25 Marks

5 Questions x 5 Marks = 25 Marks

(Internal Choice and one set of questions from each unit)

Section C: For 30 Marks

3 Questions x 10 Marks = 30 Marks

(Answer any three out of 5 questions and one question from each unit)

EVALUATION

The performance of a student in each Course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each Course shall be done by a continuous internal assessment (CIA) by the Course teacher concerned as well as by an end semester examination and will be consolidated at the end of the semester. The components for continuous internal assessment are:

Theory		**Practical**	
2 tests	: 15 Marks	Continuous Performance	: 20 Marks
Group Activity/Quiz	: 5 Marks	Model Practical	: 10 Marks
Assignments	: 5 Marks	Record	: 5 Marks
Total	25 Marks	Viva	: 5 Marks
		Total	40 Marks

Attendance need not be taken as a component for continuous assessment, although the students should secure a minimum of 75% attendance in each semester. In addition to continuous evaluation component, the end semester examination, which will be a written type examination of at least 3 hours duration, would also form an integral component of the evaluation. The ratio of marks allotted to continuous internal assessment and to end semester examination is 25:75. The evaluation of laboratory component, wherever applicable, will also be based on continuous internal assessment and on an end-semester practical examination with 40:60 ratio.

PASSING MINIMUM

Passing Minimum		
Continuous Internal Assessment (CIA)		**University Examination (UE)**
Theory	40% out of 25 marks (i.e. 10 marks)	40% out of 75 marks (i.e. 30 marks)
Practical	40% out of 40 marks (i.e. 16 marks)	40% out of 60 marks (i.e. 24 marks)
Project	Vivo-Voce 20 Marks 40% out of 20 Marks (i.e. 8 Marks)	Dissertation 80 Marks 40% out of 80 marks(i.e. 32 marks)

Failed candidates in the Internal Assessment are permitted to appear for their Internal Assessment in the subsequent semesters (2 chances will be given) by writing Tests and Assignments.

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

CONFERMENT OF THE BACHELOR'S DEGREE

A candidate shall be eligible for the conferment of the Degree of Bachelor of Arts/ Science/Commerce/Management/Literature only if he/she has earned the minimum required credits for the programme prescribed thereof (i.e. 180 credits).

GRADING SYSTEM

1. Grading

The total marks will be calculated by adding both CIA and end-semester examinations for each of the courses. The total marks thus obtained will then be graded as per details provided in Table 1.

From the second semester onwards the total performance within a semester and the continuous performance starting from the first semester are indicated by Semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$$\text{GPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \quad \text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

where 'Ci' is the Credit earned for the Course i; 'Gi' is the Grade Point obtained by the student for the Course i. 'M' is the Marks obtained for the course i and 'n' is the number of Courses passed in that semester.

CGPA = Average GPA of all the Courses starting from the first semester to the current semester.

Note: The GPA and the CGPA shall be calculated separately for the following three

Parts:

Part I: LCs; Part II: ELCs; and Part III: CCs, ACs, and ECs.

Classification of Final Results

(i) For each of the three parts, there shall be separate classification on the basis of the CGPA as indicated in Table - 2.

(ii) (ii) For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management/Literature as Outstanding/ Excellent/ Very Good/ Good/ Above Average/ Average, the marks and the corresponding CGPA earned by the candidate in Part III alone will be the criterion,

provided he / she has secured the prescribed passing minimum in the LCs and the ELCs.

(iii) (iii)Grade in Part IV and Part V shall be shown separately and it shall not be taken into account for classification.

(iv) (iv)Absence from an examination shall not be taken as an attempt.

Table 1 Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
40 and above but below 50	5	C
Below 40	0	R.A.

Table 2 Final Result

CGPA	Corresponding Grade	Classification of Final Results
9.00 and above	O	Outstanding
8.00 and above but below 8.99	A+	Excellent
7.00 and above but below 7.99	A	Very Good
6.00 and above but below 6.99	B+	Good
5.00 and above but below 5.99	B	Above Average
4.00 and above but below 4.99	C	Average
Below 4.00	R.A.	Re-Appearance

Credit based weighted Mark System is adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

Total Number of Credits to Be Earned For Award of the Degree = 180 (As per UGC B.Voc Guidelines)

B.Voc. Degree in Automobile Technology – Structure of the Syllabus

(W.e.f the academic year 2023-24)

Core Course Code	Category	Subject Order	Name of the Subject	L	T	P	C	Marks		
								CIA	ESE	Total
Semester - I										
22KHSC101	HSC01	II	Business Communication	4	0	0	4	25	75	100
22KHSC102	HSC02	IV	Value Education	2	0	0	2	25	75	100
22KBVA101	BC01	III	Fundamentals of Automobile Technology	4	0	0	4	25	75	100
22KBVA102	BSC01	III	Manufacturing Process	4	0	0	4	25	75	100
22KBVA103	BSC02	III	Technical Drawing	4	0	0	4	25	75	100
22KBVA104	PC01	III	Manufacturing Process Lab	0	0	6	6	40	60	100
22KBVA105	PC02	III	Office Automation With Tally	0	0	6	6	40	60	100
Total				**30**			**30**	**-**	**-**	**700**
Semester – II										
22KHSC201	HSC03	IV	Environmental Studies	2	0	0	2	25	75	100
22KBVA201	BC02	III	Safety Engineering	4	0	0	4	25	75	100
22KBVA202	BC03	III	Basic Electrical & Electronics	4	0	0	4	25	75	100
22KBVA203	BSC03	III	Automobile Repair and Maintenance	4	0	0	4	25	75	100
22KBVA204	PC03	III	Machine Drawing Lab	0	0	6	6	40	60	100
22KBVA205	ITC01	III	Industrial Training Level - I	0	0	10	10	40	60	100
Total				**30**			**30**	**-**	**-**	**600**
Semester – III										
22KBVA301	BC04	III	Total Quality Management	2			0	0	2	25
22KBVA302	BC05	III	Energy Sources For Automobiles	4			0	0	4	25
22KBVA303	AC01	III	Two & Three Wheeled Automobiles	4			0	0	4	25
22KBVA304	BSC04	III	Repair and Maintenance of Automotive Transmission System	4			0	0	4	25

22KBVA305	ASC01	III	Repair and Maintenance of Automotive Chassis System	4	0	0	4	25
22KBVA306	PC04	III	Repair And Maintenance of Automotive Engine Lab	0	0	6	6	40
22KBVA307	PC05	III	Repair And Maintenance of Auto Chassis Components Lab	0	0	6	6	40
Total				**30**	**30**	**-**	**-**	**700**
Semester IV								
22KBVA401	BC06	IV	Marketing Management	2	0	0	2	25
22KBVA402	AC02	III	Automotive Electrical Repairs	4	0	0	4	25
22KBVA403	AC03	III	Vehicle Maintenance and Trouble Shooting	4	0	0	4	25
22KBVA404	ASC02	III	Repair and Maintenance of Auto Electrical and Electronics Lab	4	0	0	4	25
22KBVA405	PC06	III	Repair and Maintenance of Automotive Transmission System Lab	0	0	6	6	40
22KBVA406	ITC02	III	Industrial Training Level - II	0	0	10	10	40
Total				**30**	**30**	**-**	**-**	**600**
Semester V								
22KHSC501	HSC04	IV	Soft Skills Development	2	0	0	2	25
	EC01	III	Elective Course - I	4	0	0	4	25
	EC02	III	Elective Course - II	4	0	0	4	25
22KBVA501	ASC03	III	Modern Electric Vehicles	4	0	0	4	25
22KBVA502	ASC04	III	Work shop Supervising and Management	4	0	0	4	25
22KBVA503	PC07	III	Vehicle Maintenance Lab	0	0	6	6	40
22KBVA504	PC08	III	Repair and Maintenance of Electric & Hybrid Vehicles Lab	0	0	6	6	40
Total				**30**	**30**	**-**	**-**	**700**
Semester VI								
22KHSC601	HSC05	IV	Gender Studies	2	0	0	2	25
22KHSC602	EDBP01	III	Entrepreneurship Development and Business Plan	4	0	0	4	25
22KBVA601	ASC05	III	Basics of Body Building and Repair	4	0	0	4	25

	SEC01	III	Skill Elective Course - I	4	0	0	4	25
	SEC02	III	Skill Elective Course - II	4	0	0	4	25
22KBVA602	P01	III	Project/ Industrial Training/Concurrent Field Practicum Course Training	0	0	12	12	20
Total				**30**	**30**	**-**	**-**	**600**
Semester – V **Elective Courses**								
22KBVA11	EC01	III	Employability Skills	4	0	0	4	25
22KBVA12		III	Human Resource Management	4	0	0	4	25
22KBVA13		III	Project Management and Operation Research	4	0	0	4	25
22KBVA14		III	Material and Metallurgy	4	0	0	4	25
22KBVA21	EC02	III	Urban Transport Requirement & Planning	4	0	0	4	25
22KBVA22		III	Corporate Social Responsibility	4	0	0	4	25
22KBVA23		III	Energy Storage System And Management System	4	0	0	4	25
22KBVA24		III	Production Planning And Control	4	0	0	4	25
Semester – VI **Skill Elective Courses**								
22KBVA31	SEC01	III	Automotive Air Conditioning System	4	0	0	4	25
22KBVA22		III	Automotive Pollution and Control	4	0	0	4	25
22KBVA33		III	Motor Vehicle Acts and Loss Assessment	4	0	0	4	25
22KBVA34		III	Tyre Technology	4	0	0	4	25
22KBVA41	SEC02	III	Corrosion and Prevention	4	0	0	4	25
22KBVA42		III	Performance Evaluation In Automobile Workshop	4	0	0	4	25
22KBVA43		III	Automotive System Design	4	0	0	4	25
22KBVA44		III	Off-road Vehicles	4	0	0	4	25

BUSINESS COMMUNICATION

Semester – I L T P C

22 KHSC101 4 0 0 4

Objective:

- ✓ To enable participants to communicate clearly and with impact, by improving their verbal and non-verbal communication style, as well as enhancing interpersonal skills.

Learning Outcomes:

The student will be able to acquire

- ✓ Apply communication strategies and principles to prepare effective communication for domestic and international business situations.
- ✓ Capable of effectively monitoring, analyzing, and adjusting their own communication behavior.
- ✓ Demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation.
- ✓ fluency in spoken language and enhance comprehension ability
- ✓ skills for writing different types of letters, notes, office orders
- ✓ ability to write project and other reports
- ✓ ability to lead a team and make an effective power point presentation

UNIT I Communication – Definition, Nature – Process of Communication, Objectives of Communication, Forms and Dimensions of Communication, Oral and Written Communication .Basic Grammar: Articles - Nouns and prepositions - Subject-verb agreement - Phrasal verbs - Modals - Tenses - Conditionals – Prefixes and suffixes – Prepositions -Adverbs – Relative pronouns - Passives - Conjunctions - Embedded questions - Punctuation – Abbreviationsconcord- collocations-phrasal verbs- idiomatic phrases

Sample activities: 1- Ask students to write a story/report/brochure, paying attention to the grammar.

UNIT II Writing skills: Letter Writing- Letter Writing, Sales Letter, Claim And Adjustment Letter And Social Correspondence. Inter-Office Correspondence Memorandum, Inter-Office Memo, Notices, Agenda, Minutes.External Correspondence Inviting Quotation, Sending Quotation, Placing Orders, Inviting Tenders. Job Application Job Application Letter, Preparing Resumes, Report Writing, Types Of Reports, Basic Formats Of Reports And Importance Of Including Visuals Such As Including Tables And Charts Non-verbal communication-Body language-Barriers-Principles of effective communication

UNIT III Reading Skills: Reading Tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings; Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/ expressions. **Activities:** a) Active reading of passages on general topics b) Comprehension

questions in multiple choice format c) Short comprehension questions based on content and development of ideas

UNIT IV Speaking- Fluency and pace of delivery – Art of small talk – Participating in conversations – Making a short formal speech – Describing people, place, events and things – Group discussion skills, interview skills and telephone skills.

Sample activities:- Conduct group discussion on issues on contemporary relevance. 2- Ask students to go around the campus and talk to people in the canteen, labs, other departments etc. and make new acquaintances. 3- Conduct mock interviews in class. 4- Record real telephone conversations between students and ask them to listen to the recordings and make the corrections, if any are required.

UNIT V Listening: Active listening – Barriers to listening – Listening and note taking **Activity:**Listening to announcements – Listening to news on the radio and television. Sample activities: 1- Information gap activities (e.g. listen to a song and fill in the blanks in the lyrics given on a sheet) 2- Listen to BBC news/ a play (without visuals) and ask the students to report what they heard. 23

Reference:

1. Antony Thomas,Business Communication and MIS, Pratibha Publications. Bhatia R.C.Business Communication
2. SaliniAgarwal Essential communication skill. Reddy P.N, and Apopannia, Essentials of Business communication.
3. Sharma R.C,KRISHNA Mohan, Business Communication and Report writing Leod,M.C.,Management Information system.

VALUE EDUCATION

Semester – I L T P C

22 KHSC102 2 0 0 2

Objectives:

- ✓ To understand the philosophy of life and values through Thirukural
- ✓ To analyse the components of values education to attain the sense of citizenship
- ✓ To understand different types of values towards National Integration and international understanding
- ✓ To learn yoga as value education to promote mental and emotional health
- ✓ To understand human rights, women rights and other rights to promote peace and harmony

Learning outcomes:

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

- ✓ Apply the values in thirukural to be peaceful, dutiful and responsible in family and society
- ✓ Develop character formation and sense of citizenship
- ✓ Be secular, self-control, sincere, respectful and moral.
- ✓ Master yoga, asana and meditation to promote mental health
- ✓ Be attitudinal to follow the constitutional rights

UNIT I PHILOSOPHY OF LIFE AND SOCIAL VALUES

Human Life on Earth (Kural 629) -Purpose of Life (Kural 46) -Meaning and

Philosophy of Life (Kural 131, 226) -Family (Kural 45), Peace in Family (Kural 1025) Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807) 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 (Kural 43, 981).

UNIT II HUMAN VALUES AND CITIZENSHIP

Aim of education and value education: Evolution of value oriented education, Concept of Human values: types of Values- Character Formation – Components of Value education- A P J Kalam's ten points for enlightened citizenship- The role of media in value building

UNIT III VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT:

Constitutional or national values: Democracy, socialism, secularism, equality, Justice, liberty, freedom and fraternity - Social Values: Pity and probity, self-control, universal brotherhood - Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith -Religious Values: Tolerance, wisdom, character – Aesthetic Values- Love and appreciation of literature and fine arts and respect for the same- National Integration and International Understanding.

UNIT IV YOGA AND HEALTH:

Definition, Meaning, Scope of Yoga - Aims and objectives of Yoga – Yoga Education with modern context - Different traditions and schools of Yoga - Yoga practices: Asanas, Pranayama and Meditation.

UNIT V HUMAN RIGHTS:

Concept of Human Rights: Indian and international perspectives- Evolution of

Human Rights- definitions under Indian and International documents –Broad classification of Human Rights and Relevant Constitutional Provisions: Right to

Life, liberty ad Dignity- Right to equality- Right against exploitation- Cultural and Educational Right- Economic Rights- Political Rights- Social Rights - Human Rights of Women and Children – Peace and harmony.

UNIT VI CURRENT CONTOURS: (for continuous internal assessment only):

References:

1. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004
2. Leah Levin, Human Rights, NBT, 1998
3. V.R. Krishna Iyer, Dialetics and Dynamics of Human Rights in India, Tagore Law Lectures.
4. Yogic Thearpy - Swami Kuvalayananda and Dr.S.L.Vinekar, Government of India, Ministry of Health, New Delhi.
5. SOUND HEALTH THROUGH YOGA - Dr.K.Chandrasekaran, Prem Kalyan Publications, Sedaptti, 1999.
6. Grose. D. N – "A text book of Value Education' New Delhi (2005)
7. Gawande . EN – "Value Oriented Education" – Vision for better living. New Delhi (2002) Saruptsons
8. Brain Trust Aliyar- "Value Education for Health, Happiness and Harmony" Erode (2004) Vethathiri publications

FUNDAMENTALS OF AUTOMOBILE TECHNOLOGY

Semester I	L	T	P	C
22KBVA101	4	0	0	4

Objective:

- ✓ To understand the basic principles of engines used for automobiles and different systems.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand the basic principles of engines
- ✓ Understand the importance of Automobile Engineering

UNIT-I INTRODUCTION:

Classification of automobiles - according to number of wheels, propulsion systems, transmission drives, type of fuels, application & capacity, study of main specifications. Components of an automobile - functions & layout of frame, frameless construction, axles, introduction of steering system, suspension system, braking system, power train & drives, clutch, gear box, final drive, propeller shaft, u-joints, vehicle body, wheels, tyres & tubes.

UNIT-II I C ENGINE:

Classification of heat engine, Selection of engine for two wheeler, three wheeler & four wheeler vehicles; constructional & working details of two strokes & four stoke petrol & diesel engines, different parts of internal combustion engine, applications and types, power and efficiency.

Unit III FUEL AND ELECTRICAL SYSTEMS

Carburetor –working principle, types of Carburetor. Construction, Operation of Lead Acid Battery – Electrical systems – generator – Starting Motor and Drives – Lighting and Ignition (Battery, Magneto Coil and Electronic Type)-Regulators-cut outs.

Unit IV COOLING AND LUBRICATION SYSTEMS

Cooling system - Air cooling system, water cooling system working principle -Lubrication system -types -Characteristics of lubricating oils - classification and identification of SAE oils. Servicing of all cooling and lubrication system components.

Unit V TRANSMISSION AND BRAKING SYSTEM

Introduction to transmission system, clutch, gear box (transmission), propeller shaft, universal joints, final drive and differential, rear axles. Function and principles of braking system, classification of various brakes used in automobiles.

References:

1. Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.
2. Heywood.J.B., Internal Combustion Engines Fundamentals, McGraw Hill Book Co.,1995
3. Automobile Engineering, R.K. Rajput, Laxmi Publications.
4. Ramalingam.K.K, Internal Combustion Engines, SciTech Publication, Chennai 2003.
5. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 1994
6. Devaradjane. Dr. G., Dr. M. Kumaresan, "Automobile Engineering", AMK Publishers, 2013.
7. DDU-KAUSHAL, 2016, Automobile Engineering, School of Skill Development and Entrepreneurship, Institute for Entrepreneurship and Carrere Development (IECD), Bharathidasan University, Khajamalai Campus, Tiruchirappalli-620 023.

MANUFACTURING PROCESS

Semester I	L	T	P	C
22KBVA102	4	0	0	4

Objective:

- ✓ To automobile components such as piston, connecting rod, crankshaft, engine block, front axle, frame, body etc., are manufactured by various types of production processes involving casting, welding, machining, metal forming, power metallurgy etc.

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand the Casting, Welding & Machining processes used for automotive components manufacturing
- ✓ Understand the basic methods of Forming and apply the knowledge for selecting suitable manufacturing process for automotive components manufacturing.

UNIT I FOUNDARY TECHNOLOGY

Patterns: Definition-types of patterns-solid pattern-split pattern-loosepiecepattern-match plate pattern. Castings: Principles of casting process-centrifugal casting-co2process-defects of castings

UNIT II JOINING PROCESS & INSPECTIONS OF WELDING PROCESSES

Arc Welding: Definition-arc welding equipment-electrode types-TIG welding -MIG welding-Laser beam welding. Gas welding: Oxy-Acetylene welding-Gas welding equipment's-Three types of flames-brazing-soldering-merits and demerits of weldings.

Types of welded joints-lap joint-butt joint-T-joint, corner joint-merits and demerits of welded joints- inspection and testing of welded joints.

UNIT III METAL FORMING PROCESS

Hot working process-cold working process-advantages of hot working and cold working process-rolling-forgings-types of forgings-smith forging-drop forging-upset forging-press forging and roll forging.

UNIT IV THEORY OF METAL CUTTING

Centre lathe: introduction – specifications-simple sketch for centre lathe-principal part. Drilling machine: Drilling operations-types of drilling machines-knurling-tapping. Basics of Grinding, Milling and CNC machine.

UNIT V RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS

Powder injection moulding – Shot peen hardening of gears – Production of aluminum MMC liners for engine blocks – Plasma spray coated engine blocks and valves – Recent developments in auto body panel forming – Squeeze casting of pistons – aluminum composite brake rotors – CNC lathe and milling.

References:

1. Hajra Choudhury, Elements of Workshop Technology, Vol. I and 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 Private Limited, 2007.
3. Serope Kalpajian, Steven R.Schmid, Manufacturing Processes for Engineering Materials, 4/e, Pearson Education, Inc. 2007.
4. R.K.Jain and S.C.Gupta, Production Technology, Khanna Publishers. 16th Edition,

2001.
5. H.M.T. Production Technology – Handbook, Tata McGraw-Hill, 2000.
6. Roy. A. Linberg, Process and Materials of Manufacture, PHI, 2000.
7. M. Adithan and A.B. Gupta, Manufacturing Technology, New Age, 2006

TECHNICAL DRAWING

Semester I L T P C

22KBVA103 4 0 0 4

Objectives:

- ✓ The course is aimed at developing basic graphic skills to enable them to draw basic automotive components and to learn about the intricacies of dimension and designs The emphasis while imparting instruction should be to develop conceptual skills in the students

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ The students should be able to read automobile engineering drawings and student should be in a position to understand the intricacies of the component design.

UNIT I INTRODUCTION

Scales – Recommended scales, reduced & enlarged Drawing Sheet size: A0, A1, A2, A3, A4, A5, Layout of drawing Sheet, sizes of title block and its contents. Using drawing instruments to draw straight lines, rectangles, squares, circles, polygons.

UNIT II JOINTS PULLEYS & ENGINE BEARINGS

Universal Joint, Slip Joint, Stepped or Cone Pulley, V-Belt Pulley, Bush Bearing, Split Bearing, Thrust Bearing, Ball Bearing, Roller Bearing, Straight and Needle

UNIT III FREEHAND SKETCHING OF ENGINE COMPONENTS

Sparkplug – Cylinder block - Crankshaft – Piston – Fuel Injector - Common rail fuel injection system - Electronic fuel injection system - Connecting rod – Petrol engine – diesel engine.

UNIT IV FREEH AND SKETCHING OF TRANSMISSION UNITS

Clutch– Single Plate Clutch – Multi plate clutch – gearbox- universal joint- propeller shaft - differential

UNIT V FREE HAND SKETCHING OF COOLING SYSTEM AND BRAKING SYSTEM

Cooling System - Lubrication system – braking system – Hydraulic –Pneumatic – suspension unit - leaf spring.

References:

1. R B Gupta; "Automobile Engineering Drawing", Satya Prkashan, New Delhi
2. P. S. Gill; "Machine Drawing" B D Kataria and Sons, Ludhiana

MANUFACTURING PROCESS LAB

Semester I	L	T	P	C
22KBVA104	0	0	6	6

Objective:

- ✓ To use of appropriate method, Tools and machine tools for performing Lathe operations, drilling operations and CNC lathe and milling operations.

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ Use of appropriate method, Tools and machine tools for performing Lathe operations
- ✓ Use of appropriate method, Tools and machine tools for performing drilling operations
- ✓ Use of appropriate method, Tools and machine tools for performing CNC lathe and milling operations.

1. Lathe practice

Plain turning and step turning

Taper turning

Thread cutting eccentric turning

Knurling

2. Drilling practice

Drilling

Reaming

Tapping

3. Milling practice

Plain milling

Undercut step milling

Hexagonal milling

Contour milling

4. Shaping and planning practice

Cutting key ways

Dove tail hexagonal machining

1. Surface Grinding Practice

6. Welding practice

Gas welding, Electric arc welding, MIG and TIG

7. Introduction to programming of **CNC lathe and milling machines.**

8. Facing, step turning and taper turning on **CNC lathe**

9. Pocketing and contouring on **CNC Mill.**

OFFICE AUTOMATION WITH TALLY

Semester I	L T P C
22KBVA105	0 0 6 6

Objectives:

- ✓ This subject helps the students to learn about Word Processing, Spread sheet to present the data through tables, charts and graphs (Excel/ Calc) and Presenting the data through slides with animation effects, relevant exercises are given, so that they can prepare the require document easily. It helps the student to know about the Excel, where they can prepare charts and use formula.

Tally course helps students to work with well-known accounting software

1. **M.S. WORD:**
   Preparing a newsletter.
   Creating and using styles and templates
   Printing envelopes and mail merge
   Creating and editing the table
   Creating numbered lists and bulleted lists
   Using the special features of word.

2. **M.S. EXCEL:**
   Prepare a Pay Bill for 10 Employees using various formulas in M.S. Excel.
   Create a chart for comparing the monthly sales of a company in different branch office
   Using the data consolidate command
   Finding and deleting / adding records
   Create a Pivot Table for Given Data

3. **M.S.POWER POINT:**

Create a new presentation using Blank Presentation – Formatting text and applying design templates.

Creating a new presentation – Apply Custom animation, Slide Transition – with sound effects.

Creating a new presentation using Auto content Wizard – apply rehearse timing - Set up show – Speaker Notes

4. **BASICS OF TALLY.**

Basics of Accounting, and Accounting Cycle

Introduction to Tally, and Company Information

ENVIRONMENTAL STUDIES

Semester II	L T P C
22KHSC201	2 0 0 2

Objectives:

- ✓ To appreciate the scope of Environmental Studies, Community ecology and the interdisciplinary nature of environmental issues
- ✓ To have a basic knowledge of Natural resources its classification, concepts, and natural resources of India.
- ✓ The course designed to gain knowledge on values of biodiversity and conservation on global, national, and local scales
- ✓ To study about sources and effects of environmental pollution like air, water, soil, thermal, marine, nuclear and noise
- ✓ To understand the concerns related to Sustainable Development on environment and health
- ✓ To introduce the students in the field of Law and Policies and Acts both at the national and international level relating to environment.

Learning outcomes:

- ✓ Understand the environmental importance including interactions across local to globalscales.
- ✓ The learners to update and analyze environmental relationships and interactions of environmental components
- ✓ The student to gain knowledge on importance of natural resources in a systematic way.
- ✓ The course content is introduce the concept of renewable and non-renewable energy resources and its scenario in India and at global level
- ✓ The students will know the relationship between biodiversity and ecosystem functions, direct and indirect values of biodiversity resources and their bioprospecting opportunities.
- ✓ The learners can gain awareness related on environmental pollution, causes and pollution control with case studies.

- ✓ Student to obtain the environmental ethics and gain knowledge about the sustainable development.
- ✓ Learners should realize the environmental legislation and policies of national and international regime and know the regulations applicable to industries and other organizations with significant Environmental aspects

UNIT: 1

The Multidisciplinary nature of environmental studies Definition, scope and importance. Need for public awareness

UNIT: 2

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

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

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

UNIT: 3 ECOSYSTEMS

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession.
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:-

  a. Forest ecosystem

  b. Grassland ecosystem

  c. Desert ecosystem

d. Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT: 4 BIODIVERSITY AND ITS CONSERVATION

- Introduction – Definition : Genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT: 5 ENVIRONMENTAL POLLUTION

Definition Causes, effects and control measures of :

a. Air Pollution b. Water Pollution c. Soil Pollution d. Marine Pollution e. Noise pollution f. Thermal Pollution g. 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.
- Ill-Effects of Fireworks: Firework and Celebrations, Health Hazards, Types of Fire, Firework and Safety

UNIT: 6 SOCIAL ISSUES AND THE ENVIRONMENT

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns. Case studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation

- Public awareness.

UNIT: 7 HUMAN POPULATION AND THE ENVIRONMENT

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

UNIT: 8 FIELD WORK

Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

References:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.

2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt ltd, Ahamedabad – 380013, India, E-mail: mapin@icenet.net(R)

3. Brunner R.C. 1989, Hazardous Waste Incineration, McGraw Hill Inc 480 p

4. Clark R.S. Marine Pollution, Clanderson Press Oxford (TB)

5. Cunningham, W.P.Cooper, T.H.Gorhani E & Hepworth, M.T. 2001.

6. De A.K. Environmental Chemistry, Wiley Eastern Ltd

7. Down to Earth, Centre for Science and Environment (R)

8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford University, Press 473p.

9. Hawkins, R.E. Encyclopedia of India Natural History, Bombay Natural History Society, Bombay (R)

10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press 1140 p.

SAFETY ENGINEERING

Semester II	L	T	P	C
22KBVA201	4	0	0	4

Objectives:

- ✓ To impart knowledge on safety engineering fundamentals and safety management practices.

- ✓ To impart knowledge about linear and angular measuring instruments.

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ Knowledge on safety engineering fundamentals and safety management practices.
- ✓ Knowledge about linear and angular measuring instruments.

UNIT I INTRODUCTION

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety - Risk assessment & management - Safety Education and training- Importance, various training methods – First Aid, Resuscitation, Bleeding, management of shock, Burns, scalds and accidents caused by electricity, Rescue and transport of casualty Role of management and role of Govt. in industrial safety, safety analysis.

UNIT II SAFETY PREVENTION

Definitions and theories, Accident, Injury, unsafe condition, Dangerous occurrence- Cost of accidents- Accident prevention- Safety performance - Personal protective equipment- survey the plant for locations and hazards, part of body to be protected - Economic importance of accidents, Analysis of accident records, accident investigations.

UNIT III SAFETY IN MATERIAL HANDLING

General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, electrical guards, work area, material handling, inspection - Heat treatment operations, paint shops, sand and shot blasting, safety in inspection and testing, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoring devices, radiation hazards.

UNIT IV SHOP FLOOR SAFETY

Automotive vehicle design, selection, operation and maintenance of motor vehicle – Basic automotive road Signals, Symbols, Rules and Regulation - safety on manual, mechanical handling equipment operations - Servicing and maintenance equipment grease rack operation wash rack operation - battery charging - gasoline handling - other safe practices - preventive maintenance - check lists - motor vehicle insurance and surveys.

UNIT V ELECTRICAL SAFETY

General principles of electric safety - Preventive maintenance - Electricity & Human body - Earthing / Grounding - Safety against over voltage, extra-low and residual voltages - Hazardous areas, Electrical insulation - Energy leakage - Electrical fires and Arc flash - Electrical causes of fire and explosion - National electrical Safety code - Safety in the use of portable tools.

References:

1. C.Ray Asfahl , Industrial Safety and Health management, Pearson Prentice Hall,2003.
2. N.V Krishnan. Safety Management in Industry Jaico Publishing House, Bombay, 1997.

BASIC ELECTRICAL & ELECTRONICS

Semester II	L T P C
22KBVA202	4 0 0 4

Objectives:

- ✓ To impart knowledge on Basic Electrical & Electronics practices.
- ✓ To provides knowledge of different principals of electrical engineering, basic idea of different electronic components, semi conducting devices, transducers and digital electronics used in the industry.

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ Knowledge on different principals of electrical engineering, basic idea of different electronic components, semi conducting devices, transducers and digital electronics used in the industry.

UNIT – I FUNDAMENTALS OF DC & AC CIRCUITS

Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor , Kirchhoff's laws, Mesh analysis, Nodal analysis, Ideal sources – equivalent resistor, current division, voltage division. Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phase or representation, Introduction to three phase systems - types of connections, relationship between line and phase values. Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, induced emfs and inductances.

UNIT – II ELECTRONIC COMPONENTS & SEMICONDUCTOR DEVICES

Resistors, capacitors & inductors (properties, common types, I-V relationship and uses), Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell).

UNIT – III TRANSDUCERS & DIGITAL ELECTRONICS

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

UNIT – IV NUMBER SYSTEMS

Binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

References:

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

AUTOMOBILE REPAIR AND MAINTENANCE

Semester II	L	T	P	C
22KBVA203	4	0	0	4

UNIT I PETROL ENGINE

Types – Working principle of each – Major components – Petrol supply system and its components – Carburetor – Petrol pump and injectors of MPFI engine – Various sensors and its uses – Diagnosing troubles in petrol supply system.

UNIT II DIESEL ENGINE

Diesel supply system and its components – Individual injection system – CRDI – Diesel pump – Injectors – Filters – Types of combustion chambers – Air supply system – Air cleaners – Exhaust and emission system – Silencers (Mufflers) – Catalytic convertor – Diagnosing troubles in diesel supply system.

UNIT III COOLING AND LUBRICATION SYSTEM

Cooling system and its components – Coolants used – Antifreeze solution – Types of cooling systems – Lubrication system and its components – Types of lubrication systems – Types of lubricants – Properties and SAE grade of lubricating oils – Electronics ignition system – Types and its components- Diagnosis of troubles in cooling system, lubricating system and ignition system.

UNIT IV TRANSMISSION SYSTEM

Clutch – Types – Function – Fluid flywheel – Torque convertor – Hydraulic assisted clutch – Clutch adjustments – Gear box – Types – Functions – Constant mesh gear box – Synchromesh gear box – Manual and automatic gear boxes – Planetary gears. Transfer box – Trans axle arrangement – Propeller shaft and universal joints – Rear axle and differential – Final drives – Diagnosing troubles in clutch, gear box and rear axles.

UNIT V STEERING SYSTEM

Steering system – Types – Components – Rack and pinion, Warm and sector and recirculating ball and nut steering gear boxes – Electronics control of steering system – Wheel alignments. Suspension systems – Conventional suspension – Independent suspension system for front and

rear wheels – Types of springs and shock absorbers – Stability control – Air suspension with electronic control – Diagnosing troubles in steering system and suspension system.

References:

1. Automobile Engineering, R.K. Rajput, Laxmi Publications.
2. Ramalingam.K.K, Internal Combustion Engines, SciTech Publication, Chennai 2003.
3. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 1994
4. Devaradjane. Dr. G., Dr. M. Kumaresan, "Automobile Engineering", AMK Publishers, 2013.
5. Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.

MACHINE DRAWING LAB

Semester II	L	T	P	C
22KBVA204	0	0	6	6

Objectives:

- ✓ To know about the basic of drafting of engine components using AUTOCAD software.
- ✓ To know about the basic of drafting and assembling of engine using AUTOCAD software.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Draw various components such as piston, connecting rod, crank shaft, engine valves etc.
- ✓ Draw various components and assemble it with components such as piston-connecting rod, screw jack etc.

List of Experiments

1. Drawing of automobile components such as
2. Piston,
2. Connecting rod,
3. Valves,
4. Manifold,
5. Crank shaft.
6. Assembly drawing of

7. Screw jack,
8. Piston – connecting rod assembly,
9. Valve assembly,
10. Clutch assembly,
12. Gear box assembly.

INDUSTRIAL TRAINING LEVEL - I

Semester II	L T P C
22KBVA205	0 0 6 6

Objectives:

- ✓ To technical part of the curriculum will be dealt with practical part of the curriculum for the students in order to get ready for industrial demands.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Technical part of the curriculum will be dealt with practical part of the curriculum for the students in order to get ready for industrial demands.

Level – I

- Students will be provided an industrial training at appropriate industry/industries for a minimum of 3 weeks and a maximum of 4 weeks during the semester period.
- Students will be exposed to gain hands-on-experience in Automotive Engineering Service Centers (Two, Three and Four Wheelers).
- Technical part of the curriculum will be dealt with practical part of the curriculum for the students in order to get ready for industrial demands.

TOTAL QUALITY MANAGEMENT

Semester III	L T P C
22KBVA301	2 0 0 2

Objectives:

- ✓ To enable the students to understand the principles, practices and application in Total Quality Management and Concepts.

Learning Outcomes:

- ✓ Enable the students to understand the principles, practices and application in Total Quality Management and Concepts.

UNIT I Introduction – Need for quality – Evolution of quality – Definitions of quality – Dimensions of product and service quality – Basic concepts of TQM – TQM Framework – Contributions of Deming, Juran and Crosby – Barriers to TQM – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

UNIT II TQM PRINCIPLES- Leadership – Quality Statements, Strategic quality planning, Quality Councils – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal – Continuous process improvement – PDCA cycle, 5S, Kaizen – Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I- The seven traditional tools of quality – New management tools – Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.- Statistical Process Control- Central Tendency, Normal curve, Control charts,

UNIT IV TQM TOOLS AND TECHNIQUES II- Quality Circles – Cost of Quality – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures.Six Sigma

UNIT V QUALITY MANAGEMENT SYSTEM - Introduction— Quality Systems- ISO 9000, ISO 9000:2000, ISO 14000, other quality systemsBenefits of ISO Registration—ISO 9001 Requirements—Implementation—Documentation—Internal Audits-EMS-Introduction—ISO 14000 Series Standards

References:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,MaryB.Sacre,HemantUrdhwareshe and RashmiUrdhwareshe, ―Total Quality Management, Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
3. Janakiraman. B and Gopal .R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
5. ISO9001-2015 standards

ENERGY SOURCES FOR AUTOMOBILES

Semester III	L	T	P	C
22KBVA302	4	0	0	4

Objectives:

- ✓ To provides knowledge about different forms of energy and their classification. It provides automobile solutions for sustainable development practices in societal and environmental context with low emissions.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Distinguish the types of energy used in automobiles.
- ✓ Characteristics of bio fuel used in automobile industry
- ✓ Understanding mixture of bio fuel with hydrocarbon
- ✓ Study the importance of conventional energy sources
- ✓ Knowledge of fuel cells used in automobile industry

UNIT-I ENERGY SOURCES

Different forms of energy, classification of energy resources- commercial- non commercial, renewable- non renewable, conventional- non conventional, availibilty of conventional energy resources, classification of non conventional energy resources.

UNIT II ELECTRICAL ENERGY SOURCE

types of SPV Cells, applications, features and limitations of SPV cells. Cell batteries for electrical energy, types of batteries, traction batteries- lead acid, lithium ion, Process of utilizing battery for automobiles propulsion, hybrid cars.

UNIT III SOLAR POWER

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

UNIT IV BIO FUELS

need and necessity, types, advantages. Process of using – blending of biofuels with hydrocarbon fuels. Fuel properties of biogas, fuel properties of biomass, Fuel cells.

UNIT V HYBRID ENERGY SYSTEMS

Wind - diesel system, wind - PV system, micro hydro-PV system ,biomass - PV-diesel system, geothermal-tidal and OTEC systems

References:

1. Alternate Fuels by Dr. S. Thipse, Jaico Publications
2. "Automotive Emission Control" by Crouse, AND Anglin – McGraw Hill.
3. "Alternative Fuels Guidebook" by Bechtold R.. o SAE Paper nos. 840367, 841333, 841334. o "Internal Combustion Engines" by Ganeshan – Tata McGraw Hill.
4. Chetan Singh Solanki, 'Solar Photovoltaics -Fundamentals, Technologies and Applications', PHI Learning Pvt. Ltd., New Delhi, 2011
5. Ramesh R, Kurnar K.U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, reprint 2003.

TWO & THREE WHEELED AUTOMOBILES

Semester III	L T P C
22KBVA303	4 0 0 4

Objectives:

- ✓ Present a problem oriented in depth knowledge of two and three wheeler technology.
- ✓ Address the underlying concepts and methods behind two and three wheeler technology.

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ To present a problem oriented in depth knowledge of two and three wheeler technology.
- ✓ To address the underlying concepts and methods behind two and three wheeler technology.

UNIT I POWER UNIT

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.

UNIT II FUEL AND IGNITION SYSTEMS

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

UNIT III CHASSIS AND SUB-SYSTEMS

Mainframe, 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 IV BRAKE AND WHEELS

Drum brakes, Disc brakes, front and rear brake links layouts. Spoked wheel, Cast wheel. Disc wheel. Disc types. Tyres & tubes.

UNIT V TWO & THREE WHEELERS – CASE STUDY

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer, Servicing and maintenance, recent developments**.**

References:

1. Irving. P.E., Motor cycle Engineering, Temple Press Book, London, 1992
2. The Cycle Motor Manual, Temple Press Ltd., London, 1990.
3. Encyclopedia of Motorcycling, 20 volumes, Marshall Cavensih, New York and London, 1989. 4. Bryaut. R.V., Vespa Maintenance and Repair series.
4. Raymond Broad, Lambretta – A practical guide to maintenance and repair, 1987

REPAIR AND MAINTENANCE OF AUTOMOTIVE TRANSMISSION SYSTEM

Semester III	L	T	P	C
22KBVA304	4	0	0	4

Objectives:

- ✓ To understand the purpose of clutch, gear box and drive train
- ✓ To compare various types of transmission system
- ✓ To understand the various types of brakes and suspension system.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand the purpose of clutch, gear box and drive train
- ✓ Compare various types of transmission system
- ✓ Understand the various types of brakes and suspension system.

UNIT I CLUTCH AND GEAR BOX

Introduction of clutch – Function – types of clutch – single plate clutch and multi plate clutch - clutch disc – clutch adjustment – troubles and remedies of clutch. Gear Box: Purpose of gear box – gear ratio – types of gear box (constant and synchromesh) – gear selector mechanism – troubles and remedies in the gear box

UNIT II JOINTS AND WHEELS

Working method of Universal joint and types of Universal Joint – propeller shaft – final drive – differential rear axle – Introduction of Wheels – types of wheels – Wheel balancing. Troubles and remedies in the wheels.

UNIT III AXLE AND STEERING SYSTEM

Function of front axle – materials and types of front axles – maintenance of front axle – steering system – purpose and requirements of steering system – description of steering parts – types of steering gear boxes – steering ratio – steering geometry – wheel wobbling

UNIT IV BRAKE

Introduction of brake – purpose of brake – hand brake – mechanical brake – hydraulic brake (master cylinder and wheel cylinder) – vacuum servo brake – air brake.

UNIT V FRAME AND SUSPENSION SYSTEM

Frame – suspension system conventional suspension system- shock absorber – Independence suspension system – Wheel balancing – Tube and tyre – Vulcanizing.

References:

1. Automobile Engineering – Volume I and II – Mr.B. Thangamani
2. A Text Book of Automobile Engineering, R.K. Rajput, Firewall Media, 2007.
3. Automobile Engineering, Ttti, R. B. Asthana, Bhopal, Jain & Asthana, Tata McGraw-Hill Education, 2002.
4. Automobile Engineering, Sudhir Kumar Saxena, Laxmi Publications, 2009
5. Basic Automobile Engineering, Nakra Cp, Dhanpat Rai Publishing Company (P) Limited, 2009.

REPAIR AND MAINTENANCE OF AUTOMOTIVE CHASSIS SYSTEM

Semester III	L	T	P	C
22KBVA305	4	0	0	4

Objectives:

- ✓ To understand the construction details of various types of automotive chassis and basic functions of subsystems in the chassis.
- ✓ To distinguish various types of suspension system, brake system, steering system and wheels & tyres in the vehicles.
- ✓ To apply the knowledge for selection of suitable subsystems for a vehicle.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand the construction details of various types of automotive chassis and basic functions of subsystems in the chassis.
- ✓ Distinguish various types of suspension system, brake system, steering system and wheels & tyres in the vehicles.
- ✓ Apply the knowledge for selection of suitable subsystems for a vehicle.

UNIT I INTRODUCTION

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.

UNIT II DRIVE LINE

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, Multi–axle vehicles, Differential principle and types, Differential housings, Non–Slip differential, Differential locks. Diagnosing troubles in Drive line.

UNIT III AXLE AND TYRES

Construction of rear axles. Types of loads acting on rear axles; Full floating, Three quarter floating and semi floating rear axles. Rear axle housing. Construction of different types of axle housings. Multi axled vehicles. Construction details of multi drive axle vehicles. Types of wheels, constructional details of wheels and rims, solid and pneumatic tyres, constructional details of tyres, life of tyres.

UNIT IV SUSPENSION SYSTEM

Need of suspension system -Types of suspension -Suspension springs -Constructional details and characteristics of leaf, coil and torsion bar springs -Independent suspension. Rubber suspension - Pneumatic suspension -Shock absorbers.

UNIT V BRAKING SYSTEM

Brakes – Function – Types – Hydraulic brake system – Master cylinder, Tandem master cylinder – Wheel cylinder – Vacuum assisted hydraulic brake – Air assisted hydraulic brake – Brake bleeding – Brake fluids – Disc brake – Types of calipers – Friction pads – Advantages over drum brake – Air brake system and its components – Advantages – ABS brake system – Modulator / Actuator, ECU / ECM & HCU – ABS with traction control. Wheels – Types – Tyres and its types – Construction – Wear pattern – Inflation pressure – Tyre mark – Vulcanizing – Air and hydrogen inflation in tyres– Diagnosing troubles in brakes and wheel.

References:

1. Kripal Singh, Automobile Engineering, Standard Publishers, 2011
2. R.K. Rajput, A Text–Book of Automobile Engineering, Laxmi Publications Pvt.Ltd, 2007.
3. N.K. Giri, Automotive Mechanics Khanna Publishers, New Delhi, 2005
4. Heldt P.M., Automotive Chassis Chilton Co., New York, 1990.
5. Newton Steeds and Garret, Motor Vehicles 13th Edition, Butterworth, London, 2005.
6. Heinz Hazler, ―Modern Vehicle Technology‖, Butterworth, London, 2005.

REPAIR AND MAINTENANCE OF AUTOMOTIVE ENGINE LAB

Semester III	L	T	P	C
22KBVA306	0	0	6	6

Objectives:

- ✓ To dismantle and Assemble the automobile Engine components
- ✓ To identify & differentiate components of SI & CI multi cylinder engines
- ✓ To understand working of carburetor, gearbox, fuel pumps and clutch systems.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Dismantle and Assemble the automobile Engine components
- ✓ Identify & differentiate components of SI & CI multi cylinder engines
- ✓ Understand working of carburetor, gearbox, fuel pumps and clutch systems.

1. Dismantling of Single cylinder IC engine (Two wheeler)
2. Assembling of Single cylinder IC engine (Two wheeler)
3. Dismantling and Assembling of 4 cylinder petrol engine.
4. Dismantling and Assembling of 6 cylinder diesel engine.
5. Dismantling, Studying and Assembling the piston and connecting rod assembly.
6. Dismantling, Studying and Assembling the given A.C. Mechanical fuel pump and Solex Carburettor.
7. Learning to 'overhaul', 'adjust the brake shoe' and 'bleed the air' in the hydraulic brake system.
8. Study of oil filter, fuel filter, fuel injection system, carburetor, MPFI
9. Study of ignition system components – coil, magneto and electronic ignition systems.
10. Study of engine cooling system components
11. Study of engine lubrication system components
12. Ovality and taper measurement of cylinder bore and comparison with standard specifications
13. Ovality and taper measurement of engine crank shaft and comparison with standard specification

REPAIR AND MAINTENANCE OF AUTOMOTIVE CHASSIS COMPONENT LAB

Semester III	L T P C
22KBVA307	0 0 6 6

Objectives:

- ✓ To Study and measurement of the Light motor vehicle frame Heavy duty vehicle frame.
- ✓ To Study and dismantling and assembling of Front Axle, Rear Axle, Differential, Steering systems and braking system.
- ✓ To Study and Dismantling and Assembling of clutch, gear box and transfer case.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ To Study and measurement of the Light motor vehicle frame Heavy duty vehicle frame.
- ✓ To Study and dismantling and assembling of Front Axle, Rear Axle, Differential, Steering systems and braking system.
- ✓ To Study and Dismantling and Assembling of clutch, gear box and transfer case.

Study and measurement of the following chassis frames:

1. Light motor vehicle frame

2. Heavy duty vehicle frame

Study and dismantling and assembling of

3. Front Axle

4. Rear Axle

5. Differential

6. Steering systems along with any two types of steering gear box

7. Braking systems – hydraulic servo vacuum, compressed air power brakes.

8. Leaf spring, coil spring, torsion bar spring, Hydraulic shock absorber

MARKETING MANAGEMENT

Semester - IV L T P C
22KBVA401 2 0 0 2

Course Objective:

- ✓ To familiarize the students to understand the basics of marketing and sales pertaining to Supply Chain Management.

Learning Outcomes:
The student will be able to gain

- ✓ To create basic understanding of marketing concepts
- ✓ To develop knowledge of marketing mix strategies
- ✓ To embed in-depth understanding of pricing, policies and promotion

UNIT I Introduction: Meaning and definition of different marketing concepts, functions of marketing, environmental factors, market segmentation, buying motive and process, consumer and customer, Factors affecting consumer behavior, Marketing Plan;

UNIT II Marketing Mix Strategies: meaning, product, product mix, product life cycle, importance of branding, packaging and labeling.

UNIT III Marketing Channels, their Structure; Channel Intermediaries-Role and Types; Wholesaling and Retailing; Logistics of Distribution; Channel Planning, Organizational Patterns in Marketing Channels: Assessing Performance of Marketing Channels; International Marketing Channels.

UNIT IV Pricing: Pricing policies, objectives, factors influencing pricing decisions, different pricing strategies: skimming, penetration. Market structure, channel of distribution and its importance; Promotion: Advertising, objectives and functions, types of advertising, personal selling and direct marketing, Sales Promotion

UNIT V Distribution Management - Managing marketing logistics & channels, Channel Integration - VMS, HMS, Channel Management, and Marketing channel Policies & legal issue. Channel Institutions & control, Wholesaling &- Retailing, Channel Information systems, Managing & Evaluating Channel Performance Case & future trends in sales & distribution management.

UNIT VI Current Trends: Digital marketing: concept, importance, techniques. Facebook, LinkedIN and Twitter, Google Adwords, Google Plus, Search Engine Optimization (SEO), YouTube and Video Marketing, Affiliate Marketing & Google AdSense, E-mail Marketing, Lead Generation & Marketing Automation, Google Analytics and Webmaster Tool, Case Studies.

Reference:

1. Bhattacharjee C. (2006) Service Marketing, Excel Books, New Delhi.
2. Kotler Philip and Gray Armstrong (2016) Principles of Marketing, Prentice Hall, New Delhi. 51 B. Voc (Retail and Logistics Management)
3. Parry E. Mark (2005) Strategic Marketing Management, Tata McGraw Hill, New Delhi 2005
4. Rajan Saxena (2009) Marketing Management, Tata McGraw-Hill, New Delhi.
5. Sharma Kapil (2006) Marketing Management, Global India Publication Pvt. Ltd., New Delhi.

AUTOMOTIVE ELECTRICAL REPAIRS

Semester IV	L T P C
22KBVA402	4 0 0 4

Objective:

- ✓ To impart knowledge to the students in the principles of operation and constructional details of various Automotive Electrical and Electronic Systems like Batteries, Starting System, Charging System, Ignition System, Lighting System and Dash – Board Instruments.

Leaning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Distinguish the various basic electrical and electronics systems of an automobile.
- ✓ Recognize and understand the different wiring diagrams used in automobile manuals.

UNIT I AUTOMOBILE ELECTRICAL SYSTEM

The automobile direct current (DC), 12 Volt, vehicle body earth returns electrical system. Basic circuits of automotive electrical system. Automotive wiring. Low-tension and high-tension cables. Colour coding of wires. Electrical symbols.

UNIT II BATTERIES

Lead-acid type battery. Working, materials, battery ratings, battery testing ,battery chargers, battery defects, battery maintenance.

UNIT III STARTING SYSTEM

Construction, function and working of starting motor, starter switches and starter drives. Types of starting motors, drives and switches. Service and maintenance of starter motor.

UNIT IV CHARGING SYSTEM

Components of charging system and their functions. Construction and working of alternator and cutout-relay. Regulators for alternators. Voltage regulators. Maintenance of charging system.

UNIT V LIGHTING SYSTEM

Various types of lighting lamps and bulbs in an automobile. Construction, function of various components and working of head lamp, side light, stop light, tail light, indicator light etc. Lighting switches, relays, fuses, wiring harness cables and connectors. Adjustment of headlights. Maintenance and fault rectification in lighting system.

UNIT VI IGNITION SYSTEM

Types of ignition system. Electronic, transistorized coil ignition system (TCI), capacitive discharge ignition system (CDI). Ignition system testing- ammeter test, voltmeter test and resistant test for finding faults in ignition system, Spark plug testing, ignition timing testing and setting.

References:

1. Raj Kumar Chouhan "Automotive Electrical & Electronics Equipments", Ishan Publications
2. P.L. Kohli, "Automotive Electrical Equipments" McGraw Hill, New Delhi
3. Jack Erjavec, "Automotive Technology- A Systems Approach" Thomson Delmar Learning Publishers, Singapore
4. Anil Chhikara, "Automobile Engineering" Vol.2 Satya Prakashan, New Delhi
5. Tom Denton, "Automobile Electrical and Electronics Systems" Indian Ed., Routledge (T&F Group) Publications

VEHICLE MAINTENANCE AND TROUBLE SHOOTING

Semester IV	L	T	P	C
22KBVA403	4	0	0	4

Objective:

- ✓ To the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ At the end of the course, the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

UNIT I MAINTENANCE TOOL, SHOP, SCHEDULE, RECORDS

Standard tool set, torque wrenches, compression and vacuum gauges, engine analyzer and scanner, computerized wheel alignment and balancing, gauges for engine tune up and pollution measurement, spark plug cleaner, cylinder re boring machine, fuel injection calibration machine. Importance of maintenance. Schedule and unscheduled maintenance. Scope of maintenance. Equipment downtime. Vehicle inspection. Reports. Log books. Trip sheet. Lay out and requirements of maintenance shop.

UNIT II POWER PLANT REPAIR AND OVERHAULING

Dismantling of power plant and its components. Cleaning methods. Inspection and checking. Repair and reconditioning methods for all engine components. Maintenance of ignition system, fuel injection system, cooling system,- lubrication system. Power plant trouble shooting chart.

UNIT III MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS

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

UNIT IV MAINTENANCE AND REPAIR OF VEHICLE BODY

Body panel tools for repairing. Tinkering and painting. Use of soldering, metalloid paste. Tyre maintenance, metallic, plastics.

UNIT V MAINTENANCE AND REPAIR OF ELECTRICAL SYSTEMS

Care, maintenance, testing and trouble shooting of battery, starter motor, dynamo, alternator and regulator. Transistorized regulator problems.

References:

1) A.W.Judge, Motor Vehicle Servicing, 3rd Edition, Pitman Paperpack, London , 1969.
2) 2W.Crouse, Everyday Automobile repair, Intl.student edition, TMH, New Delhi, 1986.
3) Ernest Venk., Edward spicer, Automotive maintenance and trouble shooting, D.B. Taraporevala Sons, Bombay, 1963
4) Stator Abbey, Automotive steering, braking and suspension overhaul, pitman publishing, London, 1971.
5) Frazee, fledell, Spicer,-Automobile collision Work, American technical publications, Chicago, 1953.

6) John Dolce, Fleet maintenance, Mcgraw Hill, Newyork, 1984
7) A,W.Judge, Maintenance of high speed diesel engines, Chapman Hall Ltd., London, 1956.
8) V.L.Maleev, Diesel Engine operation and maintenance, McGraw Hill Book CO., Newyork, 1995.
9) Vehicle servicing manuals.

REPAIR AND MAINTENANCE OF AUTO ELECTRICAL AND ELECTRONICS LAB

Semester IV	L T P C
22KBVA404	0 0 6 6

Objectives:

- ✓ To recognize and understand the different wiring diagrams used in automobile manuals.
- ✓ To understand basic electrical and electronic circuits used in automobile systems and also understand the basic programming with the 8085 microprocessor

Learning outcomes:

After successful completion of this course, the students should be able to:

- ✓ Recognize and understand the different wiring diagrams used in automobile manuals.
- ✓ Understand basic electrical and electronic circuits used in automobile systems and also understand the basic programming with the 8085 microprocessor

Electrical Laboratory

1.Testing of batteries and battery maintenance

2.Testing of starting motors and generators

3.Testing of regulators and cut – outs

4.Diagnosis of ignition system faults

5.Study of Automobile electrical wiring.

6. Testing the ignition system components for proper functioning and their servicing

7. Testing the ignition timing and adjustments, as specified

8. Testing all electrical light lamps and switches for proper functioning

Microprocessor

1. Block Transfer
2. 8 bit Addition, Subtraction
3. Multiplication and Division
4. Maximum and Minimum of block of data

5. Sorting
6. Stepper Motor Interfacing

REPAIR AND MAINTENANCE OF AUTOMOTIVE TRANSMISSION SYSTEM LAB

Semester IV L T P C

22KBVA405 0 0 6 6

Objectives:

- ✓ To understand the purpose of clutch, gear box and drive train
- ✓ To Study and dismantling and assembling various types of transmission system
- ✓ To understand the various types of brakes and suspension system.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand the purpose of clutch, gear box and drive train
- ✓ Able to dismantling and assembling various types of transmission system and understand the various types of brakes and suspension system.

1. Dismantling, Studying and Assembling the given fuel injection pump.
2. Dismantling, Studying and Assembling the given Single plate clutch assembly and to practice to adjust clutch free play.
3. Dismantling, Studying and Assembling the given type of gearbox.
4. Dismantling, Overhauling and assembling the differential unit and also practicing to adjust the backlash.
5. Determine the gear ratio, final transmission ratio and overall ratio for a gear box.
6. Study and Dismantling and Assembling of Transfer case
7. Dismantling, Studying and Assembling the given steering gearbox, and also knowing to adjust the backlash and end play.
8. Measure wheel base, wheel track, ground clearance, angle of approach, minimum turning circle radius for a vehicle, steering ratio, lock-to-lock angle.
9. Dismantling, Studying and Assembling the various parts of battery coil ignition system such as distributor, spark plug and etc.

INDUSTRIAL TRAINING LEVEL - II

Semester IV L T P C

22KBVA406 0 0 6 6

Objectives:

- ✓ To technical part of the curriculum will be dealt with practical part of the curriculum for the students in order to get ready for industrial demands.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Technical part of the curriculum will be dealt with practical part of the curriculum for the students in order to get ready for industrial demands.

Level – II

- Students will be provided an industrial training at appropriate industry/industries for a minimum of 3 weeks and a maximum of 4 weeks during the semester period.
- Students will be exposed to gain hands-on-experience in Automotive Manufacturing Industry.
- Technical part of the curriculum will be dealt with practical part of the curriculum for the students in order to get ready for industrial demands.
- Students have to submit a separate report and also present a seminar talk about the training undergone.

SOFT SKILLS DEVELOPMENT

Semester - V L T P C

22KHSC501 2 0 0 2

Objectives:

- ✓ To Develop communicative competence among the Students.
- ✓ To enhance the learner's soft skills by giving adequate exposure in LSRW and sub skills.
- ✓ To enable learners to put the life skills into practice with confidence.

Learning outcomes:

- ✓ Develop listening, speaking, reading and writing skills in English.
- ✓ Enhance soft skills and engage in a range of communicative tasks and activities
- ✓ Comprehend a text and identify specific and global information
- ✓ Promote communicative ability in both spoken and written form of the language
- ✓ Develop interpersonal skills to maintain human relationship
- ✓ Develop corporate skills to promote leadership qualities and team spirit.

UNIT- I KNOW THYSELF / UNDERSTANDING SELF

Introduction to Soft skills-Self discovery-Developing positive attitude-Improving perceptions-Forming values.

UNIT -II INTERPERSONAL SKILLS/ UNDERSTANDING OTHERS:

Developing interpersonal relationship-Team building-group dynamics-Net working- Improved work relationship

UNIT -III COMMUNICATION SKILLS / COMMUNICATION WITH OTHER

Art of listening –Art of reading –Art of speaking –Art of writing-Art of writing e-mails e mail etiquette.

UNIT- IV CORPORATE SKILLS / WORKING WITH OTHERS

Oral Presentation – Memos- Note taking - Note making and preparing Minutes- Reports, Proposals, Abstracts - Technical Writing.

UNIT -V SELLING SELF / JOB HUNTING

Writing resume/cv-interview skills-Group discussion- Mock interview-Mock GD – Goal setting - Career planning

UNIT - VI CURRENT CONTOURS: (for continuous internal assessment only):

References:

1. N. Krishnasamy, Manju Dhariwel and Lalitha Krishnasamy(2015). Mastering Communication Skills and Soft Skills – Bloomburg.
2. Meena.K and V.Ayothi (2013) A Book on Development of Soft Skills (Soft Skills : A Road Map to Success), P.R. Publishers & Distributors,
3. Meera Banerjee and Krishna Mohan: Developing Communication Skills, Trinity Publishers- (Lakshmi Publications.
4. Alex K. (2012) Soft Skills – Know Yourself & Know the World, S.Chand & Company LTD, Ram Nagar, New Delhi- 110 055.

ELECTIVE COURSES 1

EMPLOYABILITY SKILLS

Semester V	L T P C
22KBVA11	4 0 0 4

Objectives:

- ✓ To discuss types of communication and their forms.
- ✓ To improve comprehension.
- ✓ To improve spoken English and ability to articulate ideas
- ✓ To improve formal writing skills

Learning Outcomes:

- ✓ To learn about communication process and ways to make communication effective by giving attention to all elements involved.
- ✓ To improve grammar and gain confidence by enhancing their abilities to articulate their ideas.
- ✓ To acquire better writing skills in formal communication.
- ✓ To be able to revise documents for fruitful reading and comprehension

UNIT I COMMUNICATION SKILL

Oral and written communication Listening skills, written communications, motivation, ethics, Time management, facing job interviews, behaviour skills, Assessing oneself.

UNIT II ENGLISH LITERACY

Pronunciation, listening speaking and reading: - greetings and introductions describing people, Telephone skills, Office Hospitality, Describing things.

UNIT III ENTREPRENEURSHIP SKILLS- 1

Scope and advantage of self-employment, Entrepreneurial skills, values and attitudes, Characterchicts of Successful Entrepreneurs, Identification of entrepreneurs bu self-assessment, Micro, small and medium enterprises, Creativity and idea generation.

UNIT IV ENTREPRENEURSHIP SKILLS – 2

Understanding Consumer, Market Survey: Scope & Influence of publicity and advertisement, Accounting and analysis, Assistance provided by Central and State Govt. Organisations, Project formation, feasibility and profitability estimates, Filling up a Preliminary Project Report Proforma, Investment procedure-loan procurement.

ReferenceS:

1. Wren and Martin. High School English Grammar and Composition. New Delhi: RRP, 2007
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge, 2017
3. Malhotra, Prerna and Halder, Deb. Communication Skills: Theory and Practice.

HUMAN RESOURCE MANAGEMENT

Semester - V	L T P C
22KBVA12	4 0 0 4

Objective:

- ✓ The course aims at equipping learners with the analytical and conceptual skills necessary to interpret the nature, forms and incidences of human resources management (HRM) and the key issues facing organizations in their attempts to develop and implement HRM policies.

Course outcomes:

The student will be able to gain

- ✓ To create basic understanding of human resource management in L&SCM operations
- ✓ To develop the knowledge of organisation structures and design
- ✓ To infuse in-depth understanding of planning processes and procurement of human resources
- ✓ To make proficiency in managing internal mobility and training of human resources
- ✓ To have comprehensive knowledge of compensation systems, challenges of managing employees.

UNIT I Introduction to Human Resource in retail and logistic operations: Evolution, Importance, Scope, functions, Long Run and Short Run Objectives.

UNIT II Planning for Human Resource, Organizational charts, Design for specific needs. Job analysis,

UNIT III Process of job analysis, Job specification, Methods of job analysis, Recruitment & selection.

UNIT IV Placement, Induction, socialization, Internal mobility of human resource. Training of employees, Need for training, objectives and methods of training, evaluation, Motivation of human resource.

UNIT V Compensation management & grievance redressal, Compensation planning, wage systems, factors influencing wage system, Absenteeism &Employee turnover, Labour participation in management. Dynamic Component for Continuous Internal Assessment: Contemporary Developments to the course during the semester

References:

1. Almas Sultana (2014) Human Resource Management in Organized Retail Industry in India, Global Journal of Finance and Management.
2. Aswathappa K. (2005) Human Resource and Personnel Management Tata McGraw-Hill Education.
3. Bhatla Neeta, Krishan Kant Pandey (2014) The impact of HR issues in retail sector in emerging market, IOSR Journal of Business and Management.
4. Michael Levy and Barton Weitz (2007) Retailing Management, Mc Graw Hill, Irwin.
5. Dwivedi R.S (2009) Human Resource in Indian Organisation, Vikas Publishing House.

PROJECT MANAGEMENT AND OPERATIONS RESEARCH

Semester V	L	T	P	C
22KBVA13	4	0	0	4

Objective:

- ✓ This course is to create awareness about optimization in utilization of resources. To understand and apply operations research techniques to industrial operations and Institutes.

Learning Outcomes:

- ✓ To create awareness about optimization in utilization of resources.
- ✓ To understand and apply operations research techniques to industrial operations and Institutes.

UNIT 1 INTRODUCTION

Operations research development, history, definitions, objectives, characteristics, limitations, phases and applications. Linear Models: Formation of an L.P model, graphical solution,

simplex algorithm, artificial variables technique– Big M method, two phase method, Duality in LPP.

UNIT II TRANSPORTATION PROBLEMS

Introduction, Methods for finding initial solution, Test of optimality, Maximization and Minimization Transportation problems, Transshipment problems, Degeneracy.

UNIT III ASSIGNMENT PROBLEMS

Introduction, Solution methods, Variations of the assignment problem, Traveling salesman problem. Replacement Models: Replacement of items that deteriorates with time, Value of money changing with time and not changing with time, Optimum replacement policy , Individual and group replacement.

UNIT IV QUEUING THEORY

Queuing models, queuing systems and structures, notation, parameter, single server and multiserver models, Poisson input, exponential service, constant rate service, infinite population. Sequencing Models: Scheduling and sequencing, assumptions in sequencing models, processing 'n' jobs on 'm' machines, processing of two jobs on machines with each having different processing order.

UNIT V GAME THEORY

Introduction, Two-person zero-sum game, Minimum and Maximum principle, Saddle point, Methods for solving game problems with pure and mixed strategies. Inventory Models: Types of Inventory, EOQ, ERL, Deterministic inventory problems, Price breaks, stochastic inventory problems and Selective inventory control techniques.

References:

1. Wayne.L.Winston, Operations research applications and algorithms, Thomson learning,4th edition 2007.
2. Taha H.A, "Operation Research", Pearson Education sixth edition, 2003
3. S. D. Sharma, "Introduction to Operations Research", Discovery Publishing House, New Delhi P. K. Gupta, D. S. Hira, "Operations Research", S Chand and Co. Ltd., ISBN 81-219-0281-9.

MATERIAL AND METALLURGY

Semester V	L	T	P	C
22KBVA14	4	0	0	4

Objective:

- ✓ To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

Learning Outcomes:

After completion of this course the students shall be able to

- ✓ Explain alloys and phase diagram, Iron-Iron carbide diagram and steel classification.
- ✓ Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.
- ✓ Summarize the mechanism of plastic deformation and testing mechanical properties.
- ✓ Clarify the effect of alloying elements on ferrous and non-ferrous metals.
- ✓ Differentiate different non-mettalic materials

UNIT I ALLOYS AND PHASE DIAGRAMS

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

UNIT II HEAT TREATMENT

Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening. .

UNIT III FERROUS AND NON-FERROUS METALS

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels – HSLA, Maraging steels – Cast Iron - Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

UNIT IV NON-METALLIC MATERIALS

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON –Composites-ClassificationsMetal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test lzod and charpy, fatigue and creep failure mechanisms.

References:

1. Kenneth G.Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 2010.
2. Raghavan.V, “Materials Science and Engineering”, Prentice Hall of India Pvt. Ltd., 2015.
3. U.C.Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012
4. Upadhyay. G.S. and Anish Upadhyay, “Materials Science and Engineering”, Viva Books Pvt. Ltd., New Delhi, 2006.

ELECTIVE COURSES - 2

URBAN TRANSPORTATION REQUIREMENT & PLANNING

Semester V	L	T	P	C
22KBVA21	4	0	0	4

Objectives:

- ✓ This subject provides knowledge of different principals of electrical engineering, basic idea of different electronic components, semi conducting devices, transducers and digital electronics used in the industry.
- ✓ The objective of this subject is to make the student understand the transportation requirement in the urban areas and to be aware of the basics of planning.
- ✓ The student should have basic knowledge about street, road and highways.

Learning Outcomes:

- ✓ The student after studying this subject should be able to plan the transportation and should be able to design the roads or pathways accordingly.

UNIT I INTRODUCTION & URBAN TRANSPORTATION SYSTEM PLANNING

Role of transportation in urban development, Transportation problems in urban areas, Purpose of transportation planning, Transportation planning process and factors affecting it, Travel demand and factors affecting it, Urban transport forecasting.

UNIT II TRANSPORTATION PLAN PREPARATION

Definitions: corridor, corridor traffic forecasting, corridor traffic study, count, segment, point, segment capacity, screen line, Corridor identification, Mass transit system, Urban mass rapid transit system, Rail based transit – Metro, Light rail transit system (LRT), Mono rail, Sky rail, Road based transit – Bus rapid transit system (BRTS), Electric trolley bus, commuter Bus / City Bus.

UNIT III TRAFFIC MANAGEMENT AND CONTROL

Traffic Management measures; Arterial Management; Traffic Signs - principles, types and design considerations, road markings; Traffic Signals - types, optimal cycle length and signal

settings, warrants; Regulation of Traffic - speed regulation, regulation of vehicle, parking regulations.

UNIT IV TRANSPORT AND ENVIRONMENT

Traffic noise - factors affecting noise, abatement measures, standards; air pollution - factors affecting air pollution levels, abatement measures, standards; Traffic Safety- accident reporting and recording systems, factors affecting road safety; Transport Planning for Target groups - Children, adults, handicapped and women; Norms and Guidelines for highway landscape.

References:

1. Kadiyali, L. R., "Traffic Engineering and Transportation Planning", Khanna Publishers, New Delhi
2. Hutchison, B. G., "Introduction to Transportation Engineering and Planning", Tata McGraw-Hill Pvt. Ltd.
3. Morlok, Edward K., "Introduction to Transportation Engineering and Planning", Tata McGraw-Hill Pvt. Ltd.
4. Vuchic, Vukan R., "Urban Public Transit System and Technology", PHI Learning, New Delhi
5. Dickey, John W., "Metropolitan Transportation Planning", Tata McGraw-Hill Pvt. Ltd.

CORPORATE SOCIAL RESPONSIBILITY

Semester V	L T P C
22KBVA22	4 0 0 4

Objectives:

- ✓ Understand and demonstrate the intrinsic interdependence between Corporate Social Responsibility (CSR), Corporate Governance (CG) and the plethora of issues/approaches facing the world today, first and foremost dealing with aspects of sustainability.

Learning Outcomes:

- ✓ Understand and demonstrate the intrinsic interdependence between Corporate Social Responsibility (CSR), Corporate Governance (CG) and the plethora of issues/approaches facing the world today, first and foremost dealing with aspects of sustainability.
- ✓ Understand and demonstrate the underlying differences between CSR in divergent geographic regions of the world. This predominantly relates to institutional theory, agency theory and cultural divergence.
- ✓ Understand the roles of governments, corporations, legal systems, societies, individuals and the environment in the context of 'responsibility'.
- ✓ Understand, analyze, rationalize (defend) and formulate CSR mandates for companies.

UNIT I

Introduction to CSR Meaning & Definition of CSR, History & evolution of CSR. Concept of Charity, Corporate philanthropy, Corporate Citizenship, CSR-an overlapping concept. Concept of sustainability & Stakeholder Management.

UNIT II

International framework for corporate social Responsibility, Millennium Development goals, Sustainable development goals, Relationship between CSR and MDGs.

UNIT III

CSR-Legislation In India & the world. Section 135 of Companies Act 2013.Scope for CSR Activities under Schedule VII, Appointment of Independent Directors on the Board, and Computation of Net Profit's Implementing Process in India.

UNIT IV

The Drivers of CSR in India, Market based pressure and incentives civil society pressure, the regulatory environment in India Counter trends. Performance in major business and programs. Voluntarism Judicial activism.

UNIT V

Identifying key stakeholders of CSR & their roles. Role of Public Sector in Corporate, government programs that encourage voluntary responsible action of corporations. Role of Nonprofit &Local SelfGovernance in implementing CSR- Case Studies of Major CSR Initiatives.

Reference:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz
2. The World Guide to CSR - Wayne Visser and Nick Tolhurst
3. Innovative CSR by Lelouche, Idowu and Filho
4. Corporate Social Responsibility in India - Sanjay K Agarwal
5. Handbook on Corporate Social Responsibility in India, CII.
6. Handbook of Corporate Sustainability: Frameworks, Strategies and Tools - M. A. Quaddus, Muhammed Abu B. Siddique
7. Growth, Sustainability, and India's Economic Reforms – Srinivasan

ENERGY STORAGE SYSTEM AND MANAGEMENT SYSTEM

Semester V	L	T	P	C
22KBVA23	4	0	0	4

Objectives:

- ✓ To understand the different types of energy storage system.
- ✓ To study about the battery characteristic & parameters.
- ✓ To model the types of batteries
- ✓ To know the concepts of battery management system and design the battery pack.

- ✓ To study about the battery testing, disposal and recycling.

Learning Outcomes:

- ✓ Discuss about the different types of energy storage system.
- ✓ Describe about the battery characteristic & parameters.
- ✓ Model different types of batteries
- ✓ Apply the concepts of battery management system and design the battery pack.
- ✓ Explain about the battery testing, disposal and recycling.

UNIT – I ENERGY STORAGE SYSTEM

Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System.

UNIT – II BATTERY CHARACTERISTICS & PARAMETERS

Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters- Heat generation- Battery design- Performance criteria for Electric vehicles batteries- Vehicle propulsion factors- Power and energy requirements of batteriesMeeting battery performance criteria- setting new targets for battery performance.

UNIT – III BATTERY MODELLING

General approach to modelling batteries, simulation model of a rechargeable Li-ion battery, simulation model of a rechargeable NiCd battery, Parameterization of the NiCd battery model, Simulation examples.

UNIT – IV BATTERY PACK AND BATTERY MANAGEMENT SYSTEM

Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests.

UNIT – V BATTERY TESTING, DISPOSAL & RECYCLING

Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process, Thermal Runway: High discharge rates, Short circuits, charging and discharging. Environment and Human Health impact assessments of batteries, General recycling issues and drivers, methods of recycling of EV batteries.

References:

1. Ibrahim Dinçer, Halil S. Hamut and Nader Javani, "Thermal Management of Electric Vehicle Battery Systems", John Wiley& Sons Ltd., 2016.
2. Chris Mi, Abul Masrur& David Wenzhong Gao, "Hybrid electric Vehicle- Principles & Applications with Practical Properties", Wiley, 2011.
3. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric Hybrid Electric and Fuel Cell Vehicles", Taylor& Francis Group, 2010.
4. James Larminie, John Lowry, "Electric Vehicle Technology Explained", John Wiley & Sons Ltd, 2003.

E. Pistoia, J.P. Wiaux, S.P. Wolsky, "Used Battery Collection and Recycling", Elsevier, 2001. (ISBN: 0-444-50562-8)

5. Guangjin Zhao, "Reuse and Recycling of Lithium-Ion Power Batteries", John Wiley & Sons. 2017. (ISBN: 978-1-1193-2185-9)
6. T R Crompton, "Battery Reference Book-3rd Edition", Newnes- Reed Educational and Professional Publishing Ltd., 2000.
7. Arno Kwade, Jan Diekmann, "Recycling of Lithium-Ion Batteries: The LithoRec Way", Springer, 2018. (ISBN: 978-3-319-70571-2).

PRODUCTION PLANNING AND CONTROL

Semester V	L T P C
22KBVA24	4 0 0 4

Objectives:

- ✓ This course is to understand the various components and functions of production planning and control and to know the recent trends like manufacturing requirement Planning (MRP) and Enterprise Resource planning (ERP). To know the importance of selection of material, machines, methods and manpower.

Learning Outcomes:

- ✓ To understand the various components and functions of production planning and control
- ✓ To know the recent trends like manufacturing requirement Planning (MRP) and Enterprise Resource planning (ERP).
- ✓ To know the importance of selection of material, machines, methods and manpower.

UNIT I INTRODUCTION

Definition – Objectives of production Planning and Control – Functions of production planning and control –Types of production – Organization of production planning and control department – Internal organization of department – Information required for Production Planning.

UNIT II FORECASTING

Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitive methods.

UNIT III INVENTORY MANAGEMENT

Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems – Introduction to MRP & ERP, LOB (Line of Balance).

UNIT IV ROUTING

Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure. Schedule –definition – Difference with loading.

UNIT V SCHEDULING POLICIES

Techniques, Standard scheduling methods, Line Balancing, Aggregate planning, Chase planning, Expediting, controlling aspects. Dispatching – Activities of dispatcher – Dispatching procedure – followup – definition – Reason for existence of functions – types of followup - applications of computer in production planning and control.

References:

1. Modern Production/ operation managements / Baffa & Rakesh Sarin/Wiley & Sons.
2. Elements of Production Planning and Control / Samuel Eilon/ Collier Macmillan Ltd.
3. Manufacturing Planning and control/ Partik Jonsson & Stig-Arne Mattsson/ TATA Mc Graw – HILL Edition.
4. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller/ Prentice-Hall. Production Planning & Control / M. Mahajan / Dhanpat Rai & Co.
5. Production Control A Quantitative Approach / John E. Biegel/ Prentice-Hall.
6. Production Control / Franklin G. Moore, Ronald Jablonski/ McGraw-Hill.

MODERN ELECTRIC VEHICLES

Semester - V L T P C

22KBVA501 4 0 0 4

Objective:

- ✓ The course aims to understand about basics of hybrid electric vehicle, to understand about drives and control. Select battery, battery indication system for EV applications. Design battery charger for an EV

Learning Outcomes:

After completing this course, learners should be able to:

- ✓ To understand about basics of hybrid electric vehicle
- ✓ To understand about drives and control.
- ✓ Select battery, battery indication system for EV applications

- ✓ Design battery charger for an EV

UNIT I INTRODUCTION TO ELECTRIC VEHICLES

Electric Vehicle – Purpose of Electrical vehicles - Types – Cost and Emissions. Electric Vehicle Technology – layouts, cables, components, Controls. Batteries. Ultra-capacitor, Charging – Methods and Standards. Alternate charging sources – Wireless &Solar. Hybrid Electric vehicles

UNIT II ELECTRIC VEHICLE MOTORS

Motors (DC, Induction) – Electric motors requirements, Principle. Electric Drive Trains (EDT) – Electrical Coupling –Mechanical Coupling– Torque Coupling and Speed Coupling. Switched Reluctance Motors (SRM) Drives.

UNIT III BATTERIES FOR ELECTRICAL VEHICLES

Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors . Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications - Efficiency of batteries, methods of recycling of EV batteries

UNIT – IV FUEL CELLS FOR ELECTRIC VEHICLES

Fuel cell – Introduction, Types. Operation principles, Fuel and Oxidation Consumption, Fuel cell Characteristics – Efficiency, Durability, Specific power, Factors affecting, Power design of fuel Cell Vehicle and freeze capacity. Lifetime cost of Fuel cell Vehicle – System, Components, maintenance.

UNIT V REGENERATIVE BRAKING SYSTEM

Introduction to regenerative braking system –Advantages and disadvantages- Conceptof regenerative braking system using piezoelectric material, Shock absorbers as energy harvester

Reference:

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., “Vehicular Electric Power Systems” Boca Raton, CRC Press, 2003
2. Husain, I. “Electric and Hybrid Vehicles” Boca Raton, CRC Press, 2010.
3. Larminie, James, and John Lowry, “Electric Vehicle Technology Explained” John Wiley and Sons, 2012
4. Tariq Muneer and Irene IllescasGarcía, “The automobile, In Electric Vehicles: Prospects and Challenges”, Elsevier, 2017
5. Sheldon S. Williamson, “Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles”, Springer, 2013

WORK SHOP SUPERVISING AND MANAGEMENT

Semester V	L	T	P	C
22KBVA502	4	0	2	6

Objective:

- ✓ This course provides knowledge of appropriate use of resources and planning of project. Various automobile marketing techniques are inculcated through various research methodologies.

Learning Outcomes:

After completing this course, learners should be able to:

- ✓ **To** Study of resources used in automobile firms
- ✓ **To** How to follow service schedules for maintenance of automobile.
- ✓ **To** Knowledge of job orders in marketing of automobiles
- ✓ **To** Solving various assignment problems for assigning job roles
- ✓ **To** Understanding guidelines for workshop areas

UNIT I MANAGEMENT TRAINING AND OPERATIONS

Basic principles of supervising - Organising time and people - Job instruction training, training for new devices and techniques - Evaluate and allotment of technician – Vehicle operation and types of process - Work scheduling, Overtime, Breakdown analysis, Cost estimation - Vehicle technical specifications of various OEM vehicular products – Relevant and up-to-date knowledge of vehicle design, manufacture, consumer, industry and trade practices - Importance of maintenance, types- preventive (scheduled) and breakdown (unscheduled) maintenance - Safety precautions in maintenance- Knowledge of free and paid service schedules, fault diagnosis, technician notes, job cards, warranty procedures, log sheets and other forms- Evaluate the information gathered from the customer report, customer satisfaction.

UNIT II ENGINE MAINTENANCE

Lubrication system - lubricating/ engine oil top up, oil changing, cleaning methods, visual and dimensional inspections, minor/major adjustments of various components - maintenance of engine accessories- air filter, battery, cooling system, electrical wiring in engine compartment. Engine tune up, top overhauling, dismantling of engine - components, cleaning, visual and dimensional inspections, minor/major reconditioning of various components, reconditioning methods, engine assembly - special tools used for maintenance/ overhauling.

UNIT III MAINTENANCE OF OTHER ASSEMBLIES LUBRICATION SYSTEM

lubricating/ gear oil top up, oil changing, cleaning methods - visual and dimensional inspections, minor/major adjustments of various components of transmission system - Servicing and maintenance of clutch, gear box, propeller shaft, differential - Servicing and maintenance of suspension system, brake system, steering system, wheel alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE

Checking of electrical components for functioning, checking of battery, electrolyte - top up, terminal cleaning & protection methods, checking of starter motor, checking of charging

systems- fan belt tension checking and adjustment - Testing methods for checking of ignitions system, lighting system - fault diagnosis and maintenance of modern electronic controls - checking and servicing of dash board instruments.

UNIT V MOTOR VEHICLE ACT AND POLLUTION CONTROL AND STANDARDS

Motor Vehicle Act: Schedules and sections, Registration of motor vehicles, Licensing of drivers, Control of permit, Limits of speed, traffic signs - Constructional regulations - Description of goods carrier, delivery van, tanker, tipper, Municipal - fire fighting and break down service vehicle.

Pollution: Pollutant formation in Engines, mechanism of HC and CO formation in four stroke and two stroke engines, NOx formation in engines - Engine Design modifications, fuel modification, evaporative emission control - EGR, air injection, thermal reactors, Water Injection, catalytic converters - Application of microprocessor in emission control- Pollution standards, driving cycles – Indian Pollution standards.

References:

1. Tim Gills, "Automotive Service: Inspection, Maintenance, Repairing", Cengage Learning, 2004
2. Kirpal Singh, "Automobile Engineering", Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.

VEHICLE MAINTENANCE LAB

Semester – V	L T P C
22KBVA503	0 0 6 6

Objectives:

- ✓ To recognize and understand the different alignment, adjustment and balancing used in automobile.
- ✓ To understand and measurement of valve parameters in automobile systems.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Recognize and understand the different alignment, adjustment and balancing used in automobile.
- ✓ Understand and measurement of valve parameters in automobile systems.

1. Study and layout of an automobile repair, service and maintenance shop.

2. Study and preparation of different statements/records required for the repair and maintenance works.

3. Measurement of cylinder bore parameters.
4. Experiment on leaf spring
5. Valve grinding, valve lapping.
6. Calibration of fuel injection pump
7. Wheel alignment-testing of camber, caster.
8. Testing kingpin inclination, toe-in and toe-out.
9. Chassis alignment testing
10. Brake adjustment
11. Brake bleeding.
12. Wheel Balancing
13. Measurement of valve parameters.

REPAIR AND MAINTENANCE OF ELECTRIC AND HYBRID VEHICLES LAB

Semester – V	L T P C
22KBVA504	0 0 6 6

Objectives:

- ✓ To introduce about Electric and Hybrid Vehicles basics, understand repairing of suspension and steering system., to study the repairing of Electric and Hybrid Vehicles Drive Train and to perform the E-vehicle overhaulining.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ To introduce about Electric and Hybrid Vehicles basics.
- ✓ To understand repairing of suspension and steering system.
- ✓ To study the repairing of Electric and Hybrid Vehicles Drive Train.
- ✓ To perform the E-vehicle overhaulining.

1. Understand working of different configurations of electric vehicles

2. Understand hybrid vehicle configuration and its components, performance analysis

3. Understand the properties of batteries and its types

4. Understand of electric vehicle drive systems.

5. Understand of hybrid electric vehicles.

6. Understand Auxiliary systems including charging, starter motor, on board power supply, lighting and environmental sensing and conducting repairs. Repair & Replacement of Electric/ Hybrid Vehicle body

7. Repair & Replacement of Electric Vehicle Drive Train

8. Fault diagnosis & repair / replacement of Battery, DC & AC Electrical Machines, and Hybrid Electric Vehicles.

GENDER STUDIES

Semester VI	L T P C
22KHSC601	2 0 0 2

Objectives

- ✓ To make students to aware of Gender constructions and gendering Process
- ✓ To explore existing gender biases in the society and to understand the need to work towards the inclusive society
- ✓ To inculcate sensitivity and build gender perspectives.
- ✓ To use the course to bring attitudinal cum behavioral changes towards gender neutral ambience and promote the humanistic values

Learning Outcomes:

- ✓ Students would have gained a perspective and understood the social reality of gender society understood the differences of gender and sex and may resort to building alternative perspectives and critical thinking.
- ✓ Gained knowledge on the various social institutions governing gender and the intersectionality.
- ✓ Exposed to the kind of initiatives of the State towards gender equality

UNIT- I INTRODUCTION TO GENDER STUDIES CONCEPTS

Gender Spectrum.-Sex – Gender distinction – Biological Determinism – Patriarchy – Feminism –Gender Socialization and Stereotyping-Gender Discrimination – Gender Division of labour and roles– Gender Sensitivity and awareness – Gender Equity – Equality – Gender Main streaming and Gender Analysis.

UNIT- II UGC INITIATIVES ON WOMEN'S STUDIES

Definition of Women's Studies –Gender Studies –UGC Initiatives and guidelines on Women's Studies - Beijing Conference, UN Initiatives – Convention on Elimination of All forms of Discrimination Against Women (CEDAW)- Sustainable Development Goals on Gender Equality (SDG 5) and targets

UNIT- III AREAS OF GENDER DISCRIMINATION

Gender Socialization- Sex Ratio– Health and Nutrition– – Literacy and Education - Employment- Governance – participation in decision making- politics- property rights and

access to credit- gender based violence- Social institutions –Family, Caste, Class, religion, gender, State. Market – Media – Politics – Judiciary

UNIT -IV WOMEN DEVELOPMENT AND GENDER EMPOWERMENT

Towards Equality Report of Status of Women in India 1974 – International Women's Decade – International Women's Year – National Policy for Empowerment of Women 2001

UNIT -V WOMEN'S MOVEMENTS AND SAFEGUARDING MECHANISM

In India National /State Commission for Women(NCW) – All Women Police Station – Family Court Legislations safeguarding women –Transgender Policy—Constitutional amendments for women's political participation

UNIT - VI CURRENT CONTOURS: (for continuous internal assessment only):

Tamil Nadu State Policy for Women 2021- National Policy for Women 2015 – Prevention of Sexual Harassment at Work places Act 2013- Protection of Children from Sexual Offences Act, 2012 - Analysis of regressive and progressive High court and supreme court judgments- women proactive policies, programmes, interventions

References:

1. Bhasin Kamala, Understanding Gender : Gender Basics , New Delhi : Women Unlimited ,2004
2. Bhasin Kamala, Exploring Masculinity: Gender Basics , New Delhi: Women Unlimited,2004
3. Bhasin Kamala , What is Patriarchy? : Gender Basics, New Delhi :Women Unlimited ,1993
4. Arya Sadhna Women ,Gender Equality and the State ,New Delhi :Deep &Deep Publication, 2000
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6. Mishra .O.P,Law Relating to Women &Child ,Allahabad :Central Law Agency ,2001
7. Uma Chakravarti, Gendering Caste Through a Feminist Lens, Sage Publication 2003
8. Bhattacharya Malini , Sexual Violence and Law ,Kolkata; West Bengala Commission for Women ,2002
9. Sexual Harassment at the Workplace – A Guide , New Delhi;Sakshi,1999
10. m[pjh> FLk;g td;KiwapypUe;J ngz;fis ghJfhf;Fk; rl;lk; 2005> kJiu : Vf;jh 2005
11. nghd;.fpU\;zrhkp>N[.ghy; gh];fh;&M.[hd; tpd;nrd;l;> ngz;fSk; cr;r ePjpkd;wKk;> kJiu :Nrhf;Nfh thrfh; tl;lk;> 2004
12. FLk;g td;KiwapypUe;J ngz;fis ghJfhf;Fk; rl;lk; 2005- ifNaL> jpUr;rp: Women's Integrated National Development Trust
13. https://www.schooloflegaleducation.com/women-and-law-in-india-e-book/

ENTREPRENEURSHIP AND BUSINESS PLAN

Semester - VI	L T P C
22KHSC602	4 0 0 4

OBJECTIVES

- ✓ The goal of this subject is to provide a space and platform for discovery, both self discovery and opportunity discovery. Students will discover their strengths in terms of an entrepreneurial skill founding team and learn basics such as opportunity discovery, prototyping, competition analysis, and early customer insights and participate in on-line and campus activities and events such as idea competitions, business plan challenges, etc.

LEARNING OUTCOMES

- ✓ This course motivates to become an entrepreneur.
- ✓ The students also learn to prepare business plan

UNIT-I Introduction to Entrepreneurship Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, Myths about entrepreneurs, agencies in entrepreneurship management and future of entrepreneurship types of entrepreneurs.

UNIT-II The Entrepreneur Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.

UNIT-III E-Cell Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell

UNIT-IV Communication Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation.

UNIT-V Introduction to various form of business organization (sole proprietorship, partnership, corporations, Limited Liability company), mission, vision and strategy formulation.

References:

1. Dr. P.T .Vijayashree& M. Alagamma,2010,Entrepreneurial Development & Small Business Mgmt.MarghamPublications,Tamilnadu,India.
2. Tim Berry,2008,The Plan-as-You-Go Business Plan, Entrepreneur Press;Fitch Irvine, CA

BASICS OF BODY BUILDING AND REPAIR

Semester VI	L	T	P	C
22KBVA601	4	0	0	4

Objectives:

- ✓ At the end of the course, the students will be able to have a sound knowledge for the design of the vehicles body to give maximum comfort for the passengers and exposed to the methods of stream lining the vehicles body to minimize drug.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand the car body and commercial used in automobile.
- ✓ Understand the body material used in automobile systems.
- ✓ Learn the vehicle aerodynamics

UNIT I CAR AND BUS BODY DETAILS

Types of Car body and Bus body. Types of body constructions-Conventional and Integral body construction. Car body & Bus body construction – Construction regulations for bus body – Layout dimensions.

UNIT II COMMERCIAL VEHICLE BODY AND TYRE

Different types of commercial vehicle bodies. Constructional details of platform body, Tipper body and Tanker body. Dimension of driver's seat in relation to controls. Drivers cab design.

UNIT III BODY MATERIALS AND TRIM

Steel sheet, Aluminum, Timber, Plastics, GRP and PRP. Corrosion and Anti corrosion methods. Body panel tools for repairing, tinkering and soldering. Surface finish: Painting processes – Electroplating of components, Vacuum coating and Electrostatic painting. Body trim items.

UNIT IV VEHICLE AERODYNAMICS

Objectives- Vehicle drag and types, various types of forces & moments and their effect. Various body optimization techniques for minimum drag. Wind tunnel testing - Flow visualization techniques, scale model testing.

UNIT V BODY REPAIR

Integral body - frame – design features of an integral body frame – safety body cell – off road vehicles – accident damage and diagnosis – before repair decisions – body repair spares. Repair procedures – minor damage vehicle repairs – repairs with washer welder – repairs with hammer and dolly – panel filling with plastic body fillers and putties – body aligning – panel replacement – outer door panel replacement – rust repairs – surface rust repairs – repair of severely rusted panels. Corrosion protection.

References:

1. Powloski J, Vehicle Body Engineering, Business Books Ltd, 1989.
2. Giles G.J. Body Construction & Design Illiffe Books Butter worth & co., 1971

3. John Fenton Vehicle Body Layout and Analysis, Mechanical Engineering Publication Ltd., London, 1980.

4. Body repair Techniques, Anil Chhikara, Satya Prakashan, New Delhi – Vol IV.

SKILL ELECTIVE COURSES 1

AUTOMOTIVE AIR CONDITIONING SYSTEM

Semester VI	L T P C
22KBVA31	4 0 0 4

Objective:

- ✓ To the end of the course, the students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ At the end of the course, the students will be able to understand the components of the automotive air-conditioning and their functions and the latest developments in this field.

UNIT I AIR-CONDITIONING FUNDAMENTALS

Basic air conditioning system - location of air conditioning components in a car, schematic layout of a refrigeration system, compressor components, condenser and high pressure service ports, thermostatic expansion valve, expansion valve calibration, controlling evaporator temperature, evaporator pressure regulator, evaporator temperature regulator.

UNIT II AIR CONDITIONER – HEATING SYSTEM

Automotive heaters, manually controlled air conditioner, heater system, automatically controlled air conditioner and heater systems, automatic temperature control, air conditioning protection, engine protection.

UNIT III REFRIGERANT

Containers handling refrigerants, tapping into the refrigerant container, refrigeration system diagnosis, diagnostic procedure, ambient conditions affecting system pressures.

UNIT IV AIR ROUTING AND TEMPERATURE CONTROL

Objectives, evaporator airflow through the recirculating unit, automatic temperature control, duct system, controlling flow, vacuum reserve, testing the air control and handling systems.

UNIT V AIR CONDITIONING SERVICE

Air conditioner maintenance and service, servicing heater system removing and replacing components, trouble shooting of air controlling system, compressor service.

References:

1. Mitchell information Services, Inc - "Mitchell Automatic Heating and Air
2. Conditioning Systems" - Prentice Hall Ind. - 1989.
3. Paul Weiser - "Automotive Air Conditioning" - Reston Publishing Co., Inc., - 1990.
4. MacDonald, K.I., - "Automotive Air Conditioning" - Theodore Audel series – 1978.

AUTOMOTIVE POLLUTION AND CONTROL

Semester VI	L T P C
22KBVA32	4 0 0 4

Objectives:

- ✓ To make the students to realize the impact of automobile emissions on the environment and expose student to factors affecting the formation and control of automobile pollutants.

Learning Outcome:

After successful completion of this course, the students should be able to:

- ✓ Familiarize the norms of pollution standards
- ✓ Analyze the sources of pollution from automobiles
- ✓ Understand the pollution control methods and apply.

UNIT I VEHICLE POLLUTION

Introduction: Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution.

UNIT II SI ENGINE POLLUTION

Pollutant Formation in Si Engines: Pollutant formation in SI Engines, mechanism of HC and CO formation in four stroke and two stroke SI engines, NOx formation in SI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution.

UNIT III CI ENGINE POLLUTION

Pollutant Formation in CI Engines: Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions. Nox formation an.d control.-Noise pollution from automobiles, measurement and standards.

UNIT IV EMISSION CONTROL

Control of Emissions from SI and CI Engines: Design of engine, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fiiel cells, Two stroke engine pollution control.

UNIT V POLLUTION TEST METHODS

Measurement Techniques Emission Standards And Test Procedure: Orsat Apparatus, NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles - USA, Japan, Euro and India. Test procedures - ECE, FTP Tests. SHED Test - chassis dynamometers, dilution tunnels.

References:

1. Paul Degobert, Automobiles and Pollution, SAE International ISBN-1-56091-563-3, 1991.
2. Ganesan, V- Internal Combustion Engines- Tata McGraw-Hill Co - 2003.
3. SAE Transactions-Vehicle Emission - 1982 (3 volumes).
4. Obert.E.F.- Internal Combustion Engines, 1988.
5. Marco Nute- Emissions from two stroke engines, SAE Publication-1998.

MOTOR VEHICLE ACTS AND LOSS ASSESSMENT

Semester – VI L T P C

22KBVA33 4 0 0 4

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Paraphrase Motor Vehicle Acts.
- ✓ Examining of Motor Vehicles for Safety and Pollution Control Engineering.
- ✓ Analyzing the Penalties related with the Offences and their Procedures.
- ✓ Recognize the types of Motor Vehicle Insurance.
- ✓ Extrapolate the Duties and Responsibilities of Surveyor and Loss Assessor.

UNIT I INTRODUCTION TO TRANSPORTATION AND TRANSPORT AUTHORITIES

Functions of Transport Authorities. Key terms used in Motor Vehicle Act. Classification and anatomy of different classes of vehicle. 1d. Importance of Permit. Provisions regarding permit. Special Provisions for State Transport Undertakings (STUs).

UNIT II OFFENCES AND PENALTY PROCEDURES FOR TRAFFIC CONTROL.

Manipulate the maximum limits for speed and weight. Reconstructing provisions for vehicles with left-handed driving vehicles. Planning the rules for driving motor vehicle keeping safety of passengers and occupants at public places. Outlining the punishments for law-breakings.

UNIT III VEHICLE INSURANCE

History of Insurance. Types of motor vehicle insurance. Types of motor vehicle policies. Zero Depreciation Policy. Terms and Conditions for motor vehicle insurance.

UNIT IV ANALYZING VEHICLE IMPACT

Reasons of occurring of accidents. Effect on vehicle during impact from: i. Any One Side. ii. Head on Collision. iii. Vehicle Topple.

UNIT V SURVEYING AND INVESTIGATING MOTOR VEHICLE CLAIM.

Roles of Surveyor and loss assessor. Licensing and controlling authorities for surveyors and loss assessors. Claim procedure. Assessing losses in case of accident.

References:

1. Gujarat Motor Vehicle Rules, 1989 Gujarat State Government Government of Gujarat
2. Insurance Claims Solution Dr. L. P. Gupta Dr. L. P. Gupta
3. Central Motor vehicle Act, 1989 Central Government of India Government of India
4. Motor Vehicle Accident Reconstruction and Cause Analysis Rudolf Limpert Lexis Nexis Publications
5. Motor Vehicle Laws (Acts and Regulations) Universal's Legal Manual Universal Law Publishing Co. Pvt. Ltd.

TYRE TECHNOLOGY

Semester – VI	L	T	P	C
22KBVA34	4	0	0	4

Objectives:

- ✓ To understand various components used and their function of tyres.
- ✓ To know the building & curing of tyres.

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Understand various components used and their function of tyres.
- ✓ Know the building & curing of tyres.

UNIT I INTRODUCTION TO BASICS OF TYRES

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.

UNIT II FABRIC PREPARATION

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. Recent developments in Radical Tyre fabrics.

UNIT III TYRE BUILDING

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. Intermitant consolidation use of various cements and gum strips.

UNIT IV MOULD DESIGN

Rib, lug, combination, contact area, deflection, tread wear, mileage, TWI, abradability, Elastic wear and Plastic wear, aqua planing.

UNIT V GREEN TYRE PREPARATION & CURING

Internal and External painting – Awling – Bagging in case of Air bag cure Bag-o- matic and Air bag curing – mold lubrication- Bladder assembly bead curing rings – Dimension criticality Services to the Bag-o-matic presses Curing cycle – shaping – HPS, and hot water circulation. Dome steam cold water & vacuum cycles. Determination of optimum cure of tyres by thermocouple built tyres.

References:

1. Automobile Tyres, L J K Setright, Chapman and Hall, 1972.
2. Tyre Technology, Tom French, Adam Hilger, 1989.
3. Maurice Morton, “Rubber Technology”, Springer, 3rd edition, 1987.
4. Claude Hepburn, “Rubber Technology and Manufacture”, Third Edition, 2005. 5. Kovac. F. J, “Tyre Technology”, Good Year Tire & Rubber Company, 1973.
5. Different tyre manufacturer’s websites.

SKILL ELECTIVE COURSES - 2

CORROSION AND PREVENTION

Semester – VI	L T P C
22KBVA41	4 0 0 4

Learning Outcomes:

After successful completion of this course, the students should be able to:

- ✓ Students gain adequate about the electrochemical nature of corrosion of metals and alloys.
- ✓ Students obtain a basic understanding of multifarious painting materials and their comparison cost.
- ✓ Students know how to slow or defeat corrosion by using various anti-rust methods.
- ✓ Students understand the basic knowledge of painting material and use of latest techniques like spray gun in the Automobile parts.
- ✓ Students become familiar with basic methods of paint preparation and colour matching and their use in automotive bodies

UNIT-I

Corrosion, consequences of corrosion, chemistry of corrosion, factors affecting corrosion that control the corrosion rate, types of corrosion, corrosion prevention-conditioning the metal.

UNIT II

conditioning the corrosive environment, electrochemical control, Anti Rust coatings, Painting Materials- acrylic lacquer, acrylic enamel, urethane enamel, synthetic enamel, comparison of cost.

UNIT-III

Preventive Techniquies- Types of Primer, primer surfaces, primers, sealer, metallic, thinners and reducers, putty, wax polish and grease remover scrubbing compound, determining type of old finish.

UNIT IV

Preparing paint and matching colours- colour identification, preparing the paint, colour matching, matching colour with spray gun.

UNIT V

Spray painting equipment- spray gun- details, selection of air gap, fluid tip, fluid needle adjustment, care of spray gun, air for painting, hose size, pressure drop, spray booth. Different methods to remove paints, removing paint with disk grinder, paint removal, Prepare surface for paint, paint drying equipment. Using a spray gun, air pressure, spraying temperature, Paint defects.

References:

1. A.K. Khanna, Metallic Corrosion: Principles and Control Hardcover – 2007, New Age InternationalPublishers
2. Baldevraj, Corrosion Prevention and Control, Alpha Science International Publishers
3. S. Sastri, Corrosion prevention and protection, John Wiley &Sons,Ltd

4. Denny A. Jones, Principles and prevention of corrosion,Pearson Education Ltd, 2013

PERFORMANCE EVALUATION IN AUTOMOBILE WORKSHOP

Semester – VI	L	T	P	C
22KBVA42	4	0	0	4

Objectives:

- ✓ This course provides knowledge about purpose of performance evaluation and methods for performance appraisal. It helps to locate extract and organise all the evaluations in performance of each unit.

Learning Outcomes:

- ✓ Studying evaluation and its components.
- ✓ Implementation of performance modeling
- ✓ Learning basic assessment techniques.
- ✓ Understanding methods of performance appraisal
- ✓ How to follow customer satisfaction standards

UNIT I

Evaluation- definition and types, Purpose of performance evaluation, evaluation components i.e. elements, objectives and responsibilities, basic assessment techniques, design and implementation.

UNIT II

Performance standards, evaluation process/timelines, complaints- definition and types, performance factors and performance planning, performance modeling, customer feedback, customer facilitations and satisfaction measures.

UNIT III

Methods for performance appraisal i.e. management by objectives (MBO), critical incident method, 360 degree method, comparative evaluation method, forced distribution method.

UNIT IV

Performance indicators, performance appraisal form, employee development, Employee Ratings, different incentives for employees.

References:

1. John Jones, Chris W. Chen, New Supervisor Training (ASTD Trainer's Workshop Series)
2. Elaine Biech, New Supervisor Training, 2015
3. N Khurmi R.S Khurmi, A Textbook of Workshop Technology: Manufacturing Processes Paperback – 1 Dec 2010

4. R.S. Stephenson, Vehicle workshop operations
5. Mitch Schneider, Automotive Service Management: Operations Management 1st Edition
6. Andrew Rezin, Automotive Service Management (2nd Edition) (Automotive Comprehensive Books) 2nd Edition

AUTOMOTIVE SYSTEM DESIGN

Semester – VI L T P C

22KBVA43 4 0 0 4

UNIT I Design of Clutches & Gearbox:

Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, mutilate clutch and centrifugal clutch. Selection of gear ratios and final drive ratio, numerical on 3- speed and 4- speed gearbox.

UNIT II Design of Propeller Shafts and Axles:

Design of propeller shafts for bending, torsion and rigidity, Design of universal joints and slip joints, final drive, Design of live and dead axles.

UNITIII Brake Systems:

Design of hydraulic braking system, internal expanding shoe brake and disc brake, design of master and wheel cylinder and piping design.

UNIT IV Design of Suspension and Steering System:

General design considerations of suspension system, design of helical and leaf springs for automobile suspension system, design considerations of Belleville springs, elastomeric springs, design considerations of steering system and vehicle frame design.

UNIT V Statistical Consideration in Design and Optimization:

Ergonomics and aesthetic design, statistics in design, design for natural tolerances, statistical analysis, and mechanical reliability, introduction to design optimization of mechanical elements, adequate and optimum design, methods of optimization, Johnson's method of optimum design-simple problems in optimum design like axially loaded members.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

OFF ROAD VEHICLES

Semester – VI L T P C

22KBVA44 4 0 0 4

Objectives:

- ✓ At the end of the course, the students will be able to understand the various Off-road vehicle and their systems and features

Learning Outcomes:

- ✓ The students will be able to understand the various Off-road vehicle and their systems and features

UNIT I CLASSIFICATION AND REQUIREMENTS OF OFF-ROAD VEHICLES

Construction layout, capacity and applications of off-road vehicle - prime mover, chassis and transmission, Multiaxle vehicles.

UNIT II EARTH MOVING CONSTRUCTIONAL MACHINES

dumpers - safety features, safe warning system for dumper, Design aspects on dumper body, Articulated Dumpers, loaders - single bucket, Multi bucket and rotary types - bulldozers, kinematics for loader and bulldozers with operational linkages, excavators, backhoe loaders, scrappers, motor graders, power shawl, bush cutters, Bush cutters, stumpers, rippers.

UNIT III INDUSTRIAL APPLICATIONS

Constructional and working details of Jib crane, concrete ready mixers, compactors - vibratory compactors, forklift, utility vehicles, man - lift, scissors, lift trucks, material handlers, power generators.

UNIT IV FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES

Tractors, classification - working attachments, power take off, special implements, paddy harvester, sugarcane harvester, feller bunchers, special features and constructional details of military tankers, AVLB gun carriers and transport vehicles.

UNIT V VEHICLE SYSTEMS, FEATURES

Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Articulated steering assembly - power and capacity of earth moving machines.

References:

1. Abrosimov. K. Bran berg. A and Katayer. K., "Road making machinery", MIR Publishers, Moscow, 1971.
2. Nakra C.P., “Farm machines and equipments” Dhanparai Publishing company Pvt. Ltd.
3. Robert L Peurifoy, “Construction, planning, equipment and methods” Tata McGraw Hill Publishing company Ltd.
4. SAE Handbook Vol. III., Society of Automotive Engineers, 1997 5. Wong. J. T., "Theory of Ground Vehicles”, John Wiley & Sons, New York, 1987.

PROJECT/ INDUSTRIAL TRAINING/CONCURRENT FIELD PRACTICUM COURSE TRAINING

Semester VI	L	T	P	C
18AT606	2	0	10	12

Objective:

- ✓ To understand the concept the projects, applying the various concepts learned in the previous chapters and preparing a report based on the project undergone.
- ✓ The main focus of the Project should be on the chosen area of Specialization such as General Management /Logistics Management / Supply Chain Management / Retail Management/ Export Import Management for B.Voc.
- ✓ To understand the importance of entrepreneurship as a tool for development, the basic principles of entrepreneurship, the concept and basic principles of innovation.
- ✓ Describe and distinguish the typologies of entrepreneurship, the financial sources for startups, the modes of business networking and design business plans.-

Learning Outcomes:

- ✓ Understanding the concept the projects, applying the various concepts learned in the previous chapters and preparing a report based on the project undergone
- ✓ Acquaint the student with an understanding of how small business functions in a start-up phase, how it evolves, the problems inherent in growth, and the important role that management plays.
- ✓ To gain better understanding of how business functions, the student discuss real-life business situations and the entrepreneurs that made them succeed as well as case studies where the student can reinforce what they have learned.
- ✓ To prepare business plan or blueprint of a business that they would like to start-up and operate based on the principles they have learned in the course.
- ✓ Develop capabilities and skills necessary to assume entrepreneurial activity.
- ✓ Implement theoretical knowledge acquired by designing a small virtual enterprise

The project work may be carried out by identifying research / application problem in any one of the business / manufacturing / service organizations that suits the chosen area of the specialization

Major Types of Project The project to be undertaken may be of various types:

- Exploratory type The Students to explore the possible causes of a phenomena or status
- Descriptive – to support or disprove existing facts with quantitative data

Survey type includes designing questionnaire for collection of data through field study, collecting data from target respondents, processing and analyzing the data and arriving at conclusions

Experimental study Conduct of experiments to find the cause and effect relations between experimental variables and dependent variables e.g. Impact of training programme on performance, impact of advertisements on sales

Desk research based on secondary data Making use of published data, analyzing and interpreting such data and arriving at meaningful conclusions. Project evaluation For Project work, the assessment will be done on a continuous basis as follows

Project evaluation

For Project work, the assessment will be done on a continuous basis as follows:

Review / Exam	Weightage
First Review	10%
Second Review	20%
Third Review	20%
End - semester Exam	50%