AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI

&

VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM

(Constituent Colleges of Vinayaka Mission's Research Foundation, Deemed to be University, Salem, Tamil Nadu, India)

(AICTE APPROVED AND NAAC ACCREDITED)

VINAYAKA MISSION'S
KIRUPANANDA VARIYAR
ENGINEERING COLLEGE

Faculty of Engineering and Technology

REGULATIONS 2017

DEPARTMENT OF MECHANICAL ENGINEERING

Programme:

B.E / B.Tech. AUTOMOBILE ENGINEERING

Full Time (4 Years)

STRUCTURED CHOICE BASED CREDIT SYSTEM (SCBCS)

CURRICULUM AND SYLLABUS

(Semester I to VIII)

VINAYAKA MISSION'S RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)

VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE

VINAYAKA MISSION'S KIRUPANANDA VARIYAR

ENGINEERING COLLEGE, SALEM

DEPARTMENT OF MECHANICAL ENGINEERING

Vision

- To achieve excellence in the field of mechanical engineering eventually contributing to the development of the country

Mission

- To develop the knowledge, skills and Attitude of the students to meet ever changing demands.
- To develop and instill in students quest for the scientific attitude and experimentation skill in mechanical engineering.
- To develop the entrepreneurial skills of the students.
- To motivate the students to undergo internship training at industry and carry out industrial project.
- To motivate the students to pursue higher education.
- To train the faculty in the industry on regular basis to update their industry knowledge.

PROGRAMME OUTCOMES

Engineering Graduates will be able to:

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

Graduating Students of Automobile Engineering programme will be able to:

PSO1	Solve complex engineering problems in the field of automobile engineering by using available resources and tools for an optimized and desired output.
PSO2	Identify the thrust areas of major concern in automobile engineering affecting man and material in broad aspects, design and modify the systems to create a comfortable zone for men and machinery.
PSO3	Design components or processes for meeting the demands of quality standards with environmental considerations.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1	Design, analyze & fabricate, maintain and improve Automobile Engineering systems that are technically sound, economically feasible and socially acceptable to enhance quality of life.
PEO2	Apply modern computational, analytical, simulation tools and techniques to address the challenges faced in automobile and allied engineering streams.
PEO3	Communicate effectively using innovative tools and demonstrate leadership & entrepreneurial skills.
PEO4	Exhibit professionalism, , Ethical attitude, Team spirit and pursue lifelong learning to achieve career and organizational goals.

Credit Requirement for the Course Categories

Sl. No.	Category of Courses	Credits to be earned Min – Max.
01	**A. Foundation Courses (FC)**	**54 - 81**
	i. Humanities and Sciences (English and Management Courses)	12 – 21
	ii. Basic Sciences (Maths, Physics and Chemistry Courses)	24 – 33
	iii. Engineering Sciences (Basic Engineering Courses)	18 - 27
02	**B. Core courses (CC) relevant to the chosen Programme of study.**	**81**
03	**C. Elective Courses (EC)**	**18 - 24**
	i. Programme Specific (Class Room or Online)	12 – 15
	ii. Open Elective (Class Room or Online)	6 - 9
04	**D. Project + Internship + Industry Electives (P + I + I)**	**18**
	i. Project	9
	ii. Internship	3
	iii. Industry Supported Courses	6
05	**E. Employability Enhancement Courses + Co - Curricular Courses + Extra Curricular Courses	**9 - 18**
	i. Employability Enhancement Courses (Personality Development Training, Participation in Seminars, Professional Practices, Summer Project, Case Study etc.)	3 - 6
	ii. Co - Curricular Courses (NCC, NSS, Sports, Games, Drills and Physical Exercises)	3 - 6
	iii. Extra Curricular Courses	3 - 6
Minimum Credits to be earned		**180**

**** - Mandatory, Credits would be mentioned in Mark sheets but not included for CGPA Calculations. For overall CGPA calculations, a student has to earn minimum 171 credits in Categories A to D.**

CURRICULUM

B.E / B.Tech. AUTOMOBILE ENGINEERING

SEMESTER
I TO VIII

B.E / B.TECH. – AUTOMOBILE ENGINEERING - SEMESTER I TO VIII									
CATEGORY A – FOUNDATION COURSES - HSS, BS AND ES COURSES - CREDITS (54-81)									
S.NO.	**CODE**	**COURSE TITLE**	**OFFERING DEPT**	**CATEGORY**	**L**	**T**	**P**	**C**	**PRE - REQUIST**
i.	**HUMANITIES AND SCIENCES (ENGLISH AND MANAGEMENT SUBJECTS) - CREDITS (12 - 21)**								
1.	17EGHS01	TECHNICAL ENGLISH	ENGLISH	FC(HS)	3	0	0	3	NIL
2.	17EGHS02	BUSINESS ENGLISH	ENGLISH	FC(HS)	3	0	0	3	NIL
3.	17YMH82	YOGA & MEDITATION	PHYSICAL EDUCATION	FC(HS)	0	0	4	2	NIL
4.	17MBHS04	TOTAL QUALITY MANAGEMENT	MANAGEMENT	FC(HS)	3	0	0	3	NIL
5.	17EGHS81	ENGLISH LANGUAGE LAB	ENGLISH	FC(HS)	0	0	4	2	NIL
6.	17MBHS01	ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	MANAGEMENT	FC(HS)	3	0	0	3	NIL
7.	17MBHS07	PROFESSIONAL ETHICS AND HUMAN VALUES	MANAGEMENT	FC(HS)	3	0	0	3	NIL
8.	17MBHS08	PROJECT MANAGEMENT FOR ENGINEERING BUSINESS AND TECHNOLOGY	MANAGEMENT	FC(HS)	3	0	0	3	NIL
9.	17MBHS09	INTELLECTUAL PROPERTY RIGHTS & ALTERNATE DISPUTES RESOLUTIONS	MANAGEMENT	FC(HS)	3	0	0	3	NIL
ii.	**BASIC SCIENCES (MATHS, PHYSICS AND CHEMISTRY SUBJECTS) - CREDITS (24 - 33)**								
1.	17MABS01	ENGINEERING MATHEMATICS	MATHEMATICS	FC(BS)	2	2	0	3	NIL
2.	17PCBS02	PHYSICAL SCIENCES	PHYSICS & CHEMISTRY	FC(BS)	4	0	0	4	NIL
3.	17PHBS05	SMART MATERIALS	PHYSICS	FC(BS)	3	0	0	3	NIL
4.	17CHBS01	ENVIRONMENTAL SCIENCE AND ENGINEERING	CHEMISTRY	FC(BS)	3	0	0	3	NIL
5.	17MABS04	MATHEMATICS FOR MECHANICAL SCIENCES	MATHEMATICS	FC(BS)	2	2	0	3	ENGINEERING MATHEMATICS
6.	17MABS11	NUMERICAL METHODS FOR MECHANICAL SCIENCES	MATHEMATICS	FC(BS)	2	2	0	3	MATHEMATICS FOR MECHANICAL SCIENCES
7.	17MABS21	RESOURCE MANAGEMENT TECHNIQUE	MATHEMATICS	FC(BS)	3	0	0	3	NIL
8.	17MABS20	PROBABILITY AND STATISTICS	MATHEMATICS	FC(BS)	3	0	0	3	NIL
9.	17CHBS02	EMERGING AUTOMOTIVE MATERIALS	CHEMISTRY	FC(BS)	3	0	0	3	NIL
10.	17PCBS81	PHYSICAL SCIENCES LAB	PHYSICS & CHEMISTRY	FC(BS)	0	0	4	2	NIL
iii.	**ENGINEERING SCIENCES (MATHS, PHYSICS AND CHEMISTRY SUBJECTS) - CREDITS (18 - 27)**								
1.	17CSES01	ESSENTIALS OF COMPUTING	CSE	FC(ES)	3	0	0	3	NIL
2.	17CMES02	BASICS OF CIVIL AND MECHANICAL ENGINEERING	CIVIL & MECHANICAL	FC(ES)	4	0	0	4	NIL
3.	17CSES05	PROGRAMMING IN PYTHON	CSE	FC(ES)	3	0	0	3	NIL
4.	17EEES03	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	EEE & ECE	FC(ES)	4	0	0	4	NIL
5.	17CMES81	ENGINEERING SKILLS PRACTICE LAB A. BASIC CIVIL ENGINEERING B. BASIC MECHANICAL ENGINEERING	CIVIL & MECHANICAL	FC(ES)	0	0	4	2	NIL
6.	17CSES83	PROGRAMMING IN PYTHON LAB	CSE	FC(ES)	0	0	4	2	NIL
7.	17EEES82	ENGINEERING SKILLS PRACTICE LAB A. BASIC ELECTRICAL ENGINEERING B. BASIC ELECTRONICS ENGINEERING	EEE & ECE	FC(ES)	0	0	4	2	NIL
8.	17MEES84	ENGINEERING GRAPHICS (THEORY & PRACTICE)	MECHANICAL	FC(ES)	1	0	4	3	NIL

B.E / B.TECH. – AUTOMOBILE ENGINEERING - SEMESTER I TO VIII									
CATEGORY B – CORE COURSES RELEVANT TO THE PROGRAMME - CREDITS (81)									
S.NO.	**CODE**	**COURSE TITLE**	**OFFERING DEPT**	**CATEGORY**	**L**	**T**	**P**	**C**	**PRE - REQUIST**
1.	17ATCC01	FUNDAMENTALS OF AUTOMOTIVE ENGINES	AUTOMOBILE	CC	3	0	0	3	NIL
2.	17ATCC02	AUTOMOTIVE ENGINES	AUTOMOBILE	CC	3	0	0	3	FUNDAMENTALS OF AUTOMOTIVE ENGINES
3.	17ATCC03	AUTOMOTIVE CHASSIS	AUTOMOBILE	CC	3	0	0	3	NIL
4.	17MECC19	MECHANICS OF MACHINES	MECHANICAL	CC	3	0	0	3	NIL
5.	17MECC02	ENGINEERING THERMODYNAMICS	MECHANICAL	CC	3	0	0	3	NIL
6.	17CVCC32	FLUID MECHANICS AND STRENGTH OF MATERIALS	CIVIL	CC	3	0	0	3	NIL
7.	17ATCC04	AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS	AUTOMOBILE	CC	3	0	0	3	NIL
8.	17ATCC05	AUTOMOTIVE TRANSMISSION	AUTOMOBILE	CC	3	0	0	3	AUTOMOTIVE CHASSIS
9.	17ATCC06	COMBUSTION THERMODYNAMIC AND HEAT TRANSFER	AUTOMOBILE	CC	3	0	0	3	ENGINEERING THERMODYNAMICS
10.	17MECC18	MANUFACTURING ENGINEERING	MECHANICAL	CC	3	0	0	3	NIL
11.	17ATCC07	MODERN VEHICLE TECHNOLOGY	AUTOMOBILE	CC	3	0	0	3	AUTOMOTIVE ENGINES, AUTOMOTIVE CHASSIS
12.	17ATCC10	AUTOMOTIVE POLLUTION CONTROL	AUTOMOBILE	CC	3	0	0	3	NIL
13.	17ATCC09	AUTOMOTIVE ENGINE COMPONENTS DESIGN	AUTOMOBILE	CC	3	1	0	4	AUTOMOTIVE ENGINES,
14.	17ATCC08	AUTOMOTIVE FUELS AND LUBRICANTS	AUTOMOBILE	CC	3	0	0	3	AUTOMOTIVE ENGINES,
15.	17ATCC11	AUTOMOTIVE CHASSIS COMPONENTS DESIGN	AUTOMOBILE	CC	3	1	0	4	AUTOMOTIVE CHASSIS
16.	17ATCC12	VEHICLE BODY ENGINEERING	AUTOMOBILE	CC	3	0	0	3	NIL
17.	17ATCC13	ENGINE AND VEHICLE MANAGEMENT SYSTEM	AUTOMOBILE	CC	3	0	0	3	NIL
18.	17ATCC14	VEHICLE MAINTENANCE	AUTOMOBILE	CC	3	0	0	3	NIL
19.	17ATCC15	TWO AND THREE WHEELER TECHNOLOGY	AUTOMOBILE	CC	3	0	0	3	NIL
20.	17ATCC81	AUTOMOTIVE ENGINE COMPONENTS LAB	AUTOMOBILE	CC	0	0	4	2	AUTOMOTIVE ENGINES
21.	17ATCC82	AUTOMOTIVE CHASSIS LAB	AUTOMOBILE	CC	0	0	4	2	AUTOMOTIVE CHASSIS
22.	17CVCC92	FLUID MECHANICS AND STRENGTH OF MATERIALS LAB	CIVIL	CC	0	0	4	2	FLUID MECHANICS AND STRENGTH OF MATERIALS
23.	17ATCC83	AUTOMOTIVE ELECTRICAL AND ELECTRONICS LAB	AUTOMOBILE	CC	0	0	4	2	AUTOMOTIVE ELECTRICAL AND ELECTRONICS
24.	17MECC94	MANUFACTURING ENGINEERING LAB	MECHANICAL	CC	0	0	4	2	MANUFACTURING ENGINEERING
25.	17ATCC84	AUTOMOTIVE FUELS AND LUBRICANTS LAB	AUTOMOBILE	CC	0	0	4	2	AUTOMOTIVE FUELS AND LUBRICANTS
26.	17ATCC85	VEHICLE BODY MODELING LAB	AUTOMOBILE	CC	0	0	4	2	VEHICLE BODY ENGINEERING
27.	17ATCC86	ENGINE TESTING AND EMISSION MEASUREMENT LAB	AUTOMOBILE	CC	0	0	4	2	AUTOMOTIVE POLLUTION CONTROL
28.	17ATCC87	ENGINE RECONDITIONING LAB	AUTOMOBILE	CC	0	0	4	2	VEHICLE MAINTENANCE
29.	17ATCC88	TWO AND THREE WHEELER LAB	AUTOMOBILE	CC	0	0	4	2	TWO AND THREE WHEELER TECHNOLOGY
30.	17ATCC89	VEHICLE MAINTENANCE AND SERVICING LAB	AUTOMOBILE	CC	0	0	4	2	VEHICLE MAINTENANCE

B.E / B.TECH. – AUTOMOBILE ENGINEERING - SEMESTER I TO VIII DETAILS OF ELECTIVE COURSES FOR DEGREE WITH SPECIALISATION

CATEGORY C – ELECTIVE COURSES - CREDITS (18 - 24)

(i) PROGRAMME SPECIFIC (CLASS ROOM OR ONLINE) - CREDITS (12 - 15)

S.NO.	CODE	COURSE TITLE	OFFERING DEPT	CATEGORY	L	T	P	C	PRE - REQUIST
1.	17ATEC01	ADVANCED PRODUCTION PROCESSES FOR AUTOMOTIVE COMPONENTS	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
2.	17ATEC02	NEW GENERATION AND HYBRID VEHICLES	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
3.	17ATEC03	MODERN AUTOMOBILE ACCESSORIES	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
4.	17ATEC04	SPECIAL TYPES OF VEHICLES	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
5.	17ATEC05	POLYMER COMPONENTS AND RUBBER MATERIALS IN AUTOMOTIVE APPLICATIONS	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
6.	17ATEC06	AUTOMOTIVE SAFETY	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
7.	17ATEC07	AUTOMOTIVE INSTRUMENTATION	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
8.	17ATEC08	TRACTOR AND FARM EQUIPMENTS	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
9.	17ATEC09	COMBUSTION ENGINEERING	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
10.	17ATEC10	ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
11.	17ATEC11	COMBUSTION THEORY OF IC ENGINE PROCESSES	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
12.	17ATEC12	FUEL CELL TECHNOLOGY	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
13.	17ATEC13	COMPUTER SIMULATION OF IC ENGINE PROCESSOR	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
14.	17ATEC14	COMPUTER CONTROLLED VEHICLE SYSTEMS	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
15.	17ATEC15	VEHICLE TRANSPORT MANAGEMENT	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
16.	17ATEC16	VEHICLE DYNAMICS	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
17.	17ATEC17	VEHICLE AIR-CONDITIONING	AUTOMOBILE	EC (PS)	3	0	0	3	NIL
18.	17ATEC18	ALTERNATIVE FUELS	AUTOMOBILE	EC (PS)	3	0	0	3	NIL

B.E / B.TECH. – AUTOMOBILE ENGINEERING - SEMESTER I TO VIII
DETAILS OF ELECTIVE COURSES FOR DEGREE WITH SPECIALISATION

CATEGORY C – ELECTIVE COURSES - CREDITS (18 - 24)

(ii) OPEN ELECTIVE (CLASS ROOM OR ONLINE) - CREDITS (6 - 9)

S.NO.	CODE	COURSE TITLE	OFFERING DEPT	CATE GORY	L	T	P	C	PRE - REQUIST
1.	17AREC03	UNMANNED AIRCRAFT SYSTEMS	AERONAUTICAL	EC (OE)	3	0	0	3	NIL
2.	17ARSE21	ROCKETS AND MISSILES	AERONAUTICAL	EC (OE)	3	0	0	3	NIL
3.	17ARSE35	ADVANCED MATERIALS AND NDT FOR AEROSPACE APPLICATIONS	AERONAUTICAL	EC (OE)	3	0	0	3	NIL
4.	17ARSE32	AIRCRAFT MAINTENANCE AND REPAIR	AERONAUTICAL	EC (OE)	3	0	0	3	NIL
5.	17BTCC15	FOOD PROCESSING TECHNOLOGY	BIOTECH	EC (OE)	3	0	0	3	NIL
6.	17BTEC24	BIOFERTILIZER TECHNOLOGY	BIOTECH	EC (OE)	3	0	0	3	NIL
7.	17BTEC25	BIOLOGY FOR NON BIOLIGISTS	BIOTECH	EC (OE)	3	0	0	3	NIL
8.	17BTEC30	NATURAL RESOURCES MANAGEMENT	BIOTECH	EC (OE)	3	0	0	3	NIL
9.	17BTEC31	APPLICATION OF ENZYME IN WASTE MANAGEMENT	BIOTECH	EC (OE)	3	0	0	3	NIL
10.	17CVSE35	QUALITY CONTROL ASSURANCE IN REAL ESTATE	CIVIL	EC (OE)	3	0	0	3	NIL
11.	17CVSE42	GREEN AND ENERGY EFFICIENT BUILDING	CIVIL	EC (OE)	3	0	0	3	NIL
12.	17CVSE41	INFRASTRUCTURE PROJECT DEVELOPMENT	CIVIL	EC (OE)	3	0	0	3	NIL
13.	17CVSE28	URBAN TRANSPORTATION INFRASTRUCTURE-PLANNING AND DESIGN	CIVIL	EC (OE)	3	0	0	3	NIL
14.	17EECC14	ELECTRICAL MACHINES AND DRIVES	EEE	EC (OE)	3	0	0	3	NIL
15.	17EECC04	MEASUREMENTS AND INSTRUMENTATION	EEE	EC (OE)	3	0	0	3	NIL
16.	17EECC16	POWER ELECTRONICS AND DRIVES	EEE	EC (OE)	3	0	0	3	NIL
17.	17ECCC07	MICROCONTROLLERS & ITS APPLICATIONS	ECE	EC (OE)	3	0	0	3	NIL
18.	17ECCC18	INTERNET OF THINGS FOR ELECTRONICS	ECE	EC (OE)	3	0	0	3	NIL
19.	17ECEC06	MEMS AND SENSORS	ECE	EC (OE)	3	0	0	3	NIL
20.	17BMSE13	BIOMECHANICS	BME	EC (OE)	3	0	0	3	NIL
21.	17BMSE15	BIOMATERIALS AND ARTIFICIAL ORGANS	BME	EC (OE)	3	0	0	3	NIL
22.	17BMSE18	ROBOTICS AND AUTOMATION IN MEDICINE	BME	EC (OE)	3	0	0	3	NIL
23.	17BMSE22	CRITICAL CARE INSTRUMENTS AND THERAPEUTIC EQUIPMENT	BME	EC (OE)	3	0	0	3	NIL
24.	17CSEC09	ETHICAL HACKING	CSE	EC (OE)	3	0	0	3	NIL
25.	17CSEC11	GREEN COMPUTING	CSE	EC (OE)	3	0	0	3	NIL
26.	17CSEC24	OPEN SOURCE SYSTEMS	CSE	EC (OE)	3	0	0	3	NIL
27.	17CSEC32	VIRTUAL REALITY	CSE	EC (OE)	3	0	0	3	NIL
28.	17CSEC30	UNIX INTERNALS	CSE	EC (OE)	3	0	0	3	NIL
29.	17MESE25	COMPUTATIONAL FLUID DYNAMICS	MECHANICAL	EC (OE)	3	0	0	3	NIL
30.	17MESE19	PROCESS PLANNING AND COST ESTIMATION	MECHANICAL	EC (OE)	3	0	0	3	NIL
31.	17MECC15	FINITE ELEMENT ANALYSIS	MECHANICAL	EC (OE)	3	0	0	3	NIL
32.	17MESE05	WASTE ENERGY CONVERSION TECHNOLOGIES	MECHANICAL	EC (OE)	3	0	0	3	NIL
33.	17MEEC11	INDUSTRIAL ROBOTICS	MECHANICAL	EC (OE)	3	0	0	3	NIL
34.	17MESE32	COMPOSITE MATERIALS	MECHANICAL	EC (OE)	3	0	0	3	NIL
35.	17MESE20	RAPID PROTOTYPING AND TOOLING	MECHANICAL	EC (OE)	3	0	0	3	NIL

B.E / B.TECH. – AUTOMOBILE ENGINEERING - SEMESTER I TO VIII									
CATEGORY D – PROJECT + INTERNSHIP + INDUSTRY ELECTIVES (P + I + I)- CREDITS (18)									
S.NO.	**CODE**	**COURSE TITLE**	**OFFERING DEPARTMENT**	**CATEGORY**	**L**	**T**	**P**	**C**	**PRE - REQUIST**
	i. PROJECT - CREDITS (9)								
1.	17ATPI01	PROJECT WORK AND VIVA VOCE	AUTOMOBILE	PI	0	0	18	9	NIL
	ii. INTERNSHIP / MINI PROJECT / INDUSTRY SUPPORTED COURSES- CREDITS (9)								
1.	17ATPI02	INDUSTRIAL INTERNSHIP / MINI PROJECT	AUTOMOBILE	PI	0	0	0	3	NIL
2.	17MEPI03	NOISE, VIBRATION AND HARSHNESS	MECHANICAL	PI	3	0	0	3	NIL
2.	17MEPI04	NON DESTRUCTIVE TESTING	MECHANICAL	PI	3	0	0	3	NIL
3.	17ATPI05	COAL MINING AND MECHANIZATION	MECHANICAL	PI	3	0	0	3	NIL

B.E / B.TECH. – AUTOMOBILE ENGINEERING - SEMESTER I TO VIII

CATEGORY E – EMPLOYABILITY ENHANCEMENT COURSES, CO – CURRICULA COURSES AND EXTRA CURRICULAR COURSES (EEC) - CREDITS (9 - 18)**

(- MANDATORY, CREDITS WOULD BE MENTIONED IN MARK SHEETS BUT NOT INCLUDED FOR CGPA CALCULATIONS.)**

S.NO.	CODE	COURSE TITLE	OFFERING DEPT	CATEGORY	L	T	P	C	PRE - REQUIST
i	**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**								
1	17APEE01	PERSONALITY SKILLS DEVELOPMENT - I	MATHS	EE	2 WEEKS OF TRAINING			1	NIL
2	17APEE02	PERSONALITY SKILLS DEVELOPMENT - II	ENGLISH & MANAGEMENT	EE	2 WEEKS OF TRAINING			1	NIL
3	17ATEE01	AUTOMOBILE AND AUTO COMPONENT	AUTOMOBILE	EE	0	0	4	2	NIL
4	17ATEE02	TWO AND FOUR WHEELER SERVICING (HANDS ON TRAINING)	AUTOMOBILE	EE	0	0	4	2	NIL
5	17MEEE01	CNC PROGRAMMING (HANDS ON TRAINING)	MECHANICAL	EE	0	0	4	2	NIL
6	17MEEE02	DESIGN AND FABRICATION OF FIBRE REINFORCED COMPOSITES (HANDS ON TRAINING)	MECHANICAL	EE	0	0	4	2	NIL
7	17MEEE03	STRUCTURAL AND THERMAL ANALYSIS – ANSYS (HANDS ON TRAINING)	MECHANICAL	EE	0	0	4	2	NIL
CO - CURRICULAR COURSES									
1	17APEE03	NCC	NCC CELL	EE	2 WEEKS OF TRAINING IN NCC CAMP			1	NIL
2	17APEE04	NSS	NSS CELL	EE	2 WEEKS OF SOCIAL SERVICE IN NSS CAMP			1	NIL
3	17APEE05	SPORTS AND GAMES (INTER – UNIVERSITY LEVEL)	PHYSICAL EDUCATION	EE				1	NIL
4	17APEE06	SPORTS AND GAMES (INTRA-UNIVERSITY LEVEL)	PHYSICAL EDUCATION	EE				2	NIL
5	17APEE07	SPORTS AND GAMES (STATE AND NATIONAL LEVELS)	PHYSICAL EDUCATION	EE				2	NIL
EXTRA CURRICULAR COURSES									
1	17ATEE03	EXTRA CURRICULAR COURSE - I	AUTOMOBILE	EE	15 HOURS			1	NIL
2	17ATEE04	EXTRA CURRICULAR COURSE - II	AUTOMOBILE	EE	15 HOURS			1	NIL
3	17ATEE05	EXTRA CURRICULAR COURSE - III	AUTOMOBILE	EE	15 HOURS			1	NIL
4	17ATEE06	EXTRA CURRICULAR COURSE - IV	AUTOMOBILE	EE	15 HOURS			1	NIL
5	17ATEE07	EXTRA CURRICULAR COURSE - V	AUTOMOBILE	EE	15 HOURS			1	NIL
6	17ATEE08	EXTRA CURRICULAR COURSE -VI	AUTOMOBILE	EE	15 HOURS			1	NIL

A. Foundation Courses (FC)

Humanities and Sciences (English and Management Courses) (HSS)

17EGHS01	TECHNICAL ENGLISH	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE

Technical English is a life skill course necessary for all students of Engineering and Technology. It aims at developing communication skills in English, essential for understanding and expressing the ideas of different professional context. The outcome of the course is to help the students acquire the language skills of Listening, Speaking, Reading and Writing competency in English language and thereby making the students competent and employable in the globalised scenario.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To enable students to develop LSRW skills in English. (Listening, Speaking, Reading, and Writing.)
2	To make them to become effective communicators
3	To ensure that learners use Electronic media materials for developing language
4	To aid the students with employability skills.
5	To motivate students continuously to use English language
6	To develop the students communication skills in formal and informal situations

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Listen, remember and respond to others in different scenario	Remember
CO2. Understand and speak fluently and correctly with correct pronunciation in different situation.	Understand
CO3. To make the students experts in professional writing	Apply
CO4. . To make the students in proficient technical communicator	Apply
CO5. To make the students good communicators at the work place and to be theoretically strong.	Apply
CO6 To make the students recognize the role of technical writing in their careers in business, technical and scientific field	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**M**	**M**			**M**	**M**	**S**		**L**	**S**	**L**	**S**	**S**	**M**	**M**
CO2		**M**		**L**	**M**	**M**	**S**			**S**	**S**	**S**	**M**	**M**	
CO3	**M**		**L**	**M**			**L**	**L**		**M**	**S**	**S**			**M**
CO4		**M**				**M**	**M**			**S**		**S**	**M**	**M**	
CO5	**M**	**M**		**M**	**M**	**M**	**S**	**M**	**L**	**S**	**M**	**S**	**S**	**M**	**M**
CO6	**M**		**M**			**M**					**S**	**M**	**M**	**M**	

S- Strong; M-Medium; L-Low

SYLLABUS

LISTENING

Self introduction - Simulations using E Materials - Whatsapp, Face book, Hiker, Twitter- Effective Communication with Minimum Words - Interpretation of Images and Films - Identify the different Parts of Speech- Word formation with Prefixes and suffixes -Common Errors in English - Scientific Vocabulary (definition and meaning) - Listening Skills- Passive and Active listening, Listening to Native Speakers - Characteristics of a good listener.

SPEAKING

Articles - Phonetics (Vowels, Consonants and Diphthongs) - Pronunciation Guidelines -Listening to Indian speakers from different regions, intrusion of mother tongue - Homophones – Homonyms - Note taking and Note making - Difference between Spoken and Written English- Use of appropriate language - Listening and Responding to Video Lectures (Green India, environment, social talks) - Extempore.

REPORT WRITING

Tense forms- Verbal and Non verbal Communication - Describing objects - Process Description- Speaking Practice - Paragraph Writing on any given topic (My favourite place, games / Hobbies / School life, etc.) -Types of paragraphs - Telephone Etiquettes - Telephonic conversation with dialogue.

READING

Impersonal Passive Voice - Conditional Sentences - Technical and Non technical Report Writing (Attend a technical seminar and submit a report) - News Letters and Editing - Skimming- Scanning - How to Improve Reading Speed - Designing Invitations and Poster Preparation.

WRITING

Sentence Pattern (SVOCA) - Statement of Comparison - Transcoding (Flow Chart, Bar Chart and Pie Chart) - Informal letters - Resume Writing- Difference between Bio data, Resume and Curriculum Vitae.

TEXT BOOK

1. English for Engineers- Faculty of English – VMKV Engineering College, Salem and AVIT, Chennai

REFERENCE BOOKS

1. 1. English for Effective Communication, Department of English, VMKV & AVIT, SCM Publishers, 2009.
2. Practical English Usage- Michael Swan (III edition), Oxford University Press
3. Grammar Builder- I, II, III, and Cambridge University Press.

4 Pickett and Laster. Technical English: Writing, Reading and Speaking, New York: Harper and Row Publications, 2002.

Course Designers:

S.No.	Name of the Faculty	Mail ID
1.	Dr.P.Saradha / Associate Professor - English	saradhap@vmkvec.edu.in
2	Mr.S.K.Prem Kishor/Assistant Professor-English	Prem.english@avit.ac.in

17EGHS02	BUSINESS ENGLISH	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE

Language is one of the most valued possessions of men. It acts as a repository of wisdom. Among all other languages English, the international language plays a vital role as a propeller for the advancement of knowledge in different fields and as a telescope to view the dream of the future.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To impart and enhance corporate communication.
2	To enable learners to develop presentation skills
3	To build confidence in learners to use English in Business context
4	To make them experts in professional writing
5	To assist students understand the role of thinking in all forms of communication
6	To equip students with employability and job searching skills

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Communicate with a range of formal and informal context	Understand
CO2. Students will undergo in activities, demonstrating interaction skills and consider how own communication is adjusted in different scenario	Apply
CO3. Strengthening of oral and written skills in the business context	Apply
CO4. Create interest among the students about a topic by exploring thoughts and ideas	Apply
CO5. Make the students to start with pleasing note and make them to give different ideas	Apply
CO6. Make them in better performance in the art of communication	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**M**		**L**		**L**	**S**	**S**		**M**	**S**		**S**	**M**		
CO2		**M**	**S**	**M**		**M**	**M**		**L**	**S**		**S**		**S**	**M**
CO3	**L**	**M**				**M**		**L**		**S**	**L**	**M**			
CO4		**L**	**M**	**M**			**L**	**M**	**M**	**S**	**L**	**M**	**M**		**M**
CO5				**M**				**M**	**L**	**S**		**L**			**M**
CO6		**L**		**M**		**L**	**L**			**S**		**S**	**M**		

S- Strong; M-Medium; L-Low

SYLLABUS

SUBJECT AND VERB AGREEMENT: Subject and Verb Agreement (concord) - Preposition and Relative Pronoun - Cause and effect - Phrasal Verbs-Idioms and phrases-Listening Comprehension -Listening to Audio Files and Answering Questions-Framing Questions-Negotiation Skills-Presentation Skills and Debating Skills.

STRESS: Stress (Word Stress and Sentence Stress) Intonation- Difference between British and American English Vocabulary-Indianism-Compound Words (including Technical Terminology).

READING SKILLS: Reading Skills-Understanding Ideas and making Inferences-Group Discussion-Types of Interviews – FAQs – E - Mail Netiquette - Sample E – mails - Watching Documentary Films and Responding to Questions.

CORPORATE COMMUNICATION: Corporate Communication -Recommendation-Instruction-Check List- Circulars-Inter Office Memo- Minutes of Meeting and Writing Agenda - Discourse Markers - Rearranging Jumbled Sentences - Technical Articles - Project Proposals-Making Presentations on given Topics -Preparing Power Point Presentations

CRITICAL READING: Critical Reading-Book Review-Finding Key Information and Shifting Facts from Opinions-Business Letters (Calling for Quotation, Placing Orders and Complaint Letters) - Expansion of an Idea-Creative Writing.

TEXTBOOK

1. English for Effective Communication - Faculty of English – VMKV Engineering College, Salem and AVIT, Chennai.

REFERENCE BOOKS

1. Grammar Builder – I, II, III – Cambridge University Press.
2. Technical English – Writing, Reading and Speaking – Pickett and Lester, Harper and Row

Course Designers:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.P.Saradha	Associate Professor	English	saradhap@vmkvec.edu.in
2	Mr.S.K.Prem Kishor	Assistant Professor	English	Prem.english@avit.ac.in

VINAYAKA MISSION RESEARCH FOUNDATION

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY , PAIYANOOR

YOGA AND MEDITATION

SYLLABUS- 2018-19

UNIT – I SURYA NAMASKAR AND ASANAS

SuryaNamaskar, Padmasana, Vajrasana, Navasana, Bhujangasana, Dhanurasana, TriKonasana, Uttakatasana, Eka pada pranamasana, Pirai Asana, Padha Hasthasana, Savasana.

I – II PRANAYAMA

Surya pranayama, Chandra Pranayama, Anulom Vilom, Sheetali, Brahmari Pranayama.

UNIT – III MUDRA

Chin mudra, Rughi mudra, Yoga mudra, Maha mudra, Shanmukhi mudra.

UNIT – IV KRIYA

Kapalabathi, Bhastrika.

UNIT – V MEDITATION

Simple, Vibrational, Mantra, Yoga Nitra

References:

1. Dr.V.Krishnamoorthy, *Simple Yoga for Health*, Sri Mathi Nilayam, 2012.
2. Dr.Ananda Balayogi Bhavanani, *A Primer of Yoga Theory*, Dhivyananda Creations,2008.
3. Dr.S.Hema, Easy *Yoga for Beginners*, Tara yoga Publications,2008.
4. Dr.Asana Andiappan, *Ashtanga Yoga*, Asana Publications, 2009.
5. Yogacharya Sundaram, *Sundra Yoga Therapy*, Asana Publications, 2009
6. Dr.John B.Nayagam, *Mudumaikku Mutrupulli Vaikkum Muthiraigal*, Saaru Prabha

17MBHS04	TOTAL QUALITY MANAGEMENT	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE:

Quality is the mantra for success or even for the survival of any organization in this competitive global market. Total Quality Management (TQM) is an enhancement to the traditional way of doing business. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach for providing quality of products and processes. It becomes essential to survive and grow in global markets, organizations will be required to develop customer focus and involve employees to continually improve Quality and keep sustainable growth.

PREREQUISITE: Not Required

COURSE OBJECTIVES:

1. To understand the Total Quality Management concepts.
2. To practice the TQM principles.
3. To apply the statistical process control
4. To analyze the various TQM tools
5. To adopt the quality systems.

COURSE OUTCOMES:

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

CO1: Understand the importance of quality and TQM at managerial level.	Understand
CO2: Practice the relevant quality improvement tools to implement TQM.	Apply
CO3: Analyse various TQM parameters with help of statistical tools.	Analysing
CO4: Assess various TQM Techniques.	Evaluate
CO5: Practice the Quality Management Systems in a different organization Environment.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	-	-	-	-	L	L	L	M	L	M	-	-	-
CO2	M	-	-	-	L	L	-	L	M	M	-	L	L	-	-
CO3	S	S	M	S	S	-	-	L	-	L	-	L	M	-	M
CO4	L	M	S	L	M	-	L	-	L	M	L	M	-	-	L
CO5	L	L	M	-	L	M	S	S	M	L	L	M	L	-	M

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION

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

TQM PRINCIPLES

Customer satisfaction – Perception of Quality- Complaints- Service Quality- Customer Retention- Employee Involvement – Motivation- Empowerment - Teams- Recognition and Reward- Performance Appraisal- Benefits- Continuous Process Improvement – Juran's Trilogy- PDSA Cycle- 5S – Kaizen - Basic Concepts.

STATISTICAL PROCESS CONTROL (SPC)

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

TQM TOOLS

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

QUALITY SYSTEMS

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

TEXT BOOKS:

1. Dale H.Besterfiled- et at. - Total Quality Management- PHI-1999. (Indian reprint 2002).
2. Feigenbaum.A.V. "Total Quality Management- McGraw-Hill- 1991.

REFERENCES:

1. James R.Evans & William M.Lidsay - The Management and Control of Quality- (5th Edition) - South-Western (Thomson Learning) - 2002 (ISBN 0-324-06680-5).
2. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd - Oxford. 1989.
3. Narayana V and Sreenivasan - N.S. Quality Management – Concepts and Tasks- New Age International 1996.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	A. Mani	Associate Professor	Management Studies	mani@vmkvec.edu.in
2	Dr. V. Sheela Mary	Associate Professor	Management Studies	sheelamary@avit.ac.in

17EGHS81	ENGLISH LANGUAGE LAB	Category	L	T	P	Credit
		HSS	0	0	4	2

PREAMBLE

English Language Laboratory provides technological support to students. It acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To understand communication nuisances in the corporate sector.
2	To understand the role of mother tongue in second language learning and to avoid interference of mother tongue.
3	To communicate effectively through different activities
4	To understand and apply the telephone etiquette
5	Case study to understand the practical aspects of communication
6	To improve the oral skills of the students

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Give best performance in group discussion and interview	Understand
CO2. Best performance in the art of conversation and public speaking.	Apply
CO3. Give better job opportunities in corporate companies	Apply
CO4. Better understanding of nuances of English language through audio-visual experience and group activities	Apply
CO5. Speaking skills with clarity and confidence which in turn enhances their employability skills	Apply
CO6. Acquire strategic competence to use both spoken and written language in a wide range of communication strategies	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		**S**	**M**	**S**		**L**			**S**	**S**	**M**			**M**	**M**
CO2	**M**								**M**	**S**		**M**	**S**	**M**	
CO3	**M**									**S**		**M**			
CO4	**M**									**M**					**M**
CO5	**M**			**S**						**M**			**S**	**M**	
CO6		**M**	**M**							**M**			**M**	**M**	

S- Strong; M-Medium; L-Low

MODULE I

Ice Breaker, Grouping, Listening- (Hearing and listening)- Active Listening- Passive Listening – Listening to a song and understanding- (fill in the blanks) Telephone Conversation

MODULE II

Influence of mother tongue, videos, understanding nuances of English language (video) puzzle to solve, Activity.

MODULE III

Why is English important, Communication skills, TED (video) Communication in different scenario – a case study, ingredients of success, Activity – chart, speak the design, feedback on progress, Group wise, Individual.

MODULE IV

Telephone Etiquette, Dining Etiquette, Meeting Etiquette.

MODULE V

Case study of Etiquette in different scenario.

Course Designers:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.P.Saradha	Associate Professor	English	saradhap@vmkvec.edu.in
2	Mr.S.K.Prem Kishor	Assistant Professor	English	Prem.english@avit.ac.in

17MBHS01	ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE:

A startup means company initiated by individual innovator or entrepreneurs to search for a repeatable and scalable business model. More specifically, a startup is a newly emerged business venture that aims to develop a viable business model to meet a marketplace needs or wants in an optimum manner.

PREREQUISITE: Not Required

COURSE OBJECTIVES:

1. To understand the basics of Startups Management and components.
2. To analyze the startups fund management practices
3. To practice the various kinds of stocks and employment considerations in startups.
4. To apply the importance of intellectual property rights and its procedures.
5. To explore the entrepreneurial mindset and culture.

COURSE OUTCOMES:

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

CO1: Explain the concept of engineering startups, objectives and functions and its components.	Understand
CO2: Analyze the startups funding issues and remuneration practices in startups business.	Analyse
CO3: Analyze the various kinds of stocks and employment opportunities and consideration in startups business.	Analyse
CO4: Compare and contrast the various forms of intellectual property protection and practice.	Analyse
CO5: Explore the entrepreneurial mindset and culture that has been developing in companies of all sizes and industries.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	-	-	-	M	M	S	-	M	-	M	L	-	L
CO2	S	S	M	M	M	L	-	-	-	-	-	M	-	L	-
CO3	S	S	S	M	M	M	-	-	-	-	-	M	M	L	-
CO4	S	S	S	M	M	M	-	-	-	-	-	M	-	M	M
CO5	S	S	-	M	M	M	-	-	-	-	-	M	L	M	S

S- Strong; M-Medium; L-Low

SYLLABUS:

Elements of a successful Start up: Create Management Team and Board of Directors – Evaluate market and Target Customers – Define your product or service –Write your Business Plan

Funding Issues and Remuneration Practices: Funding Issues: Investment Criteria – Looking for seed

cash – Seed, Startup, and subsequent Funding Rounds – Milestone Funding - Remuneration Practices for your Start –up : Salaries – Headhunters – Equity Ownership – Form of Equity incentive vehicles – Other compensation – Employment Contracts

Stock Ownership & startup Employment Considerations: Stock ownership: Risk-Reward Scale – Ownership Interest over time – Common and preferred stock – Authorized and outstanding shares – Acquiring stock – Restricted Stock Grants – Future Tax Liability on Restricted Shares - Compensation and startup Employment Considerations : Entrepreneurs Need Insurance – Do Fringe benefits – outsourcing your benefits work – Life Insurance – Health Insurance – Disability Insurance

Protecting Intellectual Property: Protecting your intellectual property: Copyrights - patents–Trade secrets – Trademarks - The Legal Form of your Startup: Corporation – Partnership – Limited Liability Company – Sole Proprietorship - – Making the startup decision: commitment – Leaving a current employer - stay fit.

Entrepreneurship: Entrepreneurship - Introduction to Technology Entrepreneurship and Technology Ventures – Engineers as Entrepreneurs, The Mindset of the Entrepreneurial Leader, Creating and Selling the Entrepreneurial Value Proposition - Essentials of Successful Entrepreneurs – Social environment in entrepreneurial development – Economic environment in entrepreneurial development.

Text Book:

1. James A. Swanson & Michael L. Baird, "Engineering your start-up: A Guie for theHigh-Tech Entrepreneur" 2nd ed, Professional Publications.inc
2. Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.

Reference Books:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.
3. Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. G. Murugesan	Professor	Management Studies	murugesan@vmkvec.edu.in
2	Mr. T. Thangaraja	Assistant Professor	Management Studies	thangaraja@avit.ac.in

17MBHS07	PROFESSIONAL ETHICSAND HUMAN VALUES	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE: Ethics is a system of moral principles governing the appropriate conduct of a person or a group. Good Ethics is a fundamental requirement of any profession. Regardless of profession, ethics is an important part of work. The success depend on how the workers and their dealing with the situations ethically or unethically. Professional ethics are as important as personal ethics. Professional ethics encompass the personal and corporate standards of behavior expected by professional. Human values are the features that guide people to take into account the human element when one interacts with other human. They have many positive characters and positive feelings that create bonds of humanity between people and thus have value for all human beings and have the effect of bonding, comforting, reassuring and procuring serenity. They build space for a drive, a movement towards one another, which leads to peace.

PREREQUISITE: Not Required

COURSE OBJECTIVES:

1. To understand the basic concept of Human Values and Ethics.
2. To analyse the common ethical practice in the engineering professionals.
3. To Practice various code of ethics in Engineering.
4. To apply the rights, legal, ethical issues.
5. To practice ethical responsibilities of a professional engineer.

COURSE OUTCOMES:

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

CO1: Understand the moral values that ought to be practiced in engineering profession	Understand
CO2: Analyse the role of ethics in the field of engineering.	Analyse
CO3: Practice the code of ethics and Industrial standards	Apply
CO4: Assess the Safety, Quality Management and Risk analysis	Evaluate
CO5: Apply the skills and knowledge to handle the contemporary issues.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	-	-	-	M	-	L	M	M	L	M	-	L	-
CO2	M	-	-	-	-	S	L	M	L	M	L	M	L	-	-
CO3	M	-	M	L	L	M	-	M	-	-	M	M	-	M	M
CO4	M	M	M	-	M	L	-	M	L	L	L	M	M	M	-
CO5	M	M	M	L	L	-	-	M	L	M	M	M	M	M	L

S- Strong; M-Medium; L-Low

SYLLABUS:

Introduction to Human Values

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy –Self-Confidence–Discrimination -Character – Challenges in the work place -Spirituality –and stress management.

Overview of Engineering Ethics

Senses of 'Engineering Ethics' – Variety of moral issues – Moral Dilemmas- moral autonomy - Kohlberg'stheory-Gilligan'stheory-consensusandcontroversy-Profession – Types of Profession- Models of professional roles – Theories about right action – Self- Respect- Self-interest – Customs and Religion – Uses

of Ethical Theories–Religion - Case study: Choice of the theory

Engineering as Social Experimentation

Engineering as Experimentation – Engineering Projects VS. Standard Experiments - Engineers as responsible Experimenters – Codes of Ethics – anticorruption-A Balanced Outlook on Law.

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

GLOBAL ISSUES

Transnational and MNC corporations-Environmentalethics-Computerethics-Weaponsdevelopment and Ethical - stand for Engineers in creation-Engineers as managers-Consulting engineers-Engineers as expertwitnessesandadvisorsEthical Responsibilities of a Professional Engineer as an Expert Witness -Moral Leadership –Code of Conduct – Corporate Social Responsibility **Case Studies**

TEXT BOOK:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. R.S. Nagarajan, A Text Book on Professional Ethics and Human Values, New Age International (P) Limited, Publishers,2006

REFERENCES:

1. CharlesD.Fleddermann,"EngineeringEthics",PearsonEducation/PrenticeHall,NewJersey, 2004
2. CharlesEHarris,MichaelS.ProtchardandMichaelJRabins,"EngineeringEthics–Concepts and Cases",WadsworthThompsonLeatning, United States,2000
3. John R Boatright, "Ethicsandthe ConductofBusiness", PearsonEducation,NewDelhi,2003.
4. EdmundGSeebauerandRobertLBarry,"FundamentalsofEthicsforScientistsandEngineers", Oxford Press, 2000
5. R.Subramanian,"ProfessionalEthics",Oxford University Press ,Reprint ,2015.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	mail id
1	Dr. P. Marishkumar	Associate Professor	Management Studies	marishkumarp@vmkvec.edu.in
2	T.Thangaraja	Assistant Professor	Management Studies	thangaraja@avit.ac.in

17MBHS08	PROJECT MANAGEMENT FOR ENGINEERING BUSINESS AND TECHNOLOGY	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE: Engineering Project Management is a type of Project Management, focuses solely on engineering and Management. Similar to other Project Management it posses standard methodologies and processes with engineering background. It enables to get into the field of Project Management. These skills can provide critical benefits such as improved efficiency, enhanced effectiveness, success replication, perfect leadership and communication, and complete view of the project in the aspect of time and cost.

PREREQUISITE: Not Required

COURSE OBJECTIVES:

1. To understand the importance of Project Management.
2. To understand the Project management Techniques.
3. To understand the statistical process control.
4. To impart the various Project management tools and software.
5. To understand the Project management and resource utilization.

COURSE OUTCOMES:

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

CO1: Understand the importance of Project Management and Business.	Understand
CO2: Explain the required tools to implement Project Techniques.	Apply
CO3: Analyze various Project constraints with help of project tools.	Analyze
CO4: Evaluating various Project Techniques.	Analyze
CO5: Put forward the Project management in a different organization milieu.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	-	-	-	M	-	-	M	S	-	M	M	-	-
CO2	S	S	M	-	M	M	S	M	S	S	-	-	M	S	M
CO3	S	M	M	M	S	-	M	M	-	M	-	M	S	M	-
CO4	M	-	S	-	M			S	S			M	-	S	-
CO5	M	M	-	-	M	M	M	S		S	M	S	M	-	S

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION

Project Management concept-Attributes as a project-Project life cycle-The Project Management process- Benefits of Project Management- Needs, Identification-Project selection-preparing a request for proposal-Soliciting proposals-Proposed solutions- Proposal Marketing-Bid/No-Bid Decision-Developing Winning Proposal-Proposal preparation-Proposal contents-Pricing Consideration-Proposal Submission and Follow-up - Customer evaluation as proposals-Types of contracts-Contract provisions.

PROJECT PLANNING

Project Planning-Project Planning Objective-Work Break-down structure-Responsibility Matrix-Defining activities-Developing the network plan-Planning for Information system development- -Scheduling-activity duration estimates-project start and finish times-Schedule calculation-Scheduling for information systems development.

PROJECT CONTROL PROCESS

Schedule control-Project control process-Effects of actual schedule performance - Incorporating project changes into schedule-Updating the project schedule-Approaches to schedule control-Schedule control for information system development – Resource consideration-Constrained Planning-Planned resources utilization – Resources levelling- Limited scheduling-Project Management software – Cost Planning and Performance - Project cost Estimates-Project Budgeting-Determining actual cost-Determining the value of work performed-Cost performance analysis-Cost forecasting-Cost control-Managing Cash Flow.

RISK AND FEASIBILITY

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

PROJECT MANAGER SKILLS AND ABILITIES

Project Manager-Responsibilities of the Project Manager-Skills at the Project Manager - Developing the skill needed to be a Project Manager-Delegation-Managing Change – Project Team-Project Team development and Effectiveness- Ethical Behaviour conflict on project-problem solving-Time Management-Project Communication and Personal Communication-Effective listening-Meetings-Presentation-Report-Project documentation and Controlling changes-Types of project organization- Matrix organization.

TEXT BOOKS:

1. Samuel J.Mantel JR., Jack R.Meredith, Project Management, Wiley India, Edition 2006.
2. Santakki.V.C., Project Management, Himalaya Publishing House, Edition 2006.

REFERENCES:

1. Project Management, Jack Gido and James P Clements, (Edition 2009) Cenage Learning India pvt Ltd., New Delhi.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	mail id
1	B. Rajnarayanan	Assistant Professor	Management Studies	rajsachin.narayanan@gmail.com
2	Dr. V.Sheelamary	Asso.Professor	Management Studies	sheelamary@avit.ac.inn

17MBHS09	INTELLECTUAL PROPERTY RIGHTS AND ALTERNATE DISPUTE RESOLUTION	Category	L	T	P	Credit
		HSS	3	0	0	3

PREAMBLE: IPR & ADR

Intellectual Property Rights are valuable assets and the most essential for any kind of business development. IPR helps to set the business to show individuality from market competitors. It prevents duplication and provide authentication as a unique selling point to compete in the market and built confidence over the product among the customers. ADR is a new legal mechanism to sort out disputes among industries and helps to get easily solved through mediation and counselling. It provides instant solutions to both the parties with meagre loss in a faster way and less expensive through arbitrator.

PREREQUISITE: Not Required

COURSE OBJECTIVES:

1. To understand and practice the basic concept of IPR and Patent filing procedure.
2. To describe the various procedure for getting grants of patent, trademark and trade secrets.
3. To apply various legal aspects in patent ownership and transfer.
4. To implement the best practices and laws relating to the Intellectual property rights.
5. To examine the practices of ADR mechanism in the technological advancement contexts.

COURSE OUTCOMES:

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

CO1: Understand the concept and development of intellectual property rights.	Understand
CO2: Explain the procedure and requirement of to apply New IPR development and related system in India and across the Globe.	Understand
CO3: Solve the various issues of transfer of patent ownership with reference to International Patent Law.	Apply
CO4: Analyse the present system of Patent Act in India and changes aligned with international standards.	Analyse
CO5: Criticise the present dispute mechanism and how ADR supports and solution to business issues.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	M	M	-	-	S	L	M	L	M	-	L	-	-	-
CO2	-	-	M	L	M	M	S	L	M	L	L	L	-	-	M
CO3	-	-	M	M	-	L	M	-	M	L	L	M	L	M	-
CO4	M	-	-	L	M	-	L	-	-	L	L	M	-	-	L
CO5	-	L	-	L	M	L	-	M	L	-	M	L	L	L	-

S- Strong; M-Medium; L-Low

SYLLABUS:

UNIT – I: Introduction To IPRs

Basic concepts of Intellectual Property- Patents Copyrights, Geographic Indicators, History of IPRs- the way from WTO to WIPO- TRIPS, Nature of Intellectual Property, Industrial Property, Technological Research, Inventions and Innovations - Defining Intellectual Property and Patents, Patent Searches and Application.

UNIT – II: New Developments in IPR

Procedure for grant of Patents, TM, GIs, Trade Secrets, Patenting under PCT, Administration of Patent system in India, Patenting in foreign countries - International Treaties and conventions on IPRs, The TRIPs Agreement.

UNIT – III: Patent Ownership and Transfer

Defining Intellectual Property and Patents, Patent Searches and Application, Patent Ownership and Transfer, Patent Infringement, New Developments and International Patent Law

UNIT – IV: Legislation of IPRs

The Patent Act of India, Patent Amendment Act (2005), Design Act, Trademark Act, Geographical

Indication Act, Bayh- Dole Act and, IPR strength in India - Patent Ownership and Transfer, Patent Infringement, New Developments and International Patent Law

UNIT – V: Alternate Dispute Resolution

Alternate Dispute Resolution and Arbitration – ADR Initiatives - Reason for Choosing ADR – Advantages and Disadvantages of ADR – Assessment of ADR's – Litigation – Arbitration - Effective Mechanism for Business Issues.

TEXT BOOK:

1. Deborah E. Bouchoux, Intellectual Property Rights, Delmar, Cengage Learning, 2005.

REFERENCES:

1. V. Sople Vinod, Managing Intellectual Property by (Prentice hall of India Pvt.Ltd), 2006.
2. A. Primer, R. Anita Rao and Bhanoji Rao, Intellectual Property Rights, Lastain Book company. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2006.
3. Tejaswini Apte, A single guide to Intellectual property rights, Biodiversity and Traditional knowledge.
4. WIPO Intellectual Property Hand book.
5. Intellectual Property rights and copyrights, Ess Ess Publications.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	mail id
1	Dr. G. Palaniappan	Associate Professor	Management Studies	palaniappan@vmkvec.edu.in
2	Mr. C. M. Muthukrishna	Assistant Professor	Management Studies	Muthukrishna.mba@avit.ac.in

A. Foundation Courses (FC)

Basic Sciences (Maths, Physics and Chemistry Courses)(BS)

Subject Code	Subject Title	Category	L	T	P	Credit
17MABS01	**ENGINEERING MATHEMATICS**	BS	2	2	0	3

PREAMBLE

The driving force in Engineering Mathematics is the rapid growth of technology and is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

PREREQUISITE --

COURSE OBJECTIVES

1	To identify the characteristics of a linear system with Eigen values and Eigen vectors.
2	To improve their ability in solving geometrical applications of differential calculus
3	To find a maximum or minimum value for a function of several variables subject to a given constraint.
4	To understand the integration techniques for evaluating surface and volume integrals.
5	Incorporate the knowledge of vector calculus to support their concurrent and subsequent engineering studies

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Able to understand the system of linear equations arising in all engineering fields using matrix methods.	Understand
CO2. Determine the evolute and envelope for a given family of curves	Apply
CO3. Apply differentiation to solve maxima and minima problems.	Apply
CO4. Compute the area and volume of plane using integration	Apply
CO5. Evaluate the surface and volume integral using Green's, Stokes and Gauss Divergence theorems	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	M	--	--	--	--	--	--	M	S	M	M
CO2	S	M	M	M	M	--	--	--	--	--	--	M	S	M	M
CO3	S	M	M	M	M	--	--	--	--	--	--	M	S	M	M
CO4	S	M	M	M	M	--	--	--	--	--	--	M	S	M	M
CO5	S	M	M	M	M	--	--	--	--	--	--	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

MATRICES: Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

DIFFERENTIAL CALCULUS: Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute.

FUNCTIONS OF SEVERAL VARIABLES: Partial Derivatives – Total Differentiation – Maxima and Minima constrained Maxima and Minima by Lagrangian Multiplier Method.

MULTIPLE INTEGRALS: Double integration – change of order of integration – Cartesian and polar coordinates – Area as a double integral – Triple integration.

VECTOR CALCULUS: Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal – vector fields – vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorem (excluding proof).

TEXT BOOKS:

1. "Engineering Mathematics I & II", Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2017).
2. Dr.A.Singaravelu, "Engineering Mathematics I & II", 23rd Edition, Meenakshi Agency, Chennai (2016).

REFERENCES:

1. Veerarajan T., "Engineering Mathematics", Tata McGraw Hill Education Pvt, New Delhi (2011).
2. Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
3. Kreyszig E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt. Ltd., Singapore (2012).
4. Kandasamy P, Thilagavathy K, and Gunavathy K., "Engineering Mathematics", Volumes I & II (10th Edition).

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr.G.Selvam	Asso.Prof	VMKVEC	selvam@vmkvec.edu.in
2	Ms.S.Gayathri	Asst.Prof.Grade I	AVIT	gayathri@avit.ac.in

17PCBS02	PHYSICAL SCIENCES PART A - ENGINEERING PHYSICS	Category	L	T	P	Credit
		FC(BS)	2	0	0	2

PREAMBLE

Engineering Physics is the study of advanced physics concepts and their applications in various technological and engineering domains. Understanding the concepts of laser, types of lasers, thepropagation of light through fibers, applications of optical fibers in communication and different types of non-destructive techniques will help an engineer to analyze, design and to fabricate various conceptual based devices.

PREREQUISITE : NIL

COURSE OBJECTIVES

1	To recall the properties of laser and to explain principles of laser
2	To assess the applications of laser
3	To detail the principles of fiber optics
4	To study the applications of fiber optics
5	To explain various techniques used in Non-destructive testing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Understand the principles laser, fiber optics and non-destructive testing	Understand
CO2. Understand the construction of laser, fiber optic and Non-Destructive testing equipments	Understand
CO3. Demonstrate the working of laser, fiber optic and Non-Destructive testing based components and devices	Apply
CO4. Interpret the potential applications of laser, fiber optics and Non-Destructive testing in various fields.	Apply
CO5. Differentiate the working modes of various types of laser, fiber optic and Non-Destructive testing based devices.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S		M									M	M	M	
CO2	S		L									M	M	M	
CO3	S			M			M					M	M	M	
CO4	S	M		M	M	S	M					M	S	M	M
CO5	S	M	M									M	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT-I

LASERS: Laser characteristics - Stimulated Emission – Population Inversion - Einstein coefficients – Lasing action – Types of Laser – Nd:YAG laser, CO2 laser, GaAs laser – Applications of Laser – Holography – construction and reconstruction of a hologram

UNIT-II

FIBRE OPTICS: Principle and propagation of light in optical fibers – numerical aperture and acceptance angle – types of optical fibers (material, refractive index, mode) – Applications: Fiber optic communication system – fiber optic displacement sensor and pressure sensor.

UNIT-III

NON-DESTRUCTIVE TESTING: Introduction – Types of NDT - Liquid penetrant method – characteristics of penetrant and developer - ultrasonic flaw detector – X-ray Radiography: displacement method – X-ray Fluoroscopy.

TEXT BOOK

1. Engineering Physics, compiled by Department of Physics, Vinayaka Mission's Research Foundation (Deemed to be University), Salem.
2. P.K. Palanisamy, Engineering Physics, Scientific Publishers, 2011.
3. Dr.M. N. Avadhanulu, Engineering Physics, S.Chand & Co, 2010.

REFERENCE BOOKS

1. Beiser, Arthur, Concepts of Modern Physics, 5th Ed., McGraw-Hill, 2009.
2. Halliday.D, Resnick.R, Walker.J, Fundamentals of Physics, Wiley & sons, 2013.
3. Gaur R. K. and Gupta S. L., Engineering Physics, DhanpatRai publishers, New Delhi, 2001.
4. Avadhanulu.M.N., Arun Murthy.T.V.S, Engineering Physics Vol. I, S.Chand, 2014.
5. Rajendran. V, Engineering Physics, Tata McGraw Hill Publication and Co., New Delhi, 2009.
6. Baldev Raj et al. Practical Non-Destructive Testing, Narosa Publications, 2017.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Dr. C. Senthil kumar	Professor	Physics / VMKVEC	senthilkumarc@vmkvec.edu.in
2	Dr. R. Sethupathi	Associate Professor	Physics / VMKVEC	sethupathi@vmkvec.edu.in
3	Dr. G. Suresh	Associate Professor	Physics / AVIT	suresh.physics@avit.ac.in
4	Dr. B.Dhanalakshmi	Associate Professor	Physics / AVIT	dhanalakshmi.phy@avit.ac.in

17PCBS02	PHYSICAL SCIENCES PART B -ENGINEERING CHEMISTRY Semester I (Common to All Branches)	Category	L	T	P	C
		FC(BS)	2	0	0	2

Preamble

Objective of this course is to present a better understanding of basic concepts of chemistry and its applications on different engineering domains. It also imparts knowledge on fundamentals of Electrochemistry, Energy storage technologies, properties of water and its treatment methods, classification of fuels, Non conventional sources of Energy and various advanced Engineering materials.

Prerequisite

Not required

Course Objectives

1	To impart basic knowledge in Chemistry so that the student will understand the engineering concept
2	To familiar with electrochemistry and Battery and fuel Cells
3	To lay foundation for practical applications of water softening methods and its treatment methods in engineering aspects.
4	To inculcate the knowledge of fuels and advanced material.

Course Outcomes

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

CO1.	Describe the electrochemistry, batteries and working principle of energy storage devices	Understand
CO2.	Estimate the hardness of water	Apply
CO3.	Identify suitable water treatment methods	Analyze
CO4.	Outline the important features of fuels and advanced materials	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1.	S	M	-	M	-	S	S	S	-	-	L	M	S	M	S
CO2.	S	S	M	-	-	M	M	M	-	-	-	M	M	S	M
CO3.	S	S	M	-	-	M	S	M	-	-	-	M	M	M	M
CO4.	S	-	-	-	L	L	M	L	-	-	-	S	M	S	M

S- Strong; M-Medium; L-Low

SYLLABUS

Electrochemistry, Batteries and Fuel cells
Electrode potential - Nernst equation – Electrodes (SHE, Calomel and Glass) - cells - EMF measurement. Primary battery (Daniel and dry cell) – secondary battery (lead Acid storage battery and Nickel-Cadmium battery) – Fuel cell (H_2-O_2 fuel cell)
Water Technology and Corrosion
Sources of water – impurities – Hardness and its determination (problems to be avoided) – boiler troubles – water softening (Zeolite & Demineralisation) – Domestic water treatment – Desalination (Electrodialysis & Reverse Osmosis).
Fuels And Chemistry of Advanced Materials
Classification of Fuels (Solid, Liquid, Gaseous, Nuclear and Bio fuels) – Calorific Value of a fuel –Non Petroleum Fuels –Non conventional sources of Energy – combustion. Basics and Applications:-Organic electronic material, shape memory alloys, polymers (PVC, Teflon, Bakelite)

TEXT BOOKS

1. Engineering Chemistry by prepared by Vinayaka Mission's Research Foundation, Salem.

REFERENCE BOOKS

1. A text book of Engineering Chemistry by S.S. Dara, S.Chand & company Ltd., New Delhi
2. Engineering Chemistry by Jain & Jain, 15th edition Dhanpatrai Publishing Company (P) Ltd., New Delhi
3. A text book of Engineering Chemistry by Shashi Chawla, Edition 2012 Dhanpatrai & Co., New Delhi.
4. Engineering Chemistry by Dr. A. Ravikrishnan, Sri Krishna Publications, Chennai.

Course Designers:

S. No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. V. Anbazhagan	Professor	Chemistry/VMKVEC	anbu80@gmail.com
2.	Mr. A. Gilbert Sunderraj	Assistant Professor	Chemistry/VMKVEC	asmgill80@gmail.com
3.	Dr. R. Nagalakshmi	Professor	Chemistry/AVIT	nagalakshmi.chemistry@avit.ac.in
4.	Dr.K.Sanghamitra	Associate Professor	Chemistry/AVIT	sanghamitra.chemistry@avit.ac.in

17PHBS05	SMART MATERIALS	Category	L	T	P	Credit
		FS(BS)	3	0	0	3

PREAMBLE

Smart Materials gives an outlook about various types of materials having potential application in Engineering and Technology. In particular, Students learn about Smart Materials and their applications, Properties of Crystalline Materials & Nanomaterials, Characteristics of Magnetic materials. They also get a clear picture about superconducting materials.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To explain the fundamental properties and classification of smart materials, crystalline materials, Nano materials, Magnetic materials and Super conducting materials.
2	To paraphrase the basic crystalline structure and its properties.
3	To illustrate the synthesis and fabrication of Nano materials.
4	To predict the application of smart materials, crystalline materials, Nano materials, Magnetic materials and Super conducting materials.
5	To analyze the various parameters of crystalline materials.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Restate the properties of various materials.	Understand
CO2. Summarize the various structures of materials.	Understand
CO3. Predict the applications of various materials to designing equipments.	Apply
CO4. Illustrate the properties of materials to designing equipments.	Apply
CO5. Calculate the crystalline parameters of the materials.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	M	S				M			S	M		M
CO2	S	M	S	M	S				M			M			M
CO3	S	S	S	S	S				S			M	M		M
CO4	S	M	S	M	S				M			M	M		M
CO5	M	S	S	M	M				S			M			

S- Strong; M-Medium; L-Low

SYLLABUS

SMART MATERIALS: Shape Memory Alloys (SMA) – Characteristics and properties of SMA, Application, advantages and disadvantages of SMA. Metallic glasses – Preparation, properties and applications.

CRYSTALLINE MATERIALS: Unit cell – Bravais lattice – Miller indices – Calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures.

NANO MATERIALS: Nanophase materials – Top-down approach - Mechanical Grinding - Lithography - Bottom-up approach – Sol-gel method – Carbon nanotubes – Fabrication – applications.

MAGNETIC MATERIALS: Basic concepts – Classification of magnetic materials – Domain theory – Hysteresis – Soft and Hard magnetic materials.

SUPERCONDUCTING MATERIALS: Superconducting phenomena – properties of superconductors – Meissner effect – isotope effect – Type I and Type II superconductors – High Tc Superconductors – Applications of superconductors.

TEXT BOOK:

Mani P, Engineering Physics II, Dhanam Publications, 2018.

REFERENCES:

1. Pillai S.O., Solid State Physics, New Age International (P) Ltd., publishers, 2018.
2. Senthilkumar G. Engineering Physics II. VRB Publishers, 2018.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. S. Mohammed Harshulkhan	Assistant Professor	Physics/VMKVEC	harshulkhan@vmkvec.edu.in
2	Mr. R. Sakthi ganapathy	Assistant Professor	Physics/VMKVEC	sakthiganapthy@vmkvec.edu.in
3	Dr .G. Latha	Professor	Physics/AVIT	latha.physics@avit.ac.in
4	Dr. R. N. Viswanath	Professor	Physics/AVIT	viswanath.physics@avit.ac.in

17CHBS01	Environmental Science & Engineering (Common to All Branches)	Category	L	T	P	C
		FC(BS)	3	0	0	3

Preamble

Environmental science and Engineering is an interdisciplinary field that integrates physical, chemical, biological, information sciences and provides the basic knowledge of structure and function of ecosystem and better understanding of natural resources, biodiversity and their conservation practices. The course helps to create a concern for our environment that will generate pro-environmental action, including activities we can do in our daily life to protect it. Furthermore, it deals the social issues and ethics to develop quality engineer in our country.

Prerequisite

Not required

Course Objectives

1	Applying Science and Engineering knowledge to protect environment
2	To provide comprehensive insight in natural resources and protect natural resources
3	To create awareness on the various pollutions and their impact.
4	To educate the ways and means to manage natural calamities
5	To impart fundamental knowledge on human welfare measures

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Comprehend the impact of engineering solutions in a global and societal context	Understand
CO2.	Illustrate the contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems	Understand
CO3.	Illustrate the importance of ecosystem and biodiversity	Apply
CO4.	Practice to improve the environment and sustainablity	Apply
CO5.	Conclude the importance of conservation of resources.	Analyze
CO6.	Estimate the important role of IT in healthy environment for future generations	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1.	S	M	-	-	-	M	S	S	M	M	-	S	M	M	S
CO2.	S	-	-	-	-	S	S	S	-	-	-	S	M	M	S
CO3.	S	-	-	-	-	M	S	M	L	-	-	S	M	S	S
CO4.	S	-	-	-	-	M	S	S	M	M	-	S	M	S	M
CO5.	S	-	-	-	-	M	S	S	M	M	-	S	M	S	M
CO6.	S	-	-	-	-	M	S	S	M	M	-	S	M	S	M

S- Strong; M-Medium; L-Low

SYLLABUS

ENVIRONMENT AND NATURAL RESOURCES

Environment - Definition, scope & importance - Public awareness- Forest resources, mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) - Scope & role of environmental engineers in conservation of natural resources - Sustainability development.

ECOSYSTEMS AND BIO – DIVERSITY

Ecosystem - Definition, structure and function - Energy flow -Ecological succession - food chain, food web, ecological pyramids- Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio - Diversity :values and uses, hotspots, threats and conservation.

ENVIRONMENTAL POLLUTION

Pollution - Definition, man made impacts and control measures of air, water and land pollution - Water quality standards & characterization - Importance of sanitation -Nuclear hazards – Hazardous waste management : Solid waste, waste water and biomedical waste - Prevention of pollution and role of individual – Disasters management : Floods, earthquake, cyclone and land slides - Clean technology options.

SOCIAL ISSUES AND ENVIRONMENT

Urban problems related to energy - Water conservation – Resettlement and rehabilitation of people - Environmental ethics - Climate change - Global warming - Acid rain - Ozone depletion-Waste land reclamation, Environment Protection Act for air, water, wild life and forests - Pollution Control Board.

HUMAN POPULATION AND ENVIRONMENT

Population growth - Population explosion - Family welfare programme - Environment & human health - Human rights – Value education - Women and child welfare, Role of information technology in environment and human health.

TEXTBOOK

1. Environmental Science and Engineering by Dr.A. Ravikrishnan, Sri Krishna Publications, Chennai.

REFERENCES

1. Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.
2. Bharucha Erach "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India
3. Trivedi R.K. “Handbook of Environmental Laws", Rules, Guidelines, Compliances and tandards Vol I & II, Enviro media.
4. Dr. J. Meenambal, Environmental Science and Engineering, MJP Publication, Chennai
5. Gilbert M. Masters : Introduction to Environmental Engineering and Science, Pearson Education Pvt Ltd., II Edition, ISBN 81-297-0277-0, 2004

Course Designers:

S. No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. V. Anbazhagan	Professor	Chemistry/VMKVEV	anbu80@gmail.com
2.	Mr. A. Gilbert Sunderraj	Assistant Professor	Chemistry/VMKVEV	asmgill80@gmail.com
3.	Dr. R. Nagalakshmi	Professor	Chemistry/AVIT	nagalakshmi.chemistry@avit.ac.in
4.	Dr.K.Sanghamitra	Associate Professor	Chemistry/AVIT	sanghamitra.chemistry@avit.ac.in

17MABS04	MATHEMATICS FOR MECHANICAL SCIENCES	Category	L	T	P	Credit
		BS	2	2	0	3

PREAMBLE

Partial Differential Equations frequently arise in the field of science and engineering, which emphasizes the development of rigorous logical thinking and analytical skills of the student for solving different kinds of problems such as Heat flow equations of one dimension and two dimensions. Statistical methods are important tool, which provide the engineer with both descriptive and analytical methods for dealing with the variability in observed data.

PREREQUISITE

Engineering Mathematics (17MABS01)

COURSE OBJECTIVES

1	To formulate and solve partial differential equations.
2	To represent a periodic function as a Fourier series.
3	To be familiar with applications of partial differential equations.
4	To be familiar with random variables and describe the properties of discrete and continuous distribution functions
5	To provide an understanding for the graduate on statistical concepts to include measures of central tendency, curve fitting, correlation and regression.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Explain the methodology of forming and solving partial differential equations.	Apply
CO2. Demonstrate periodic functions as Fourier series of sine and cosines and calculate the Fourier coefficients numerically.	Apply
CO3. Solve partial differential equations like wave equations and heat flow equation by Fourier series.	Apply
CO4. Classify the random variables to determine the appropriate distributions.	Analyze
CO5. Apply least square method to fit a curve for the given data and evaluate the correlation coefficient and regression lines for the data.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	--	--	--	--	--	--	M	S	M	--
CO2	S	S	M	M	M	--	--	--	--	--	--	M	S	M	--
CO3	S	S	M	M	M	--	--	--	--	--	--	M	S	M	M
CO4	S	S	M	M	M	--	--	--	--	--	--	M	S	S	--
CO5	S	S	M	M	M	--	--	--	--	--	--	M	S	S	M

S- Strong; M-Medium; L-Low

SYLLABUS

PARTIAL DIFFERENTIAL EQUATIONS: Formation - Solutions of standard types f(p,q)=0, clairauts form, f(z,p,q)=0,f(p,x)=g(q,y) of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

FOURIER SERIES: Dirichlet's conditions – General Fourier series – Half -range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

BOUNDARY VALUE PROBLEMS: Classification of second order linear partial differential equations – Solutions of one – dimensional wave equation, one – dimensional heat equation – Steady state solution of two – dimensional heat equation – Fourier series solutions in Cartesian coordinates.

STANDARD DISTRIBUTIONS: Moment generating function of random variables – Binomial – Poisson – Geometric – Uniform – Exponential – Gamma and Normal Distributions and their Properties (Mean Variance and Problems).

STATISTICS: Measures of central tendency, Curve fitting – Straight line and Parabola by least square method, Correlation, Rank correlation and Regression.

TEXT BOOKS:

1. Dr.A.Singaravelu, "Transforms and Partial differential Equations", 18th Edition, Meenakshi Agency, Chennai (2013).
2. A.Singaravelu, "Probability and Statistics", Meenakshi Agencies, Chennai (2016)
3. S.C.Gupta, V.K.Kapoor, "Fundamentals of mathematical statistics", Sultan Chand & Sons (2006).

REFERENCES:

1. T. Veerarajan, "Engineering Mathematics" (for semester III), Third Edition, Tata McGraw-Hill Publishing Company limited (2011).
2. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
3. Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore (2012).
4. T. Veerarajan, "Probability, Statistics and Random processes" 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi (2006).
5. Johnson. R.A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson education, Delhi, 2000. (Chapters 7, 8, 9, 12).

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Ms.M.Usha	Assistant professor	VMKVEC	usha@vmkvec.edu.in
2	Ms.S.Sarala	Asst.Prof. grade II	AVIT	sarala@avit.ac.in

17MABS11	NUMERICAL METHODS FOR MECHANICAL SCIENCES	Category	L	T	P	Credit
		BS	2	2	0	3

PREAMBLE

This course aims at developing the ability to formulate an engineering problem in a mathematical form appropriate for subsequent computational treatment and to choose an appropriate numerical approach. An under graduate of Engineering student needs to know sufficient numerical methods and techniques for solving engineering problems such as static or steady state problems, vibration or stability problems and initial value or transient problems etc.

PREREQUISITE

1.Engineering Mathematics (17MABS01)

2.Mathematics for Mechanical Sciences(17MABS04)

COURSE OBJECTIVES

1	To familiar with numerical solution of equations
2	To be get exposed to finite differences and interpolation
3	To be thorough with the numerical Differentiation and integration
4	To find numerical solutions of ordinary differential equations
5	To find numerical solutions of partial differential equations

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Solve the system of linear algebraic equations and single non linear equations arising in the field of Mechanical Engineering.	Apply
CO2. Apply methods to find intermediate numerical value & polynomial of numerical data.	Apply
CO3. Apply methods to find integration, derivatives of one and two variable functions.	Apply
CO4. Solve the initial value problems using single step and multistep methods.	Apply
CO5. Solve the boundary value problems using finite difference methods.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	--	--	--	--	--	--	M	S	--	--
CO2	S	S	M	M	M	--	--	--	--	--	--	M	S	--	--
CO3	S	S	M	M	M	--	--	--	--	--	--	M	S	--	--
CO4	S	S	S	S	M	--	--	--	--	--	--	M	S	--	--
CO5	S	S	S	S	M	--	--	--	--	--	--	M	S	M	--

S- Strong; M-Medium; L-Low

SYLLABUS

SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS: Method of false position, Newton-Raphson method for single variable, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss- Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power Method.

INTERPOLATION AND APPROXIMATION: Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling's and Bessel's).

NUMERICAL DIFFERENTIATION AND INTEGRATION: Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both 1/3rd and 3/8th) rules. Romberg's rule, Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

INITIAL VALUE PROBLEMS OF ODE: Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order -first and second order differential equations. Multistep Methods - Milne and Adam's-Bash forth predictor and corrector methods.

BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS: Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

TEXT BOOKS:

1. S.K Gupta, "Numerical Methods for Engineers", New Age International Pvt. Ltd. Publishers, 2015.
2. S. R. K. Iyengar, R. K. Jain, Mahinder Kumar Jain, "Numerical methods for Scientific and Engineering Computations", New Age International publishers , 6th Edition, 2012.
3. T. Veerarajan, T.Ramachandran, "Numerical Methods with Programs in C and C++", Tata McGraw-Hill (2004)

REFERENCES:

1. Joe D. Hoffman, Steven Frankel, "Numerical Methods for Engineers and Scientists", 3 rd Edition, 2015, Tata Mc-Graw Hill.(New York).
2. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers", MC Graw Hill Higher Education, 2010.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr. M.Vijayarakavan	Asso.Prof	VMKVEC	vijayarakavan@vmkvec.edu.in
2	Dr.A.K.Thamizhsudar	Asso.Prof. grade II	AVIT	thamizhsudar@avit.ac.in

17 MABS21	RESOURCE MANAGEMENT TECHNIQUES	Category	L	T	P	Credit
		BS	2	2	0	3

PREAMBLE

Operations Research is the study of optimization techniques and its helps in solving problems in different environments that need decisions like, Inventory control problems, Maintenance and Replacement problems, Sequencing, Scheduling problems, Assignment of Jobs to applicants, Transportation problems, Network problems and Decision models. Entire subject is useful for all resource managers of various fields.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To be thorough with linear programming problem, formulate a real world problem.
2	To acquire the knowledge of linear programming problem in assignment and transportation
3	To acquire skills in handling techniques of PERT, CPM and sequencing model
4	To be exposed to the concepts of Inventory control.
5	To study the decision theory and game theory techniques to analyze the real world systems

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Formulate and Solve the Linear programming problem.	Apply
CO2. Solve specialized linear programming problems like the Transportation and Assignment problems.	Apply
CO3. Predict the shortest path in network problems	Analyze
CO4. Design a continuous or periodic review inventory control system.	Apply
CO5. Solve larger problem using technical knowledge and complete the task on time	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	--	--	--	--	--	--	S	S	S	M
CO2	S	S	M	M	M	--	--	--	--	--	--	S	S	S	M
CO3	S	S	S	M	M	--	--	--	--	--	--	S	S	S	M
CO4	S	S	S	M	M	--	--	-	--	--	--	S	S	S	M
CO5	S	S	S	M	M	--	--	-	--	--	--	S	S	S	M

S- Strong; M-Medium; L-Low

SYLLABUS

LINEAR PROGRAMMING: Linear programming problem – Graphical method - Simplex method – Big M

method – Duality principle.

TRANSPORTATION MODEL: Transportations problem – Assignment problem – Under Assignment - Travelling salesman problem.

NETWORK MODEL: Project Network – CPM and PERT Networks – Critical path scheduling – Sequencing Models.

INVENTORY MODELS: Inventory Model – Economic Order Quantity Model – Purchasing Model (with and without shortages) – Manufacturing Model (with and without shortages) - Stochastic Inventory Model (Stock in discrete and continuous units).

DECISION MODEL: Decision Model – Game theory – Two Person Zero sum game – Algebraic solutions Graphical solutions – Replacement model – Model based on Service life – Economic life single / multivariable search technique.

TEXTBOOKS:

1. F.S Hillier and G.J. Lieberman, "Introduction to Operations Research: Concept and Cases, McGraw-Hill International, (2008).
2. H.A.Taha, "Operations Research: An Introduction", 7th Edition, Prentice Hall of India, (2002).

REFERENCES:

1. Kanti Swarup, P.K.Gupta, Man Mohan, "Operations Research" S.Chand & Sons, New Delhi, (2010).
2. Sundarasen.V, Ganapathy subramaniyam . K.S, Ganesan.K. "Resource Management Techniques", A.R. Publications, Chennai (2013).
3. Premkumar Gupta, D.S. Hira, "Operations Research" S. Chand & company New Delhi.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the college	Mail ID
1	Dr. S.Punitha	Associate Professor	VMKVEC	punitha@vmkvec.edu.in
2	Mr.D.Balaji	Asso.Prof.grade I	AVIT	balajiduraiswamy1984@gmail.com

17MABS20	PROBABILITY AND STATISTICS	Category	L	T	P	Credit
		BS	2	2	0	3

PREAMBLE

The theory of probability is a unified mathematical theory with applications to many natural sciences; physics, engineering, medicine, economy, etc., all benefit from probabilistic computations. Based on this, the course aims at giving adequate exposure in basic concepts of probability distributions, test of hypothesis and Design of experiments. Statistical Quality control is a method of quality control which employs statistical methods to monitor and control a process. This helps ensure the process operates efficiently, producing more specification-conforming product.

PREREQUISITE – Engineering Mathematics (17MABS01)

COURSE OBJECTIVES

1	To get the knowledge on concepts of random variables and distributions
2	To acquire skills in handling situations involving more than one random variable and functions of random variables
3	To acquire knowledge of Testing of Hypothesis useful in making decision and test them by means of the measurements made on the sample.
4	To be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation
5	To understand the concept of Quality control and the use of operating characteristic (OC) curves in Acceptance sampling.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Classify the random variables and determine the appropriate distributions	Apply
CO2. Determine the probability distribution for two-dimensional random variables.	Apply
CO3. Identify and perform statistical significance tests for small, large samples and interpret the test results appropriately.	Analyze
CO4 Analyze and interpret the results from Analysis of Variance (ANOVA), a technique used to compare means amongst more than two independent populations.	Analyze
CO5. Demonstrate the ability to design and interpret the in-control status of the process through control charts. Estimate whether a lot is acceptable or unacceptable based on acceptance sampling plans.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	S	M	--	--	--	--	--	--	M	S	M	--
CO2	S	S	M	S	M	--	--	--	--	--	--	M	S	M	--
CO3	S	S	S	S	M	--	--	--	--	--	--	S	S	S	S
CO4	S	S	S	S	M	--	--	--	--	--	--	S	S	S	S
CO5	S	S	S	S	M	--	--	--	--	--	--	S	S	S	S

S- Strong; M-Medium; L-Low

SYLLABUS

RANDOM VARIABLES: Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Normal distributions.

TWO DIMENSIONAL RANDOM VARIABLES: Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

TESTING OF HYPOTHESIS: Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

DESIGN OF EXPERIMENTS: One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design.

STATISTICAL QUALITY CONTROL: Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TEXT BOOKS:

1. Douglas C. Montgomery and George C.Runger, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley, 2013
2. S.P. Gupta, "Statistical Methods", Sultan Chand & Sons, New Delhi, 45th Revised Edition, 2017.

REFERENCES:

1. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 2015.
2. Miller, "Probability and Statistics for Engineers", Freund-Hall, Prentice India Ltd. 2009.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	College	Mail ID
1	Dr. P.Sasikala	Professor	VMKVEC	sasikalap@vmkvec.edu.in
2	Dr.A.K.Thamizhsudar	Asso.Prof. grade II	AVIT	thamizhsudar@avit.ac.in

17CHBS02	EMERGING AUTOMOTIVE MATERIALS	Category	L	T	P	C
		CC	3	0	0	3

Preamble

The course aims to provide students on different emerging materials applicable for automotive applications in the present scenario thereby enabling the students to achieve knowledge in the different physical and chemical properties of metals, non-metals, polymers, composites, nano materials and understand the different applications in automotive field.

Prerequisite

Nil

Course Objectives

1	To understand about metallic and non-metallic materials, characteristics and its applications
2	To provide an understanding on chemical components of surface coatings in automotives.
3	To provide knowledge on engineering polymers and composites.
4	To learn about different types of materials suitable for automotive batteries and super capacitors.
5	To understand about nano-materials and apply in automotives.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Understand the metallic and non-metallic materials used in industries	Understand
CO2.	Gain the knowledge about surface coating materials for automotive.	Understand
CO3.	Apply polymers and composites in developing varied applications in automotives.	Apply
CO4.	Choose different materials and power storage devices for automotives.	Apply
CO5.	Categorise the nano-materials for specific applications in automotives.	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	-	-	-	-	-	-	-	M	M	S
CO2	S	M	L	M	M	M	-	-	-	-	-	-	M	M	S
CO3	S	S	S	S	M	M	-	-	-	-	-	-	M	M	S
CO4	S	S	M	M	M	S	-	-	-	-	-	-	M	M	S
CO5	S	S	M	L	M	S	-	-	-	-	-	-	M	M	S

S- Strong; M-Medium; L-Low

Syllabus

ENGINEERING MATERIALS CLASSIFICATION, PROPERTIES &APPLICATIONS

Classification of engineering materials- Metallic materials-ferrous materials-steel & cast iron and nonferrous materials –aluminium and copper. Non-Metallic materials – glasses, ceramics, Polymer and plastics – their characteristics and unique properties- Material for structural applications - Lightweight structural materials for automobiles and aero plane applications.

PAINTS & COATINGS

Introduction to surface coatings - Components of paints. Pigments, pigment properties, different types, extenders, solvents, oils, driers, diluents, lacquers, varnishes, paint preparation, formulation, factors affecting pigment dispersion, preparation of pigment dispersion. Different types of paints- classification based on polymeric resin, emulsion, oil and alkyd paints, acrylic paints, epoxy coatings, polyurethane, silicones, formaldehyde based resins, chlorinated rubbers, hydrocarbon resins. Classification based on application, fluropolymers, vinyl resins, appliance furnishes, automotive finishes, coil coatings, can coatings, marine coatings, aircraft coatings.

POLYMERS & COMPOSITES

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PTFE Polymers – Urea and Phenol formal deliydes – polymer applications in automotives.

Composites – Types of composites - Naturally occurring, synthetic & engineered composites – MMC – CMC – PMC - Fibre and whisker reinforced composites (continuous and discontinuous) – particulate composites layered or sheet composites, composite coating or thin fibre, inter metallic composites - properties and characteristics of composites-application in automotives.

MATERIAL FOR BATTERIES

Batteries – primary and secondary batteries, chemistries of primary batteries such as Zinc-Carbon, Alkaline and secondary batteries such as Lead acid, Nickel Cadmium, Ni Metal hydride battery, Ni Hydrogen battery, lithium ion, lithium phosphate and high temperature batteries- sodium-sulphur, Solid-state and molten solvent batteries; Advanced Batteries, Super capacitors for energy storage. Role of carbon nanomaterials as electrodes in batteries and super capacitors.

NANOMATERIALS AND MATERIALS FOR ENERGY STORAGE

Nanomaterials-Definition, Classification of Nanostructured materials, causes of interest in nanomaterials, Synthesis of nanomaterials, mechanical milling, sol-gel method, chemical vapour deposition (CVD), Carbon Nano-Tubes (CNT), Carbon Nano-Fibres (CNF), graphene, preparation of graphene. Fabrication of CNTs and CNFs, CNTs and CNFs for hydrogen storage.

Processes for producing ultrafine powders-mechanical grinding, wet chemical synthesis of nanomaterials. Gas phase synthesis of Nano materials, gas condensation processes, chemical vapour condensation, laser ablation – application of nanomaterials in automotives. .

TEXT BOOK:

1. F. W. Billmeyer, Textbook of polymer science, 3rd ed., John Wiley & Sons, Asia, New Delhi, 1994.
2. G. Odian, Principles of Polymerization, 4th ed., Wiley-Interscience, 2004
3. R.M. Jones, Mechanics of Composites, 2nd ed., Taylor & Francis, 1999.
4. C.H. Hamann, A. Hamnett, W. Vielstich, Electrochemistry, 2nd ed., John Wiley & Sons, 2007.
5. The Physics and Chemistry of NanoSolids by Frank J. Owens and Charles P. Poole Jr, Wiley-Interscience, 2008.
6. Budinski, Kenneth G. Budinski,Micahel K, Engineering Materials ; Properties and selection, PHI, 9th Edn.'
7. Jain and Jain, Engineering Chemistry, 2018, Dhanpat Rai Publishers.

REFERENCES:

1. Johannes Jensen Bent Squrensen, "Fundamentals of Energy Storage", John Wiley, NY, 1984.
2. M. Rubinstein, R.H. Colby, Polymer Physics, Oxford University Press, 2003.
3. P. Gosh, Polymer Science and Technology, Mc-Graw Hill, 2002.
4. A.J. Bard, L.R. Faulkner, Electrochemical Methods, Fundamentals and Application. Wiley, 2001.
5. Nanomaterials- Synthesis, Properties and Applications, Edited by A.S. Edelstein and R.C. Cammarata, Institute of Physics Publishing, London, 1998 (paper back edition).

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Dr. R. Nagalakshmi	Professor	Chemistry/AVIT	nagalakshmi.chemistry@avit.ac.in
2	A. Gilbert Sunderraj	Asst Professor	Chem/VMKVEC	gilbertsunderraj@vmkvec.edu.in

17PCBS81	PHYSICAL SCIENCES PART B - ENGINEERING CHEMISTRY LAB Semester I (Common to All Branches)	Category	L	T	P	C
		FC(BS)	0	0	2	1

Preamble

The main objective of this course is to develop the intellectual and psychomotor skills of the students by imparting knowledge in water technology and quantitative analysis.

Prerequisite

Not required

Course Objectives

1	To impart basic skills in Chemistry so that the student will understand the engineering concept.
2	To inculcate the knowledge of water and electrochemistry.
3	To lay foundation for practical applications of chemistry in engineering aspects.

Course Outcomes

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

CO1.	Estimate the chemical properties of water	Apply
CO2.	Determine the presence of various elements in the water	Analyze
CO3.	Calculate the strength of acids, oxidizing and reducing agents	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	S	M	M	-	L	M	M	S	-	-	-	M	S	M	M
CO2.	S	M	M	-	L	M	M	L	-	-	-	M	S	M	M
CO3.	S	S	M	-	L	M	M	M	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

1. Determination of Hardness by EDTA method
2. Estimation of Hydrochloric acid by conductometric method
3. Acid Base titration by pH method
4. Estimation of Ferrous ion by Potentiometric method
5. Determination of Dissolved oxygen by Winkler's method
6. Estimation of Sodium by Flame photometer
7. Estimation of Copper from Copper Ore Solution
8. Estimation of Iron by Spectrophotometer

TEXT BOOKS

1. Laboratory Manual on Engineering Chemistry prepared by Vinayaka Mission's Research Foundation, Salem.

Course Designers:

S. No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. V. Anbazhagan	Professor	Chemistry/VMKVEC	anbu80@gmail.com
2.	Mr. A. Gilbert Sunderraj	Assistant Professor	Chemistry/VMKVEC	asmgill80@gmail.com
3.	Dr. R. Nagalakshmi	Professor	Chemistry/AVIT	nagalakshmi.chemistry@avit.ac.in
4.	Dr.K.Sanghamitra	Associate Professor	Chemistry/AVIT	sanghamitra.chemistry@avit.ac.in

17PCBS81	PHYSICAL SCIENCES LAB: PART A – REAL AND VIRTUAL LAB IN PHYSICS	Category	L	T	P	Credit
		FC(BS)	0	0	2	1

PREAMBLE

In this laboratory, experiments are based on the calculation of physical parameters like young's modulus, rigidity modulus, viscosity of water, wavelength of spectral lines, thermal conductivity and band gap. Some of the experiments involve the determination of the dimension of objects like the size of a microparticle and thickness of a thin wire. In addition to the above real lab experiments, students gain hands-on experience in virtual laboratory.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To impart basic skills in taking reading with precision of physics experiments
2	To inculcate the habit of handling equipments appropriately
3	To gain the knowledge of practicing experiments through virtual laboratory.
4	To know the importance of units
5	To obtain results with accuracy

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Recognize the importance of units while performing the experiments, calculating the physical parameters and obtaining results	Understand
CO2. Operate the equipments with precision	Apply
CO3. Practice to handle the equipments in a systematic manner	Apply
CO4. Demonstrate the experiments through virtual laboratory	Apply
CO5. Calculate the result with accuracy	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO3
CO1	S	S													
CO2	S	S	M	M	S				M			M	M	M	M
CO3	S														
CO4	S	S	M	M	S							S	M	M	M
CO5	S	S													

S- Strong; M-Medium; L-Low

SYLLABUS

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating – Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer

LAB MANUAL

Physical Sciences Lab: Part A – Real And Virtual Lab In Physics Manual compiled by Department of Physics, Vinayaka Missions Research Foundation (Deemed to be University), Salem.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Dr. C. Senthil kumar	Professor	Physics / VMKVEC	senthilkumarc@vmkvec.edu.in
2	Dr. R. Sethupathi	Associate Professor	Physics / VMKVEC	sethupathi@vmkvec.edu.in
3	Dr. G. Suresh	Associate Professor	Physics / AVIT	suresh.physics@avit.ac.in
4	Dr. B.Dhanalakshmi	Associate Professor	Physics / AVIT	dhanalakshmi.phy@avit.ac.in

A. Foundation Courses (FC)

Engineering Sciences (Basic Engineering Courses) (ES)

17CSES01	ESSENTIALS OF COMPUTING	Category	L	T	P	Credit
		ES	3	0	0	3

PREAMBLE

This course aims to provide the fundamental concepts of Computer operations like hardware and software installation, and emphasizing principles application packages. Studying the fundamentals concepts of Algorithms, to resolve the real world application.

PRERQUISITE – Nil

COURSE OBJECTIVES

1	To provide basic knowledge of hardware and software components of computers.
2	To introduce and demonstrate various software application packages.
3	To study Problem solving Techniques and program development cycle.
4	To learn about various algorithm and identifying the algorithm efficiency.
5	To learn different algorithm for various application.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. To understand the Basic knowledge on hardware and software terminologies.	Understand
CO2. To Demonstrate the various Application Packages like MS-word, MS- Excel etc.	Apply
CO3.To Understand Program Devolvement Cycle and apply various Problem Solving Techniques.	Apply
CO4.To analyze the efficiency of Algorithms.	Analyze
CO5.To Implement of Algorithms for various concepts.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	-	-	-	-	-	-	-	-	-	-	-	-	S	-
CO2	S	M	M	-	M	-	-	-	-	-	-	M	M	M	-
CO3	S	S	S	-	M	-	-	-	-	-	-	-	-	-	-
CO4	S	S	S	-	S	-	-	-	-	-	-	-	M	-	-
CO5	S	M	M	-	M	-	-	-	-	-	-	S	M	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS OF COMPUTER AND INFORMATION TECHNOLOGY: Computer – Generations, Types of Computers, Block diagram of a computer – Components of a computer system –Hardware and software definitions – Categories of software – Booting – Installing and Uninstalling a Software –Software piracy – Software terminologies – Applications of Computer – Role of Information Technology – History of Internet – Internet Services.

SOFTWARE APPLICATIONS: Office Automation: Application Packages – Word processing (MS Word) – Spread sheet (MS Excel) – Presentation (MS PowerPoint).

PROBLEM SOLVING METHODOLOGIES: Problems Solving Techniques - Program Development Cycle – Algorithm Development – Flow chart generation –Programming Constructs (Sequential, Decision-Making, Iteration) – Types and generation of programming Languages.

INTRODUCTION TO ALGORITHMS: Implementation of Algorithms – program verification – The efficiency of algorithms – The analysis of algorithms.

IMPLEMENTATION OF ALGORITHMS: Fundamental Algorithms: Introduction – Exchanging the values of two variables – Counting – Summation of a set of Numbers – factorial computation – Generation of the Fibonacci sequence – Reversing the digits of an integer.

TEXT BOOKS:

1. "Essentials of Computer Science and Engineering", Department of Computer Sciences, VMKVEC, Salem, Anuradha Publishers, 2017.
2. Dromey.R.G, "How to Solve it by Computer", Prentice-Hall of India, 1996.

REFERENCES:

1. Aho.A.V., Hopcroft.J.E and Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson Education, 2004.
2. Knuth D.E., "The Art of computer programming Vol 1: Fundamental Algorithms", 3rd Edition, Addison Wesley, 1997.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in
2	Mrs.T.Geetha	Assistant Professor	CSE	geetha@vmkvec.edu.in

17CMES02	BASICS OF CIVIL AND MECHANICAL ENGINEERING PART -A BASICS OF CIVIL ENGINEERING (Common to All Branches)	Category	L	T	P	Credit
		ES	2	0	0	2

PREAMBLE

The aim of the subject is to provide a fundamental knowledge of basic Civil Engineering

PREREQUISITE- NIL

COURSE OBJECTIVES

1	To understand the basic concepts of surveying and construction materials.
2	To impart basic knowledge about building components.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. An ability to apply knowledge of mathematics, science, and engineering.	Apply
CO2. An ability to design and conduct experiments, as well as to analyze and interpret data .	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	M	S	-	-	-	-	-	-	M	-	L
CO2	S	M	L	S	M	S	-	-	M	-	-	-	-	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

SURVEYING AND CIVIL ENGINEERING MATERIALS

SURVEYING: Objects – types – classification – principles – measurements of distances – angles – levelling – determination of areas – illustrative examples.

CIVIL ENGINEERING MATERIALS: Bricks – stones – sand – cement – concrete – steel sections.

BUILDING COMPONENTS AND STRUCTURES :

FOUNDATIONS: Types, Bearing capacity – Requirement of good foundations.

SUPERSTRUCTURE: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TEXT BOOKS:

1. “Basic Civil and Mechanical Engineering”, VMU, (2017). Company Ltd., New Delhi,2009

REFERENCES:

1.Ramamrutham S., “Basic Civil Engineering”, Dhanpatrai Publishing Co. (P) Ltd., 2009.
2. Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Dept/ College	Mail ID

1	S. Supriya	Assist. Professor	Civil / VMKVEC	jansupriyanair@gmail.com
2	Mrs.Pa.Suriya	Asst. Professor	Civil / AVIT	suriya@avit.ac.in

17CMES02	B-BASICS OF MECHANICAL ENGINEERING	Category	L	T	P	Credit
		FC(ES)	2	0	0	2

Preamble

Basic Mechanical Engineering gives the fundamental ideas in the areas of manufacturing and Automobile engineering. An engineer needs to understand, the basic manufacturing techniques and working principle of an Automobile Engineering Components.

Prerequisite –NIL

Course Objective

1	To demonstrate the principles of casting and metal joining processes in manufacturing.
2	To describe and to apply the in depth knowledge in automotive engines and important components.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Illustrate with the application of casting and metal joining processes in manufacturing.	Apply
CO2.	Explain the operation of automotive engines and important components.	Understand

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
CO2	S	M	L	L	-	-	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

FOUNDRY AND WELDING

Foundry: Introduction to Casting - Types, Pattern- Definition, Function. Foundry tools. Green Sand Moulding application.

Welding: Introduction to welding, Classification – Gas welding, Arc Welding, TIG, MIG, Plasma – Definitions. Arc Welding - Methods and Mechanisms – Applications.

AUTOMOTIVE ENGINES AND COMPONENTS

Introduction, Two stroke and four stroke cycle – Petrol and Diesel Engines - Construction and working, Fundamentals of automotive components - Brakes, Clutches, Governor, Flywheel, Axles, Drives etc., Fuel supply systems, Exhaust emission and control.

Text Books

1	Basic Civil and Mechanical Engineering, School of Mechanical Engineering Sciences, VMU, Salem

Reference Books

1	K.Venugopal, Basic Mechanical Engineering, Anuradha Publications, Chennai
2	NR. Banapurmath, Basic Mechanical Engineering, Vikas Publications, Noida
3	TJ.Prabu, Basic Mechanical Engineering, SCITECH Publications, Chennai

Course Designers

S.No	Faculty Name	Designation	Department / Name of the College	Email id
1	S. Duraithilagar	Associate Professor	Mech / VMKVEC	sduraithilagar@vmkvec.edu.in
2	M.Saravanakumar	Asst. Prof	Mech /AVIT	saravanakumar@avit.ac.in

17CSES05	PROGRAMMING IN PYTHON	CATEGORY	L	T	P	CREDIT
		ES	3	0	0	3

PREAMBLE

The purpose of this course is to introduce Python, a remarkably powerful dynamic programming language to write code for different operating systems along with application domain. Python has evolved on more popular and powerful open source programming tool

PRERQUISITE

NIL

COURSE OBJECTIVES

1	To provide basic knowledge on Python programming concepts.
2	To introduce different methods in list, string, tuple, dictionary and sets.
3	To compute different programs using python control statements.
4	To learn about different functions in python.
5	To compute the exception handling functions, file concepts and CSV and JSON.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Learn python statements, comments and indentation, tokens, input and output methods using various example programs.	Understand
CO2. Apply the different methods involved in List, String, Tuples and Dictionary.	Apply
CO3. Design solutions for complex programs using decision making and looping statements.	Apply.
CO4.Apply the function programs with all the concepts like lambda, decorators and generators.	Apply.
CO5. Compute the exception handling programs, file concept programs and understand the concepts of CSV and JSON.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	M	-	-	-	-	-	-	-	-	-	-
CO2	S	M	M	M	M	-	-	-	-	-	-	-	-	-	-
CO3	M	S	S	S	M	-	-	-	-	-	-	-	M	-	M
CO4	S	S	S	S	M	-	-	-	-	-	-	-	M	M	M
CO5	S	M	M	M	M	-	-	-	-	-	-	-	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT-1 INTRODUCTION

Introduction to python-Advantages of python programming-Tokens-Variables-Input/output methods-Data types-Operators

UNIT-2 DATA STRUCTURES

Strings-Lists-Tuples-Dictionaries-Sets

UNIT-3 CONTROL STATEMENTS

Flow Control-Selection control Structure-if-if-else-if-elif-else-Nested if iterative control structures-while loop, for loop and range.

UNIT-4 FUNCTIONS

Declaration-Types of Arguments-Fixed arguments, variable arguments, keyword arguments and keyword variable arguments-Recursions-Anonymous functions: lambda- Decorators and Generators.

UNIT-5 EXCEPTION HANDLING

Exception Handling-Regular Expression-Calendars and clock files:File input/output operations-Dictionary operations-Reading and writing in structured files:CSV and JSON.

TEXT BOOKS:

1. Bill Lubanovic, "Introducing Python Modern Computing in Simple Packages", 1st Edition, O'Reilly Media, 2014.
2. Programming With Python Book ‘Himalaya Publishing House Pvt Ltd
3. “Dive Into Python” by Mark Pilgrim

REFERENCES:

1. Mark Lutz, “Learning Python”, 6th Edition, O'Reilly Media, 2014.
2. David Beazley, Brian K. Jones, "Python Cookbook", 3rd Edition, O'Reilly Media, 2015.
3. Mark Lutz, “Python Pocket Reference”, 6th Edition, O'Reilly Media, 2015.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr. K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in
2	Mrs. T. Narmadha	Assistant Professor	CSE	narmadha@vmkvec.edu.in

17EEES03	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING A. BASIC ELECTRICAL ENGINEERING	Category	L	T	P	Credit
		FC(ES)	2	0	0	2

PREAMBLE

It is a preliminary course which highlights the basic concepts and outline of Electrical engineering. The concepts discussed herein are projected to deliver explanation on basic electrical engineering for beginners of all engineering graduates.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To understand the electrical inventions, basic concepts of AC and DC circuits and basic laws of electrical engineering.
2	To gain knowledge about the working principle, construction, application of DC and AC machines and measuring instruments.
3	To understand the fundamentals of safety procedures, Earthing and Power system.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1: Explain the evolution of electricity, name of the inventors, electrical quantities and basic laws of electrical engineering.	Remember
CO2: Demonstrate Ohm's and Faraday's Law.	Apply
CO3:Understand the basic concepts of measuring instruments, electrical machineries and its applications.	Understand
CO4: Analyze the various types of electrical loads, power rating of electrical machineries and energy efficient equipment.	Analyze
CO5: Explain the electrical safety and protective devices.	Understand
CO6: Compare the various types electrical power generation systems by application of conventional and non-conventional sources.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	--	S	--	--	--	--	--	--	L	L	L	--
CO2	S	M	S	S	--	--	--	--	M	-	--	M	L	L	--
CO3	L	S	L	--	S	--	--	--	--	L	--	L	L	M	L
CO4	S	M	S	L	L	S	S	--	--	S	--	L	L	M	L
CO5	L	M	S	M	--	S	M	M	--	S	--	L	L	M	L
CO6	S	L	S	L	M	S	S	--	--	M	--	L	--	--	--

S- Strong; M-Medium; L-Low

SYLLABUS

HISTORY OF ELECTRICITY, QUANTITIES AND CIRCUITS

Evolution of Electricity and Electrical inventions, Electrical quantities- Charge, Electric potential, voltage, current– DC & AC, power, energy, time period, frequency, phase, flux, flux density, RMS, Average, Peak, phasor & vector diagram. Electric Circuits - Passive components (RLC), Ohm's law, KCL, KVL, Faraday's law, Lenz's law. Electrical materials – Conducting and insulating materials.

MEASURING INSTRUMENT AND ENERGY CALCULATION

Measuring Instruments – Analog and Digital meters – Types and usage. AC and DC Machines & Equipment- Types, Specifications and applications.

Loads – Types of Loads- Power rating and Energy calculation – for a domesticload. Energy Efficient equipments – star ratings.

ELECTRICALSAFETY AND INTRODUCTIONTOPOWERSYSTEM

Protection & Safety - Hazards of electricity - shock, burns, arc-blast, Thermal Radiation, explosions, fires, effects of electricity on the human body. Electrical safety practices, Protection devices.

Electric Power- Generation resources, Transmission types & Distribution system (levels of voltage, power ratings and statistics)- Simple layout of generation, transmission and distribution of power.

TEXT BOOKS:

1. Metha.V.K, RohitMetha,"Basic Electrical Engineering",Fifth Edition,Chand.S&Co,2012.
2. Kothari.D. PandNagrath.I.J,"Basic Electrical Engineering",Second Edition,TataMcGraw-Hill,2009.
3. R.K.Rajput , "Basic Electrical and Electronics Engineering", Second Edition, Laxmi Publication, 2012.
4. P. Selvam, R. Devarajan, A.Nagappan, T. Muthumanickam and T. Sheela"Basic Electrical and Electronics Engineering", First Edition, VMRFDU, Anuradha Agencies, 2017

REFERENCE BOOKS:

1. Smarajt Ghosh, Fundamentals of Electrical & Electronics Engineering", Second Edition, PHI Learning, 2007.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. R. Devarajan	Professor	EEE/VMKVEC	devarajan@vmkvec.edu.in
2	Mr. R. Sathish	Assistant Professor	EEE/VMKVEC	sathish@vmkvec.edu.in
3	Ms. D. Saranya	Assistant Professor (Gr-II)	EEE/AVIT	dsaranya@avit.ac.in
4	Mr. S. Prakash	Assistant Professor (Gr-II)	EEE/AVIT	sprakash@avit.ac.in

17EEES03	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING B. BASIC ELECTRONICS ENGINEERING	Category	L	T	P	Credit
		FC(ES)	2	0	0	2

PREAMBLE

The course aims to impart fundamental knowledge on electronics components, digital logics and communication engineering concepts. The course begins with classification of various active and passive components, diodes and transistors. It enables the student to design small digital logics like multiplexer, demultiplexer, encoder, decoder circuits, etc. It crafts the students to get expertise in modern communication systems.

PRERQUISITE – Nil

COURSE OBJECTIVES

1	To learn and identify various active and passive components and their working principles.
2	To understand the number conversion systems.
3	To learn the digital logic principles and realize adders, multiplexer, etc.,
4	To understand the application oriented concepts in the communication systems.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Interpret working principle and application of various active and passive electronic components like resistors, capacitors, inductors, diodes and transistors.	Understand
CO2. Construct the rectifiers and regulators circuits and explore their operations.	Apply
CO3. Execute number system conversions and compute several digital logic operations.	Apply
CO4. Design adders, Multiplexer, De-Multiplexer, Encoder, Decoder circuits.	Apply
CO5. Apply the modern technologies in developing application oriented gadgets like the UHD, OLED, HDR.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	--	--	--	--	--	--	M	--	--	--	M	-	-
CO2	S	M	M	M	--	--	M	--	M	--	--	M	-	-	-
CO3	S	M	M	--	--	--	--	--	M	--	--	--	-	-	-
CO4	S	M	M	M	--	--	M	--	M	--	--	M	-	M	-
CO5	S	M	--	--	M	--	M	--	M	M	--	M	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

SEMICONDUCTOR DEVICES

Passive and Active Components - Resistors, Inductors, Capacitors, Characteristics of PN Junction Diode - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar Junction Transistor, JFET, MOSFET & UJT.

DIGITAL FUNDAMENTALS

Number Systems – Binary, Octal, Decimal and Hexa-Decimal – Conversion from one to another – Logic Gates – AND, OR, NOT, XOR, Universal Gates – Adders, Multiplexer, De Multiplexer, Encoder, Decoder – Memories

COMMUNICATION AND ADVANCED GADGETS

Modulation and Demodulation – AM, FM, PM – RADAR – Satellite Communication – Mobile Communication, LED, HD, UHD, OLED, HDR & Beyond, Smart Phones – Block diagrams Only.

TEXT BOOKS:

1. R.K. Rajput, "Basic Electrical and Electronics Engineering", Laxmi Publications, Second Edition, 2012.
2. Dr.P.Selvam, Dr.R.Devarajan, Dr.A.Nagappan, Dr.T.Muthumanickam and Dr.T.Sheela,"Basic Electrical and Electronics Engineering", Department of EEE & ECE, Faculty of Engineering & Technology, VMRFDU, Anuradha Agencies, 2018.
3. Edward Hughes, "Electrical and Electronics Technology", Pearson Education Limited, Ninth Edition, 2005.

REFERENCES:

1. John Kennedy, "Electronics Communication System", Tata McGraw Hill, 2003.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
2	Mrs.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in
3	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
4	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17CMES81	ENGINEERING SKILLS PRACTICE LAB B. BASIC MECHANICAL ENGINEERING	Category	L	T	P	Credit
		FC(ES)	0	0	4	2

Preamble

Workshop is a hands-on training practice to Mechanical Engineering students. It deals with fitting, carpentry, foundry and welding related exercises. Also, it will induce the habit of selecting right tools, planning the job and its execution.

Prerequisite –NIL

Course Objective

1	To perform the practice in different types of fitting processes.
2	To utilize the different type of joints using wooden materials.
3	To perform and acquire in depth knowledge in metal joining processes.
4	To demonstrate the pattern using foundry processes.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Identify the different types of fitting using MS plate.	Apply
CO2.	Predict the different types of joints using wooden material	Apply
CO3.	Utilize the different types of joining process in metal by Arc Welding	Apply
CO4.	Make use of different types of green sand mould	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
CO1	S	M	L	L	L	-	-	-	-	-	-	-	L	-	-
CO2	S	M	L	L	L	-	-	-	-	-	-	-	L	-	-
CO3	S	M	L	L	L	-	-	-	-	-	-	-	L	-	-
CO4	S	M	L	L	L	-	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

Tee – Fitting
Vee – Fitting
Preparation of a mould for a single piece pattern
Preparation of a mould for a split piece pattern
Half- Lap Joint in Carpentry
Dove Tail Joint in Carpentry
Lap Joint – Welding
Butt Joint – Welding

Text Books

1	**BASIC MECHANICAL ENGINEERING, LAB MANUAL**

Reference Books

1	K.Venugopal, Basic Mechanical Engineering, Anuradha Publications, Chennai
2	NR. Banapurmath, Basic Mechanical Engineering, Vikas Publications, Noida

Course Designers

S.No	Faculty Name	Designation	Department / Name of the College	Email id
1	Dr. V. K. Krishnan	Associate Professor	Mech / VMKVEC	vkkrishnan@vmkvec.edu.in
2	B.SELVA	Assistant	Mech/AVIT	selvababu@avit.ac.in

	BABU	Professor		

17CSES83	PROGRAMMING IN PYTHON LAB	Category	L	T	P	Credit
		ES	0	0	4	2

PREAMBLE

This laboratory enables the students clearly understand the basic concepts of python, control statements and file commands in python.

PRERQUISITE

NIL

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Learn Syntax and Semantics and create Functions in Python	Understand
CO2. Handle Strings and Files in Python.	Understand
CO3. Design solutions for complex programs using decision making and looping statements.	Apply
CO4.Understand Lists, Dictionaries in Python.	Apply
CO5. Compute the exception handling programs	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	-	-	-	-	-	-	-	-	-	-	-
CO2	S	M	L	-	-	-	-	-	-	-	-	-	-	-	-
CO3	S	M	M	-	-	-	-	-	-	-	-	-	M	-	M
CO4	S	M	M	-	-	-	-	-	-	-	-	-	M	M	M
CO5	S	M	M	-	-	-	-	-	-	--	-	-	M	M	M

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

1. Write a program to sum of series of N natural numbers
2. Write a program to calculate simple interest.
3. Write a program to generate Fibonacci series using for loop
4. Write a program to calculate factorial using while loop
5. Write a program to find the greatest of three numbers using if condition
6. Write a program for finding the roots of a given quadratic equation using conditional control statements
7. Write a program to find the greatest of three numbers using conditional operator
8. Write a program to compute matrix multiplication using the concept of arrays
9. Write a program to implement recursive function
10. Write a program to read and write data using file concepts

REFERENCES:

1. Mark Lutz, “Learning Python”, 5th Edition, O'Reilly Media, 2013.
2. David Beazley, Brian K. Jones, "Python Cookbook", 3rd Edition, O'Reilly Media, 2013.
3. Mark Lutz, “Python Pocket Reference”, 5th Edition, O'Reilly Media, 2014.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in
3	Mrs. T. Narmadha	Assistant Professor	CSE	narmadha@vmkvec.edu.in

17EEES82	ENGINEERING SKILLS PRACTICE LAB A. BASIC ELECTRICAL ENGINEERING	Category	L	T	P	Credit
		FC(ES)	0	0	2	1

PREAMBLE

It is a laboratory course which familiarizes the basic electrical wiring, measurement of electrical quantities and various types of earthing methods.

PRERQUISITE – NIL

COURSE OBJECTIVES

1	To learn the residential wiring and various types of electrical wiring.
2	To measure the various electrical quantities.
3	To know the necessity and types of earthing and measurement of earth resistance.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO 1: Implement the various types of electrical wiring.	Apply
CO 2: Measure the fundamental parameters of AC circuits.	Analyze
CO 3: Measure the earth resistance of various electrical machineries.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	--	S	--	--	--	--	--	--	L	L	M	L
CO2	S	M	S	S	--	--	--	--	M	--	--	M	L	M	L
CO3	L	S	L	--	S	--	--	--	--	L	--	L	--	--	--

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

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

REFERENCES

1. Laboratory Reference Manual.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. R. Devarajan	Professor	EEE/VMKVEC	devarajan@vmkvec.edu.in
2	Mr. R. Sathish	Assistant Professor	EEE/VMKVEC	sathish@vmkvec.edu.in
3	Ms. D. Saranya	Assistant Professor (Gr-II)	EEE/AVIT	dsaranya@avit.ac.in
4	Mr. S. Prakash	Assistant Professor (Gr-II)	EEE/AVIT	sprakash@avit.ac.in

17EEES82	ENGINEERING SKILLS PRACTICES LAB PART B - BASIC ELECTRONICS ENGINEERING	Category	L	T	P	Credit
		FC(ES)	0	0	2	1

PREAMBLE

This course is to provide a practical knowledge in Basic Electronics Engineering. It starts with familiarization of electronic components and electronic equipments. It enables the students to construct and test simple electronic projects.

PRERQUISITE – Nil

COURSE OBJECTIVES

1	To familiarize the electronic components, basic electronic equipments and soldering techniques.
2	To study the characteristics of Diodes, BJT and FET.
3	To understand the principles of various digital logic gates.
4	To understand the concept of basic modulation techniques.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Construct experiments for PN and Zener diode characteristics	Understand
CO2. Demonstrate the fundamentals of soldering techniques.	Apply
CO3. Classify the characteristics of Diodes, BJT and FET.	Apply
CO4. Distinguish between amplitude and frequency modulation techniques.	Apply
CO5. Verify the truth tables of logic gates (AND, OR, NOT, NAND, NOR, XOR).	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	--	--	--	--	--	--	M	--	M	--	--	--	--
CO2	M	M	M	--	--	--	--	--	M	--	M	--	M	--	--
CO3	S	M	--	--	--	--	--	--	M	--	M	--	--	M	--
CO4	S	M	--	--	--	--	--	--	M	--	M	--	M	M	M
CO5	S	M	M	--	--	--	--	--	M	--	M	--	--	-	--

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

1. Identifying Electronics Components.
2. Practicing of Soldering and Desoldering.
3. Characteristics of PN junction Diode.
4. Characteristics of Zener diode.
5. Input & Output characteristics of BJT.
6. Transfer characteristics of JFET.

7. Verification of Logic Gates. 8. Study of Amplitude Modulation. 9. Study of Frequency Modulation.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
2	Mrs.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in
3	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
4	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17MEES84	ENGINEERING GRAPHICS (Theory & Practice)	Category	L	T	P	Credit
		FC(ES)	1	0	4	3

Preamble

Engineering Graphics is referred as language of engineers. An engineer needs to understand the physical geometry of any object through its orthographic or pictorial projections. The knowledge on engineering graphics is essential in proposing new product through drawings and interpreting data from existing drawings. This course deals with orthographic and pictorial projections, sectional views and development of surfaces.

Prerequisite – NIL

Course Objective

1	To implement the orthographic projections of points, straight lines, plane surfaces and solids.
2	To construct the orthographic projections of sectioned solids and true shape of the sections.
3	To develop lateral surfaces of the uncut and cut solids.
4	To draw the pictorial projections (isometric and perspective) of simple solids.
5	To sketch by free hand the orthographic views from the given pictorial view.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	To Interpret the physical geometry of any object through its orthographic or pictorial projections	UNDERSTAND
CO2.	Apply in the form of drawing of the orthographic projections of points, straight lines, plane surfaces and solids.	Apply
CO3.	To establish in the form of drawing of the orthographic projections of sectioned solids and true shape of the sections.	Apply
CO4.	Develop lateral surfaces of the solid section and cut section of solids.	Apply
CO5.	Sketch the pictorial projections (isometric and perspective) of simple solids.	Apply
CO6.	To apply free hand sketch of the orthographic views from the given pictorial view.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	L	S	L	-	-	-	-	-	-	-	L	-	
CO2	S	S	L	S	L	-	-	-	-	-	-	-	L	-	
CO3	S	S	L	S	L	-	-	-	-	-	-	-	L	-	
CO4	S	M	L	S	S	-	-	-	-	-	-	-	L	-	
CO5	S	S	L	S	L	-	-	-	-	-	-	-	L	-	
CO6	S	S	L	S	L	-	-	-	-	-	-	-	L	-	

S- Strong; M-Medium; L-Low

Syllabus

PLANE CURVES AND FREE HAND SKETCHING

Conics – Construction of ellipse– First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

PROJECTION OF POINTS, LINES

Projection of points, Projection of straight lines located in the first quadrant: inclined to both planes – Determination of true lengths and true inclinations – rotating line method only.

PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to any one reference plane by change of position method.

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of above solids in simple vertical position by cutting planes inclined to any one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids like Prisms, pyramids, cylinders and cones.

ISOMETRIC VIEW AND PERSPECTIVE PROJECTION

Principles of isometric View – isometric scale – isometric view of simple solids- Introduction to Perspective projection				
Text Books				
1	Natarajan K V, “Engineering Graphics”, Tata McGraw-Hill Publishing Company Ltd. New Delhi.			
2	K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International Private Limited.			
3	K.R.Gopalakrishna“Engineering Drawing” (Vol. I & II), Subhas Publications, 2014.			
Reference Books				
1	N.D. Bhat and V.M. Panchal, Engineering Graphics, Charotar Publishers 2013			
2	E. Finkelstein, “AutoCAD 2007 Bible”, Wiley Publishing Inc., 2007			
3	R.K. Dhawan, “A text book of Engineering Drawing”, S. Chand Publishers, Delhi,2010.			
4	DhananjayA.Jolhe, “Engineering Drawing with an Introduction to AutoCAD”, Tata McGraw Hill Publishing Company Limited, 2008.			
5	G.S. Phull and H.S.Sandhu, “Engineering Graphics”, Wiley Publications, 2014.			
Course Designers				
S.No	Faculty Name	Designation	Department / Name ofthe College	Email id
1	Prof. N.Rajan	Associate Professor	Mech / VMKVEC	rajan@vmkvec.edu.in
2	Prof. M.SARAVANAN	Asst. Prof	Mech / AVIT	saravanan@avit.ac.in

B. Core Courses (CC)

17ATCC01	FUNDAMENTALS OF AUTOMOTIVE ENGINES	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

The student will undergo a sequential understanding of the concept, construction and required components of fundamentals of automotive engine to provide environmental friendliness.

Prerequisite

Nil

Course Objectives

1. To describe the fundamentals of Engine principle and operations.
2. To apply an in-depth knowledge of construction details of Engine components.
3. To categorize the concept of Petrol and Diesel engine fuel injection system and types.
4. To employ the detailed application of Cooling systems and types.
5. To demonstrate an in-depth knowledge types of Lubrication systems.

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Appraise on the working of an automotive engine.	Understand
CO2. Apply to designing the automotive systems.	Apply
CO3. Choose an appropriate method of fuel injection system.	Apply
CO4. Apply a perfect cooling system.	Apply
CO5. Apply a appropriate lubrication system.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
2	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
3	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
4	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
5	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

ENGINE PRINCIPLE AND OPERATION:

Introduction to IC engines, Basic engine terminologies, Classification of IC engines, Constructional details of four stroke and two stroke engine, working principle, four stroke and two stroke petrol and diesel engine construction and operation, comparison of four stroke and two stroke engine operation, comparison of petrol and diesel engine operation firing order and its significance. Port Timing, Valve Timing of engines, Firing order - 4, 6 & 8 cylinders, Number and Arrangement of engine cylinders.

CONSTRUCTION DETAILS OF ENGINE COMPONENTS:

Cylinder block & Crank case, cylinder head, oil pan, manifolds, gaskets & its types liners, Functions of piston, piston materials, piston rings-types & functions, piston pin, connecting rod. Crank shafts - function, materials, Flywheel. Engine valves– types, arrangement of valve in engine, valve materials, valve guides, valve springs, valve actuating mechanisms, valve clearance, valve train component - camshaft, cam shaft drive, valve tappet , push rod, rocker arm & rocker shaft, variable valve timing technologies.

FUEL INJECTION SYSTEMS:

Carburetor working principle, requirements of an automotive carburetor, starting, idling, acceleration and normal circuits of carburetors, fuel feed systems, mechanical and electrical fuel feed pumps. Petrol injection, MPFI. Unit injector. GDI, Mechanical and pneumatic governors. Fuel injector, common rail direct injection, Types of injection nozzle.

COOLING SYSTEMS :

Need for cooling system, Types of cooling system: air cooling system, liquid cooling system, forced circulation system, pressure cooling system. Water pump, radiator-cellular and tubular types, variable speed fan-types of engine coolants, anti freeze Solutions.

LUBRICATION SYSTEMS:

Splash lubricating system, Pressure system, Dry sump lubrication system, pressure lubrication system, Full flow and by pass systems, Characteristics of lubricating oils, classification &Identification of SAE oils, Filtering Systems—Oil Strainer–Oil pumps–Gear and Rotor type, Construction and operation-Pressure Relief Valve – Construction. Draft tube – Positive Crankcase Ventilation Systems – Construction. Vapour recovery cooling system Oil Cooler.

Text Books

1. Ganesan.V., “Internal Combustion Engines”, Tata McGraw-Hill Publishing Co., New Delhi, 2013.
2. John B.Heywood, “Internal Combustion Engine Fundamental”, McGraw-Hill, 2011.
3. M.L.Mathur and R.P.Sharma, “A course in Internal combustion engines”, Dhanpat Rai & Sons Publications, New Delhi, 2014.

Reference Books

1. “Internal Combustion Engine analysis and Practice”, Obert.E.F International Text Book Co., Scranton, Pennsylvania, 1988.
2. William H. Crouse, “Automotive Engines”, McGraw-Hill Publishers, 1985.
3. “Internal Combustion Engines”, Taylor. C.F, MIT Press, 1972
4. Pulkrabek, “Engineering Fundamentals of the Internal Combustion Engines”, Practice Hall of India, 2003.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	A.Imithyas	Assistant. Professor GRI	Auto AVIT	imthicyr @avit.ac.in
4	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in

17ATCC02	AUTOMOTIVE ENGINES	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

In automotive engines, is an internal combustion engine, generally a petrol engine, where the combustion process of the air-fuel mixture is ignited by a spark from a spark plug. Compression-ignition engines, typically diesel engines, where the heat generated from compression together with the injection of fuel is enough to initiate the combustion process.

Prerequisite

Fundamentals of Automotive Engines (17ATCC01)

Course Objectives

1.	To acquire knowledge on engine components and the subsystems of automotive engines
2.	To categorize the concept of Petrol and Diesel engine fuel injection system and types
3.	To distinguish in-depth knowledge of Combustion and Combustion chamber process
4.	To apply in-depth knowledge of Air Motion, Super Charging and Turbo Charging.
5.	To compare Engine performance and Evaluation test on automotive engines

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Demonstrate the Engine principle and operations.	Understand
CO2. Apply the various concept of fuel injection system and types	Apply
CO3. Categorize the combustion process.	Analyze
CO4. Analyze the concepts in Air Motion, Super Charging and Turbo Charging	Analyze
CO5. Compare the Performance and Evaluation testing on Automotive Engines	Evaluate

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1.	M	L	L	L	-	-	-	-	-	-	-	M	L	-	-
2.	S	S	S	S	-	-	-	-	-	-	-	M	L	-	-
3.	S	S	S	S	-	-	-	-	-	-	-	M	L	-	-
4.	S	L	L	M	-	-	-	-	-	-	-	M	L	-	-
5.	S	S	S	S	-	-	-	M	-	-	-	M	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

ENGINE COMPONENTS

Review of 4 stroke, 2 stroke, SI and CI engines- constructional details and materials of engine components, cylinder, piston assembly, connecting rod, crankshaft, cam shaft, flywheel, cylinder head, valves, Valve operating mechanisms-side valve, over head valve and over head cam shaft valve mechanisms, Valve timing and port timing diagrams.

FUEL SYSTEMS

Air-fuel ratio requirements of SI engines, SI engine fuel systems, Carburetors- history and development, simple carburetor, multiple barrel and variable venturi carburetors, feedback carburetors, Gasoline fuel injection systems- port fuel injection, throttle body injection , Electronic fuel injection- components, CI engine fuel injection systems- unit injector and common rail injection systems, inline plunger injection pump, distributor pump, Injection nozzles- single hole, multihole, pintle and pintaux nozzles, Mechanical governor for fuel injection pumps.

COMBUSTION AND COMBUSTION CHAMBERS

Stages of combustion in SI engines, Factors affecting ignition delay and flame propagation, Abnormal combustion-knocking, control of knock, octane rating of SI engine fuel, Combustion chambers for SI engines, Stages of combustion in CI engines- factors affecting ignition delay, CI engine knock, cetane rating of CI engine fuel, Comparison of SI engine and CI engine knock, Direct and indirect injection combustion chambers for CI engines.

AIR MOTION, SUPER CHARGING AND TURBO CHARGING

Importance of air motion – Swirl, squish and turbulence, Swirl ratio, Supercharging- need and methods, Turbocharging- construction and operation, intercooler, waste gate, variable geometry turbocharging,

ENGINE PERFORMANCE AND EVALUATION

Engine performance- indicated, brake and friction power, indicated thermal, brake thermal and volumetric efficiencies, specific fuel consumption, Measurement of engine power- fuel consumption, air flow rate and speed, Engine loading, types of dynamometers, to improve engine performance, Morse Test, Heat balance and Performance maps.

TEXT BOOK:

1. Ganesan.V., “Internal Combustion Engines”, Tata McGraw-Hill Publishing Co., New Delhi, 2013.
2. M.L.Mathur and R.P.Sharma, “A course in Internal combustion engines”, Dhanpat Rai & Sons Publications, New Delhi, 2014.

REFERENCES:

1. William H.Crouse, “Automotive Engines”, McGraw-Hill Publishers, 1985.
2. John B.Heywood, “Internal Combustion Engine Fundamental”, McGraw-Hill, 1988.
3. Pulkrabek “Engineering Fundamentals of the Internal Combustion Engines”, Practice Hall of India, 2003.
4. K.K. Ramalingam , Internal Combustion Engines, Sci-Tech Publications, 2009.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC03	AUTOMOTIVE CHASSIS	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

A chassis is the internal framework of an artificial object, which supports the object in its construction and use. An example of a chassis is a vehicle frame, the under part of a motor vehicle, on which the body is mounted; if the running gear such as wheels and transmission, and sometimes even the driver's seat, are included, then the assembly is described as a rolling chassis.

Prerequisite

Nil

Course Objectives

1. To apply the concept of entire process involved in vehicle frame and steering systems.
2. To perform the application of propeller shaft and final drive
3. To employ the concepts of axles and tyres.
4. To perform the application of Suspension System.
5. To apply the concepts of braking system in automotive chassis

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Summarize Automotive chassis and its accessories.	Understand
CO2. Utilize the applications of final drive	Apply
CO3. Apply the knowledge of axles and tyres.	Apply
CO4. Utilize the applications of Suspension System.	Apply
CO5. Develop the concepts of braking System.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1.	S	M	M	M	-	-	-	-	-	-	-	M	L	-	-
2.	S	M	M	M	-	-	-	-	-	-	-	M	L	-	-
3.	S	M	M	M	-	-	-	-	-	-	-	M	L	-	-
4.	S	M	M	M	-	-	-	-	-	-	-	M	L	-	-
5.	S	M	M	M	-	-	-	-	-	-	-	M	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION, FRAME, STEERING SYSTEM

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

PROPELLER SHAFT AND FINAL DRIVE

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

AXLES AND TYRES

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

SUSPENSION SYSTEM

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

BRAKING SYSTEM

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

TEXT BOOK:

1. Kripal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2012.
2. R.K. Rajput, A Text–Book of Automobile Engineering, Laxmi Publications Private Limited, 2015.
3. N.K. Giri, Automotive Mechanics, Kanna Publishers, 2007.

REFERENCES:

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

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17MECC19	MECHANICS OF MACHINES	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

The students completing this course are expected to understand the role of mechanisms and its applications.

Prerequisite : Nil

Course Objective

1	To Demonstrate the various types of kinematics of mechanisms.
2	To study the gear nomenclature and illustrate the various types of gears and gear trains
3	To study and construct the cam profile
4	To categorize the knowledge of static force analysis.
5	To analyze the balancingof masses and vibrations.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Explain the principles involved in mechanics of machines.	Understand
CO2.	Solve problems related to gear tooth for various applications	Apply
CO3.	Construct cams and followers for specified motion profiles.	Apply
CO4.	Analyze about the various static and dynamic forces.	Analyze
CO5.	Analyze balancing problems in rotating and reciprocating parts of machinery.	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	S	M	L	-	-	-	-	-	-	-	-	-	M	M	L
CO2	S	S	M	L	-	-	-	-	-	-	-	-	M	M	L
CO3	S	S	M	L	-	-	-	-	-	-	-	-	M	M	L
CO4	S	S	S	S	-	-	-	-	-	-	-	-	M	M	L
CO5	S	S	S	S	-	-	-	-	-	-	-	-	M	M	L

S- Strong; M-Medium; L-Low

SYLLABUS

KINEMATIC OF MECHANICS	
Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods	
GEARS AND GEAR TRAINS	
Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains	
KINEMATICS OF CAM	
Classifications - Displacement diagrams-parabolic- Simple, harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion	
FORCE ANALYSIS	
Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.	
BALANCING AND VIBRATION	
Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines-Direct and reverse crank method Free vibrations – Equations of motion – natural Frequency – Damped Vibration –critical speed of simple shaft – Torsional vibration – Forced vibration	
Text Books	
1	Ambekar A.G., ―Mechanism and Machine Theory‖ Prentice Hall of India, New Delhi, 2007
2	Shigley J.E., Pennock G.R and Uicker J.J., ―Theory of Machines and Mechanisms‖, Oxford University Press, 2003
3	Khurmi.R.S. and Gupta, Theory of Machines, S.Chand @ Co., 2005.
Reference Books	
1	Thomas Bevan, ―Theory of Machines‖, CBS Publishers and Distributors, 1984.
2	Ghosh.A, and A.K.Mallick, ―Theory and Machine‖, Affiliated East-West Pvt. Ltd., New Delhi, 1988
3	Rao.J.S. and Dukkipatti R.V. ―Mechanisms and Machines‖, Wiley-Eastern Ltd., New Delhi, 1992.
4	Ramamurthi. V., "Mechanisms of Machine", Narosa Publishing House, 2002
5	Robert L.Norton, "Design of Machinery", McGraw-Hill, 2004.
Course Designers	

S.No	Faculty Name	Designation	Department/ Name of the College	Email id
1	Dr.S.Venkatesan	Professor	Mechanical, VMKVEC	venkatesan@vmkvec.edu.in
2	Mr.S.Sathiyaraj	Asst. Prof	Mechanical, AVIT	sathiyaraj@avit.ac.in

17MECC02	ENGINEERING THERMODYNAMICS	Category	L	T	P	Credit
		CC	2	1	0	3

Preamble

Thermodynamics is a branch of science that deals with energy and its transfer. All activities in nature involve some interaction between energy and matter. Engineering thermodynamics plays a major part in the design and analysis of automotive engines, rockets, jet engines, refrigeration and air-conditioning systems, and power plants, etc. Therefore, developing a good understanding of the basic principles of engineering thermodynamics is essential for mechanical engineers. This course deals with the basic principles and concepts of thermodynamics, laws of thermodynamics, energy and entropy of ideal gas, steam, and mixture of gases.

Prerequisite

NIL

Course Objective

1	To provide the basic concepts and laws of thermodynamics.
2	To provide an understanding about the concept of enthalpy and entropy in thermal systems.
3	To discuss the working principle of steam cycles and pure substances.
4	To detail about the properties of gas and vapor mixtures
5	To discuss about fuels and combustion.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Understand the fundamental concepts and laws of thermodynamics.	Understand
CO2.	Understand the concepts of thermodynamic processes for various working fluids.	Understand
CO3.	Determine the basic properties of working fluid while undergoing processes in thermodynamic systems	Apply
CO4.	Derive the governing equations of behaviour of gases and vapours	Analyze
CO5.	Determine the amount of air required for combustion of fuels and analysis of the products.	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO 1	PO 2	PO 3	PO	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3

CO1	S	M	M	L	-	-	-	-	-	-	-	-	L		
CO2	S	M	M	L	-	-	-	-	-	-	-	-	L		
CO3	S	M	M	M	-	-	-	-	-	-	-	-	L		
CO4	S	S	M	M	-	-	-	-	-	-	-	-	L		
CO5	S	S	S	M	-	-	-	-	-	-	-	-	L		

S- Strong; M-Medium; L-Low

SYLLABUS

BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS

Definition of Thermodynamics, macroscopic and microscopic approach, thermodynamic systems and surroundings, thermodynamic properties, thermodynamic equilibrium, state, path, process and cycle, reversible and irreversible processes, work, energy, and heat, state postulate and Zeroth-law of thermodynamics, thermometer and thermometric property, temperature Scales.Internal energy, First law of thermodynamics, perpetual motion machine of the first kind PMM I, application of first law to non-flow processes or closed system and related problems, application of first law to steady flow process, steady flow energy equation. Problems

SECOND LAW OF THERMODYNAMICS

Limitations of First law of thermodynamics, thermal reservoir, heat engine, refrigerator, and heat pump, statements of Second law of thermodynamics, perpetual motion machine of II Kind - PMM II, Carnot cycle, , Carnot theorem, corollary of Carnot's theorem, Clausius inequality. Problems on heat engine, refrigerator and heat pump. Entropy, Temperature – entropy diagram, entropy changes for a closed system. Problems on entropy change calculations in different processes. Availability and irreversibility , available and unavailable energy, availability in non-flow and steady flow systems. Problems on irreversibility and

PURE SUBSTANCES AND THERMODYNAMIC RELATIONS

Definition of pure substance, phase change of a pure substance, p-T diagram, p-V-T Surface, phase change terminology, property diagram in common use. Formation of steam, sensible heat, latent heat, dryness fraction, enthalpy, superheated steam, thermodynamic properties of steam and steam table, work, internal energy, entropy calculation, Mollier diagram, calorimeters for determination of dryness fraction. Problems determining thermodynamic properties of steam.

Thermodynamic relations : Thermodynamic potentials, thermodynamic gradients, general thermodynamics relations, entropy (Tds) equations, equations for internal energy and enthalpy, equation of state, coefficient of expansion and compressibility, specific heats, Joule Thomson coefficient, Clausius –Claperyon equation, Maxwell's relations.

GASES AND VAPOUR MIXTURES

Ideal gas, equation of state for a perfect gas, Joules law, internal energy, enthalpy & specific heat capacities of an ideal gas, real gases, Van der waals equation – Amagats experiment , the cooling effect. Law of corresponding states, reduced properties, compressibility chart. Problem on calculation of properties ideal and real gases. Daltons law, Gibbs – Daltons law, volumetric analysis of a gas mixture, apparent molecular weight and gas constant, specific heats of a gas mixture, adiabatic mixing of perfect gases. Problems on gas mixture property values.

FUELS AND COMBUSTION

Characteristics of an ideal fuel, properties of fuel , flash point , fire point, cloud point, pour point, viscosity, combustion reaction and combustion analysis, theoretical air and excess air, stoichiometric air fuel ratio, analysis of combustion products, internal energy and enthalpy of formation, calorific value, determination of calorific value of fuels, Junkers gas calorimeter, Orsat apparatus, exhaust gas analyser, problem on calculation of air fuel ratio.

TEXT BOOK:

1. P.K.Nag, Engineering Thermodynamics, Mc Graw Hill, 5th edition,2013.
2. Yunus. A.Cengel et al, Thermodynamics: An Engineering Approach, McGH, 8th Edn, 2015

REFERENCES:

1. R.K.Rajput, A text book of Engineering Thermodynamics , Laxmi Publications, 5th Edn, 2016.
2. D.S.Kumar, Engineering Thermodynamics : Principles and Practices, Laxmi Publications, Katsun Books 2012

Course Designers

SL.No	Faculty Name	Designation	Department/ Name of the College	Email id
1	N.Lakshminarayanan	Associate Professor	Mechanical/AVIT	nlakshiminarayanan@avit.ac.in
2	R.Anandan	Associate Professor	Mechanical/VMKVEC	anandan@vmkvec.edu.in

17CVCC32	FLUID MECHANICS AND STRENGTH OF MATERIALS (COMMON TO AUTO & MECT)	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The aim of the course is to understand the concepts of stress and strain and their uses, to understand the properties of fluid, Principles of fluid statics and dynamics.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand basic mechanical forces acting on rigid and deformable bodies.
2	To draw shear force and bending moment diagram for various types of beams.
3	To form deflection equations of beams and columns for different end conditions.
4	To understand fluid property and flow characteristics.
5	To understand flow dynamics and measurement.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Compute resultant, resolve several concurrent forces and also to apply equilibrium concepts, Compute simple stresses and strains	Apply
Co2. Practice shear force and bending moment computations and construct shear force and bending moment diagrams	Apply
Co3. Evaluation of beam deflection and slope	Apply
Co4. Determine the variation of pressure in fluid at rest and calculate the hydrostatic forces and point of application on a plane or curved surface.	Understand
CO5. Distinguish between various types of flows and derive the continuity equation for compressible and incompressible flow	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	L	M	L	-	-	-	-	-	L	L	-	-
CO2	S	M	M	L	L	L	-	-	-	-	-	M	L	-	M
CO3	S	M	M	L	L	L	-	-	-	-	-	L	-	L	-
CO4	S	S	S	M	L	L	-	L	-	-	L	M	-	-	-
CO5	M	M	M	L	L	M	-	-	-	-	L	M	L	M	-

S- Strong; M-Medium; L-Low

Syllabus

STRESS- STRAIN AND DEFORMATION OF SOLIDS

Properties of material, Concept of Stress and Strain, Hook's Law, Stress Strain Diagram for structural steel and Non-ferrous materials. Poisson's Ratio & principles of superposition, Total elongation of tapering bars of circular and rectangular cross-sections. Elongation due to self-weight, volumetric strain. Expression for Volumetric strain, Elastic constants, relationship among elastic constants, compound bars Rigid and Deformable bodies – Strength- Stiffness and Stability – Stresses; Tensile- Compressive and Shear – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

BEAMS - LOADS AND STRESSES

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever- Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Shear stresses in beams.

DEFLECTION OF BEAMS

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method- Macaulay Method- and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns – Introduction to curved beams.

FLUID PROPERTY AND FLOW CHARACTERISTICS

Surface tension – Capillarity – Viscosity – Newton's law – Fluid pressure and pressure head - Fluid velocity – Uniform and steady flow – Reynolds number - Classification as laminar and turbulent flow – Continuity equation.

FLOW DYNAMICS AND MEASUREMENT IN PIPE NETWORKS

Euler's and Bernoulli's Equations – Manometer, Venturi meter and orifice meter - Pressure losses along the flow – Categorisation into minor losses - Flow through circular pipes – Statement of Darcy – Weisbach equation – Friction factor – Pipes in series and parallel - Hydraulic gradient

Text Books

1. R. K. Rajput, 'Strength of Materials (Mechanics of Solids)', S. Chand & Company Ltd., 2003.
2. R.K., Bansal, A text book on Fluid Mechanics & Hydraulic Mechanics,- M/s. Lakshmi Publications (P) Ltd, 2004.

Reference Books

1. Ryder G.H- "Strength of Materials"- Macmillan India Ltd.- Third Edition- 2007
2. K. L. Kumar, 'Engineering Fluid Mechanics', S. Chand & Company Ltd., 2002.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr.T.Subramani	Professor & Head	Civil / VMKVEC	tsm2007@rediffmail.com
2	Dr.R.Divahar	Asso. Professor	Civil / AVIT	divahar.civil@avit.ac.in

17ATCC04	AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

Automotive electrical and electronic systems used in road vehicles, enable study analyze and apply the concepts of various electrical and electronics component such as battery alternator ignition system and other engine management systems.

Prerequisite

Nil

Course Objectives

1. To perform the concepts of battery and charging systems..
2. To compilet the knowledge of starting systems in the vehicle.
3. To employ the knowledge in the application of various types of charging system & lighting system.
4. To demonstrate the application and knowledge of fundamental of automotive electronics.
5. To employ the application and knowledge of sensors and actuators.

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Outline the concepts of Electrical and Electronics System	Understand
CO2. Summarize the various concept of starting systems.	Understand
CO3. Apply the various types of charging system & lighting system.	Apply
CO4. Identify the application automotive electronics.	Apply
CO5. Compare the sensors and actuators.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1.	S	M	M	L	-	-	-	-	-	-	-	L	L	-	-
2.	S	M	M	L	-	-	-	-	-	-	-	L	L	-	-
3.	S	S	S	M	-	-	-	-	-	-	-	M	L	-	-
4.	S	S	S	M	-	-	-	-	-	-	-	M	L	-	-
5.	S	S	S	M	-	-	-	-	-	-	-	M	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

BATTERIES

Principle and construction of lead-acid battery. Characteristics of battery, rating, capacity and efficiency of batteries. Various tests on battery condition, charging methods. Details of modern storage batteries.

STARTING SYSTEM

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

CHARGING SYSTEM & LIGHTING SYSTEM

Generation of direct current, shunt generator characteristics, armature reaction,third brush regulation, cutout. Voltage and current regulators, compensatedvoltage regulator, alternators principle and constructional aspects and bridgerectifiers, new developments.Lighting system: insulated and earth return system, details of head light and sidelight, LED lighting system, head light dazzling and preventive methods – Horn,wiper system and trafficator.

FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS

Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

SENSORS AND ACTUATORS

Types of sensors: sensor for speed, throttle position, exhaust oxygen level,manifold pressure, crankshaft position, coolant temperature, exhaust temperature,air mass flow for engine application. Solenoids, stepper motors, relay.

TEXT BOOK:

1. Kholi,P.L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd., New Delhi, 2004.
2. Judge,A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 2004.
3. Younng A.P & Griffiths L, "Automobile Electrical and Electronic Equipments", English Languages Book Society & New Press.
4. Tom Weather Jr and Cland C.Hunter, "Automotive Computers and Control system", Prentice Hall Inc., New Jersey.

REFERENCES:

1. Vinal,G.W., Storage Batteries, John Wiley & Sons Inc., New York, 1985.
2. Crouse,W.H., Automobile Electrical Equipment, McGraw Hill Book Co. Inc., New York, 1980.
3. Spreadbury,F.G., Electrical Ignition Equipment, Constable & Co. Ltd., London, 1962.
4. Automotive Hand Book, fifth edition, Robert Bosch, Bently Publishers, 2003.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC05	AUTOMOTIVE TRANSMISSION	Category	L	T	P	C
		CC	3	0	0	3

Preamble

Automotive Transmission provide knowledge and understanding on various types gear drives and transmission in automobiles.

Prerequisite

Automotive Chassis (17ATCC03)

Course Objectives

1	To impart the knowledge of trends in clutch and gear box.
2	To gain application knowledge of hydrodynamic drive.
3	To understand the various type of planetary gear box.
4	To impart the knowledge of automatic transmission applications.
5	To impart the knowledge of hydrostatic and electric drive.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Classify the various concepts of clutches and gear box.	Understand
CO2.	Make use of hydrodynamic drive.	Apply
CO3.	Identify the application of planetary gear box.	Apply
CO4.	Utilize the application and ideas of automatic transmissions	Apply
CO5.	Apply hydrostatic and electric drive.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	-	-	-	-	-	-	-	M	L		
CO2	S	S	M	M	-	-	-	-	-	-	-	M	L		
CO3	S	S	M	M	-	-	-	-	-	-	-	M	L		
CO4	S	S	M	M	-	-	-	-	-	-	-	M	L		
CO5	S	S	M	M	-	-	-	-	-	-	-	M	L		

S- Strong; M-Medium; L-Low

Syllabus

CLUTCH AND GEAR BOX

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

HYDRODYNAMIC DRIVE

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

PLANETARY GEAR BOXES

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

AUTOMATIC TRANSMISSION APPLICATIONS

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

HYDROSTATIC AND ELECTRIC DRIVE

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

TEXT BOOK:

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

REFERENCES:

1. Heldt, P.M., Torque converters, Chilton Book Co., 1992.
2. SAE Transactions 900550 & 930910.
3. Hydrostatic transmissions for vehicle applications, I Mech E Conference, 1981-88.
4. Crouse, W.H., Anglin, D.L., Automotive Transmission and Power Trains construction, McGraw Hill, 1992.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	A.Imithyas	Assistant. Professor GRI	Auto / AVIT	imthicyr@avit.ac.in
4	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in

17ATCC06	COMBUSTION THERMODYNAMICS AND HEAT TRANSFER	Category	L	T	P	C
		CC	3	0	0	3

Preamble

Combustion Thermodynamics and Heat Transfer provide knowledge and understanding of combustion and heat transfer in engineering applications

Prerequisite

Engineering Thermodynamics (17MECC02)

Course Objectives

1	To impart the knowledge of application in combustion processes.
2	To analyze the concepts of thermodynamics of combustion.
3	To analyze the various concepts of normal, abnormal combustion in SI engines
4	To impart the in depth knowledge and analyze of combustion and heat transfer in IC engines.
5	To analyze the experimental investigation of combustion and heat transfer in IC engines.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Apply the concepts of combustion processes.	Apply
CO2.	Analyze various concept in thermodynamics of combustion	Analyze
CO3.	Compare normal and abnormal combustion in SI engines.	Analyze
CO4.	Analyze combustion and heat transfer in IC engines	Analyze
CO5.	Evaluate experimental investigation of combustion and heat transfer in IC engines.	Evaluate

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	M	-	-	-	-	-	-	M	M		
CO2	S	S	S	S	M	-	-	-	-	-	-		M		
CO3	S	S	S	S	M	-	-	-	-	-	-		M		
CO4	S	S	S	S	M	-	-	-	-	-	-		M		
CO5	S	S	S	S	M	-	-	M	-	-	-		M		

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION TO COMBUSTION PROCESSES

Definition for Fuel and Oxidizer – types – Various combustion modes- Combustion in premixed laminar and premixed turbulent combustion - Flame Speed – Burning Velocity - diffusion flames – Combustion process in IC engines.

THERMODYNAMICS OF COMBUSTION

Thermodynamics of combustion – Thermodynamic Properties – Ideal gas law – Gas mixture combustion – Stoichiometric combustion – Thermochemistry – Hess's law- Adiabatic flame temperature – Physics of combustion – Fick's law of species diffusion – Conservation equations – Boundary layer concept

NORMAL, ABNORMAL COMBUSTION IN SI ENGINES

Stages of combustion – Flame propagation — Flame Limits –Flame Extinction -Rate of pressure rise – Cycle to cycle variation – Abnormal combustion – Theories of detonation – Effect of engine operating variables on combustion –Example problems.

COMBUSTION AND HEAT TRANSFER IN IC ENGINES

Droplet and spray combustion theory – delay period – Peak pressure – Heat release – Gas temperature – Diesel knock. Basic definitions – Convective heat transfer – Radiative heat transfer – Heat transfer, temperature distribution and thermal stresses in piston – Cylinder liner – Cylinder head – fins and valves.

EXPERIMENTAL INVESTIGATION OF COMBUSTION AND HEAT TRANSFER IN IC ENGINES

Photographic studies of combustion processes – P-θ diagrams in SI and CI engines, Assembly – Temperature measurement in piston – cylinder liner – Cylinder head and engine valves.

TEXT BOOK:

1. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Co., 2013
2. Spalding.D.B., Some fundamentals of Combustion, Butterworth Science Publications, London, 1985.
1. John B.Heywood, "Internal Combustion Engine Fundamental", McGraw-Hill, 2011.

REFERENCES:

1. Lewis,B., Pease,R.N. and Taylor,H.S., Combustion Process, High Speed Gas dynamics and Jet Propulsion Series, Princeton University Press, Princeton, New Jersey, 1976.
2. Taylor,E.F., The Internal Combustion Engines, International Text Book Co., Pennsylvania, 1982.
3. D.P.Mishra.,Fundamentals of Combustion, PHI .,2008

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	A.Imithyas	Assistant. Professor GRI	Auto AVIT	imthicyr @avit.ac.in
4	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in

17MECC18	MANUFACTURING ENGINEERING	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

This course provides deep knowledge about the various manufacturing processes, which are used in the manufacturing industry to produce mechanical components.

Prerequisite : NIL

Course Objective

1	To understand the manufacturing process of conventional and special casting process of foundry technology.
2	To impart the knowledge of various types welding process in metal joining processes.
3	To know the working principles of the various unconventional, conventional machining operations and also metal forming processes.
4	To impart the basic knowledge and working principle of various forming and the moulding processes in plastics.
5	To impart the knowledge of various metal forming processes and manufacturing process of powder metallurgy.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Explain the working principles of various metal casting processes and to identify the defects and interpret causes in the product of metal casting processes	understand
CO2.	Discuss the working principles of various metal joining processes and machines/equipments used and Select the suitable joining methods for fabrication/ assembly of products.	understand
CO3.	Examine the working principle of various conventional machine tools, work and unconventional manufacturing processes.	Apply
CO4.	Illustrate the types of plastics, working principle of various moulding process and the characteristics of the forming and shaping processes	Apply
CO5.	Apply the concepts of various metal forming and powder metallurgy.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO12	PSO 1	PSO 2	PSO 3
CO1	S	M	-	-	-	-	-	-	-			-	M	-	-
CO2	S	M	-	-	-	-	-	-	-	-		-	M	-	-
CO3	S	M	L	-	-	-	-	-	-	-		M	M	-	-
CO4	S	L	L	-	-	-	-	-	-	-		M	M	-	-
CO5	S	L	L	-	-	-	-	-	-	-		M	M	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to Casting technology

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes– CO_2 moulding, shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting and identify casting defects and remedies.

Welding

Classification of welding processes. Principles of Oxy-acetylene gas welding. A.C metal arc welding, Resistance welding, Submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, and identify defects in welding process - Soldering and brazing.

Machining

General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planner, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining and Electron beam machining and Laser beam machining.

Forming and shaping of plastics

Types of plastics - Characteristics of the forming and shaping processes – moulding of thermoplastics– working principles and typical applications of- Injection moulding – Plunger and screw machines– Blow moulding – rotational moulding – film blowing – extrusion- typical industrial applications – Thermoforming – processing of thermo sets– working principles and typical applications- Compression moulding – Transfer moulding – Bonding of thermoplastics– Fusion and solvent methods – Induction and ultrasonic methods.

Metal forming and powder metallurgy

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

Text Books

1	S.K.HajraChoudhury and A.K. HajraChoudhury, '**Elements of Work shop Technology**', Vol – I & II Manufacturing Processes, Media Promoters and Publishers Pvt. Ltd, 1986.
2	Mikell P.Groover, '**Fundamental of Modern Manufacturing**', Wiley India Edition, Third Edition, Reprint, 2012.
3	P.C. Sharma, '**A Text Book of Production Technology (Manufacturing Processes)**', S. Chand & Company Ltd., New Delhi, Seventh Reprint, 2012.

Reference Books

1	Serope Kalpajian, Steven R.Schmid, "Manufacturing Processes for Engineering Materials", 4/e, Pearson Education, Inc. 2007
2	Jain. R.K.,and S.C. Gupta, "Production Technology", 16th Edition, Khanna Publishers, 2001
3	E.Paul Degarmo, J.T.Black, and Ronald A. Konser, '**Materials and Processes in Manufacturing**', 5th Edition, Prentice Hall India Ltd., 1997.

Course Designers

S.No	**Faculty Name**	**Designation**	**Department/ Name of the College**	**Email id**

1	S. ARUNKUMAR	Assistant Professor	MECH / VMKVEC	arunkumar@vmkvec.edu.in
2	M.SARAVANA KUMAR	Asst. Prof	MECH / AVIT	saravanakumar@avit.ac.in

17ATCC07	MODERN VEHICLE TECHNOLOGY	Category	L	T	P	C
		CC	3	0	0	3

Preamble

Modern vehicle technology study and understand the latest trends prevailing in the field of modern vehicle's technology

Prerequisite

Automotive Chassis (17ATCC03), Automotive Engines (17ATCC02)

Course Objectives

1	To understand the trends in modern vehicle's technology
2	To apply the knowledge in power system and new generation vehicles.
3	To develop and apply vehicle operation and control
4	To impart the knowledge and application of vehicle automated tracks
5	To impart the knowledge of applications in suspension, brakes, aerodynamics and safety.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Classify modern vehicle's technology	Understand
CO2.	Develop power system and new generation vehicles	Apply
CO3.	Plan vehicle operation and control.	Apply
CO4.	Apply knowledge in the application of vehicle automated tracks.	Apply
CO5.	Make use of suspension, brakes, aerodynamics and safety	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	-	-	-	-	-	-	-	M	M		
CO2	S	S	S	S	-	-	-	-	-	-	-	M	M		
CO3	S	S	S	S	-	-	-	-	-	-	-	M	M		
CO4	S	S	S	S	-	-	-	-	-	-	-	M	M		
CO5	S	S	S	S	-	-	-	-	-	-	-	M	M		

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION

Electric and hybrid vehicles, flexible fuel vehicles (FFV), solar powered vehicles, magnetic track vehicles, fuel cells vehicles.

POWER SYSTEM AND NEW GENERATION VEHICLES

Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

VEHICLE OPERATION AND CONTROL

Computer Control for pollution and noise control and for fuel economy – Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

VEHICLE AUTOMATED TRACKS

Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY

Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs- crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards

TEXT BOOK:

1. Heinz, "Modern Vehicle Technology" Second Edition, Bu
2. Bosch Hand Book, SAE Publication.

REFERENCES:

1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.
3. Noise reduction, Branek L.L., McGraw Hill Book company, New York, 1993.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	A.Imithyas	Assistant. Professor GRI	Auto AVIT	imthicyr @avit.ac.in
4	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in

17ATCC10	AUTOMOTIVE POLLUTION CONTROL	Category	L	T	P	C
		CC	3	0	0	3

Preamble

To study and purpose is to understand automotive pollution control.

Prerequisite

NIL

Course Objectives

1	To understand the introduction of pollutions.
2	To understand the pollution formation in SI engines.
3	To understand the pollution formation in CI engines
4	To impart the control of emission in CI engines.
5	To understand the measurement technique and emission standards.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize the current scenario of Automobile Emissions and standards	Understand
CO2.	Apply the formation of Emissions from SI Engines.	Apply
CO3.	Apply the formation of Emissions from CI Engines.	Apply
CO4.	Examine Emission and control Techniques in SI and CI Engines.	Analyze
CO5.	Inspect measuring techniques of Emission and test procedure	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	--	--	--	--	M	M	--	--
CO2	S	S	S	S	M	--	--	--	--	--	--	M	M	--	--
CO3	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO4	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO5	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Introduction pollution control act- norms and standards. 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
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
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 and Sox formation and control. Noise pollution from automobiles, measurement and standards.
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, fuel cells, Two stroke engine pollution control.
MEASUREMENT TECHNIQUES - EMISSION STANDARDS
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

TEXT BOOK:
1. Paul Degobert – Automobiles and Pollution – SAE International ISBN-1-56091-563-3, 1991.
2. Ganesan, V- "Internal Combustion Engines"- Tata McGraw-Hill Co.- 2013.
3. SAE Transactions- "Vehicle Emission"- 1982 (3 volumes).
REFERENCES:
1. Obert.E.F.- "Internal Combustion Engines"- 1988.
2. Marco Nute- "Emissions from two stroke engines, SAE Publication – 1998

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC09	AUTOMOTIVE ENGINE COMPONENTS DESIGN	Category	L	T	P	C
		CC	3	1	0	4

Preamble

To study and purpose is to understand automotive engine design.

Prerequisite

Automotive Engines (17ATCC02)

Course Objectives

1	To understand the introduction of materials
2	To understand the limits fits and tolerances
3	To understand the design of piston and cylinder
4	To impart the design knowledge of connecting rod and crankshaft.
5	To understand the design of valves and flywheel

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Outline of Engine Component materials.	Understand
CO2.	Analyze shaft and spring	Analyze
CO3.	Examine piston and cylinder	Analyze
CO4.	Inspect Connecting rod and crankshaft	Analyze
CO5.	Function of flywheel	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	--	--	--	--	M	M	--	--
CO2	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO3	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO4	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO5	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Classification of design – Engineering materials and their physical properties as applied to design – Selection of materials – Factors of safety in design – Endurance limit of materials – Determination of endurance limit for ductile materials – Notch sensitivity – Principle of design optimization – Future trends – CAD Euler's formula – – Rankine's formula – Tetmajer's formula – Johnson formula – Design of push rods and eccentricity loaded columns – Reduction of stress concentration.
DESIGN OF SHAFTS AND SPRINGS
Introduction – Material and design stresses – Design of axles – Design of shafts on the basis of strength – Design of shaft on the basis of rigidity – Design of hollow shafts – Design of close coiled helical spring subjected to axial loading – Torsion of helical springs
DESIGN OF CYLINDER AND PISTON
Choice of material for cylinder and piston, piston friction, piston slap, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly..
DESIGN OF CONNECTING ROD AND CRANKSHAFT
Material for connecting rod, determining minimum length of connecting rod, small end and big end design, shank design, design of big end cap bolts, connecting rod failures, balancing of I.C. Engines, significance of firing order, material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations
DESIGN OF VALVES AND FLYWHEEL
Design aspects of intake and exhaust manifolds, inlet and Exhaust valves, valve springs, tappets, valve train. Materials and design of flywheel

TEXT BOOK:
1. A.Kolchin and V.Demidov, "Design of Automotive Engines", MIR Publishers, Moscow, 1984.
2. Gupta.R.B. "Auto Design", Satya Prakashan, New Delhi.
3. Jain.R.K., "Machine Design", Khanna Publishers, New Delhi, 1997..
REFERENCES:
1. Dr.Ram Prasad., "Petroleum Refining Technology", Khanna Publishers, 2008
2. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATCC08	AUTOMOTIVE FUELS AND LUBRICANTS	Category	L	T	P	C
		CC	3	0	0	3

Preamble

To provide knowledge and understanding on the use of fuels and lubricants in various types of automobiles

Prerequisite

Automotive Engines (17ATCC02)

Course Objectives

1	To understand the manufacture of fuels and lubricants.
2	To understand the theory of lubrication
3	To understand the lubricants.
4	To impart the knowledge on properties and testing of fuels
5	To understand the combustion & fuel ratings.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize the manufacturing methods of various fuels and lubricants	Understand
CO2.	Identify the different lubrication methods and their effects on components	Apply
CO3.	Develop the properties of lubricants	Apply
CO4.	Utilize the properties of fuels	Apply
CO5.	Experiment with combustion and fuel rating of various fuels with additives	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	L	--	--	--	--	--	--	--	M	M	--	--
CO2	S	M	M	M	--	--	--	--	--	--	--	M	M	--	--
CO3	S	S	S	S	--	--	--	--	--	--	--	M	M	--	--
CO4	S	S	S	S	--	--	--	--	--	--	--	M	M	--	--
CO5	S	S	S	S	--	--	--	--	--	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

MANUFACTURE OF FUELS AND LUBRICANTS

Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerization, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants

THEORY OF LUBRICATION

Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

LUBRICANTS

Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.

PROPERTIES AND TESTING OF FUELS

Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, distillation, vapour pressure, flash point, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point etc.

COMBUSTION & FUEL RATING

SI Engines – flame propagation and mechanism of combustion, normal combustion, knocking, octane rating, fuel requirements. CI Engine, mechanism of combustion, diesel knock, cetane rating, fuel requirements. Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives – specifications

TEXT BOOK:

1. Gupta.O.B., “Elements of Fuels, Furnaces and Refractories”,Khanna Publishers, 2007.
2. Ganesan.V., “Internal Combustion Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 2013.

REFERENCES:

1. Dr.Ram Prasad., “Petroleum Refining Technology”, Khanna Publishers, 2008
2. Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC11	AUTOMOTIVE CHASSIS COMPONENTS DESIGN	Category	L	T	P	Credit
		CC	3	1	0	4

Preamble

To study and purpose is to design of chassis.

Prerequisite

Automotive Chassis (17ATCC03)

Course Objectives

1	To understand the design and calculation of clutch
2	To understand the performance of vehicle total resistance.
3	To understand the design vehicle frame and suspension systems
4	To impart the design of front axle and steering systems
5	To understand the design of final drive and rear axle

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Outline various vehicular structures	Understand
CO2.	Analyze engineering problems related to automobile drive line components.	Analyze
CO3.	Examine performances of various axles and to design the same.	Analyze
CO4.	Inspect various braking systems	Analyze
CO5.	Function various suspension systems	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	--	--	--	--	M	M	--	--
CO2	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO3	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO4	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--
CO5	S	S	S	S	M	--	--	--	--	--	--	S	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

CLUTCH DESIGN CALCULATION
Design of single plate clutch, multi plate clutch, design of centrifugal clutch, cone clutch, energy dissipated, torque capacity of clutch, design of clutch components, design details of roller and springs type of clutches
GEAR BOX
Performance of vehicle, total resistance to motion, traction and tractive effort, acceleration, calculation of gear ratio, design of three speed gear box, design of four speed gear boxes
VEHICLE FRAME AND SUSPENSION
Study of loads, moments and stresses on frame members, computer aided design of frame for passenger and commercial vehicles, computer aided design of leaf springs, coil springs and torsion bar springs
FRONT AXLE AND STEERING SYSTEMS
Analysis of loads, moments and stresses at different sections of front axle, determination of loads at kingpin bearings, wheel spindle bearings, choice of bearings, determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering
FINAL DRIVE AND REAR AXLE
Design of propeller shaft, design details of final drive gearing, design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings

TEXT BOOK:
1. Giri.N.K- "Automobile Mechanics"- Khanna Publisher, New Delhi- 2002.
2. Heldt.P.M - "Automotive Chassis"- Chilton Co., New York- 1992
3. "Design Data Book", PSG College of Technology, Coimbatore, 2015
REFERENCES:
1. Steeds. W -"Mechanics of Road Vehicles"- Illiffe Books Ltd., London- 1990
2. Giles.K.G - Steering, Suspension and tyres"- Illiffe Books Ltd., London – 1988
3. Newton Steeds & Garret- "Motor Vehicle"- Illiffe Books Ltd., London – 2000.
4. Dean Averns - "Automobile Chassis Design"- Illiffe Books Ltd – 1992

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC12	VEHICLE BODY ENGINEERING	Category	L	T	P	C
		CC	3	0	0	3

Preamble

The aim of the subject is to study and understand the automotive body building technology

Prerequisite

Nil

Course Objectives

1	To understand the car body details.
2	To understand the vehicle aerodynamics
3	To understand the bus body details
4	To impart the commercial vehicle details
5	To understand the body materials, trim and mechanisms

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize car body details	Understand
CO2.	Compare vehicle aerodynamics	Understand
CO3.	Identify bus body details	Apply
CO4.	Model commercial vehicle body details	Apply
CO5.	Make use of body materials, trim and mechanisms	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	--	--	--	--	--	--	--	--	M	M	--	--
CO2	S	M	M	--	--	--	--	--	--	--	--	M	M	--	--
CO3	S	S	M	--	--	--	--	--	--	--	--	M	M	--	--
CO4	S	S	M	--	--	--	--	--	--	--	--	M	M	--	--
CO5	S	S	M	--	--	--	--	--	--	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

CAR BODY DETAILS
Types: saloon, convertibles, limousine, estate car, racing and sports car. Visibility: regulations, driver's visibility, tests for visibility, methods of improving visibility and space in cars. Safety: safety design, safety equipments for cars. Car body construction; design criteria, prototype making, initial tests, crash tests on full scale model, Dummies and Instrumentation
VEHICLE AERODYNAMICS
Objectives. Vehicle drag and types; various types of forces and moments, effects of forces and moments, side wind effects on forces and moments, Various body optimization techniques for minimum drag, wind tunnel testing: flow visualization techniques, scale model testing, component balance to measure forces and moments
BUS BODY DETAILS
Types: mini bus, single decker, double-decker, two level and articulated bus. Bus body layout; floor height, engine location, entrance and exit location, seating dimensions. Constructional details: frame construction, double skin construction, types of metal sections used, windscreen and doors, Regulations, Conventional and integral type construction
COMMERCIAL VEHICLE DETAILS
Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Dimensions of driver's seat relation to controls. Drivers cab design.
BODY MATERIALS, TRIM AND MECHANISMS
Steel sheet, timber, plastic, GRP, properties of materials; Corrosion, anticorrosion methods. Selection of paint and painting process, spray painting and components. Body trim items. Body mechanisms.

TEXT BOOK:
1. J.Powloski - "Vehicle Body Engineering" - Business Books Ltd, London -1989
2. Braithwaite.J.B. - "Vehicle Body building and drawing" - Heinemann Educational Books Ltd., London – 1977.
REFERENCES:
1. Giles.J.C. - "Body construction and design" - Liiffe Books Butterworth & Co. - 1971
2. John Fenton - "Vehicle Body layout and analysis" - Mechanical Engg. Publication Ltd., London – 1982.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	A.Imithyas	Assistant. Professor GRI	Auto AVIT	imthicyr @avit.ac.in
4	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in

17ATCC13	ENGINE AND VEHICLE MANAGEMENT SYSTEM	Category	L	T	P	C
		CC	3	0	0	3

Preamble

To study and purpose is to understand engine management system

Prerequisite

NIL

Course Objectives

1	To understand the fundamentals of automotive electronics in details.
2	To understand the types sensors
3	To impart knowledge on SI engine management system.
4	To impart knowledge on CI engine management system.
5	To understand the vehicle management systems

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize the vehicle motion control and stabilization system	Understand
CO2.	Classify Driver assistance, security and warning system	Understand
CO3.	Apply safety concepts used in passenger cars	Apply
CO4.	Identify vehicle collision and its effects.	Apply
CO5.	Apply Safety and comfort system	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO2	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO3	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO4	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO5	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
Microprocessor architecture, open and closed loop control strategies, PID control, Look up tables, Introduction to modern control strategies like Fuzzy logic and adaptive control. Parameters to be controlled in SI and CI enignes and in the other parts of the automobile
SENSORS
Inductive, Hall effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, air mass flow, crank shaft position, cam position, engine and wheel speed, steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors
SI ENGINE MANAGEMENT
Three-way catalytic converter, conversion efficiency versus lambda. Layout and working of SI engine management systems like Bosch L-Jetronic and LH-Jetronic. Group and sequential injection techniques. Working of the fuel system components. Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop control of fuel injection and closed loop lambda control. Electronic ignition systems and spark timing control. Closed loop control of knock.
CI ENGINE MANAGEMENT
Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valve
VEHICLE MANAGEMENT SYSTEMS
ABS system, its need, layout and working. Electronic control of suspension – Damping control, Electric power steering, Supplementary Restraint System of air bag system – crash sensor, seat belt tightening. Cruise control. Vehicle security systems- alarms, vehicle tracking system. On board diagnostics. Collision avoidance Radar warning system.

TEXT BOOK:
1. William B Ribbens "Understanding Automotive Electronics", SAE Publications, 1998
2. Eric Chowanietz "Automobile Electronics" SAE Publications, 1994
REFERENCES:
1. Robert Bosch "Diesel Engine Management" SAE Publications, 2006
2. Robert Bosch, "Gasoline Engine Management" SAE Publications, 2006.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC14	VEHICLE MAINTENANCE	Category	L	T	P	C
		CC	3	0	0	3

Preamble

To study and purpose is to understand various vehicle maintenance

Prerequisite

Nil

Course Objectives

1	To understand the maintenance of records and schedules.
2	To understand the engine maintenance and repair and overhauling.
3	To understand the chassis maintenance and repair and overhauling
4	To impart the various electrical system maintenance service and repairs.
5	To understand the various maintenance of cooling, fuel, lubrication and body.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize vehicle maintenance records and schedule	Understand
CO2.	Explain repair and overhauling of engine	Understand
CO3.	Apply maintenance, repair and overhauling of chassis drive line components	Apply
CO4.	Identify maintenance, repair and servicing of electrical systems	Apply
CO5.	Conduct maintenance, repair and servicing of cooling lubrication system, fuel system and body	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO2	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO3	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO4	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO5	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

MAINTENANCE OF RECORDS AND SCHEDULES
Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance..
ENGINE MAINTENANCE – REPAIR AND OVERHAULING
Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up
CHASSIS MAINTENANCE - REPAIR AND OVERHAULING
Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.
ELECTRICAL SYSTEM MAINTENANCE - SERVICING AND REPAIRS
Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.
MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VECHICLE BODY
Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts. Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance

TEXT BOOK:
1. John Doke “Fleet Management”, McGraw-Hill Co. 1984
2. Venk Spicer, “Automotive Maintenance and Trouble Shooting”.
REFERENCES:
1. James D Halderman - Advanced Engine Performance Diagnosis – PHI - 1998
2. Judge.A.W., “Maintenance of high speed diesel engines”,Chapman Hall Ltd., London.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	A.Imithyas	Assistant. Professor GRI	Auto AVIT	imthicyr @avit.ac.in
4	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in

17ATCC15	TWO AND THREE-WHEELER TECHNOLOGY	Category	L	T	P	C
		CC	3	0	0	3

Preamble

To study and purpose is to understand two and three-wheeler technology

Prerequisite

NIL

Course Objectives

1	To understand the power units.
2	To understand the fuel and ignition systems
3	To understand the fuel and ignition systems
4	To understand the brakes and wheels
5	To impart the various types of two and three-wheeler case study

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize the power unit	Understand
CO2.	Classify chassis and sub-systems	Understand
CO3.	Apply brakes and wheels	Apply
CO4.	Identify two wheelers	Apply
CO5.	Apply the detailed study of three wheelers	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO2	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO3	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO4	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO5	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

THE 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..
FUEL AND IGNITION SYSTEMS
Fuel system, Fuel injection system, Lubrication system. Magneto coil and battery coil spark ignition system. Electro ignition system. Starting system. Kick starter system
CHASSIS AND SUB-SYSTEM
Main frame, its types. Chassis and shaft drive. Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems. Shack absorbers. Panel meters and controls on handle bar.
BRAKES AND WHEELS
Drum brakes, disc brakes, front and rear brake links layouts. spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and Tubes
TWO AND 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

TEXT BOOK:
1. Irving, P.E., Motor cycle Engineering, Temple press Book, Loondon,1992
2. Bryaut, R.V., Vespa Maintenance and repair series. RAYMOND Broad, Lambretta- A practical guide to maintenance and repair, 1987
REFERENCES:
1. The Cycle Motor Manual, Temple Press Ltd., London, 1990
2. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATCC15	TWO AND THREE-WHEELER TECHNOLOGY	Category	L	T	P	C
		CC	3	0	0	3

Preamble

To study and purpose is to understand two and three-wheeler technology

Prerequisite

NIL

Course Objectives

1	To understand the power units.
2	To understand the fuel and ignition systems
3	To understand the fuel and ignition systems
4	To understand the brakes and wheels
5	To impart the various types of two and three-wheeler case study

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize the power unit	Understand
CO2.	Classify chassis and sub-systems	Understand
CO3.	Apply brakes and wheels	Apply
CO4.	Identify two wheelers	Apply
CO5.	Apply the detailed study of three wheelers	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO2	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO3	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO4	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--
CO5	S	S	S	M	--	--	--	M	--	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

THE 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..
FUEL AND IGNITION SYSTEMS
Fuel system, Fuel injection system, Lubrication system. Magneto coil and battery coil spark ignition system. Electro ignition system. Starting system. Kick starter system
CHASSIS AND SUB-SYSTEM
Main frame, its types. Chassis and shaft drive. Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems. Shack absorbers. Panel meters and controls on handle bar.
BRAKES AND WHEELS
Drum brakes, disc brakes, front and rear brake links layouts. spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and Tubes
TWO AND 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

TEXT BOOK:
1. Irving, P.E., Motor cycle Engineering, Temple press Book, Loondon,1992
2. Bryaut, R.V., Vespa Maintenance and repair series. RAYMOND Broad, Lambretta- A practical guide to maintenance and repair, 1987
REFERENCES:
1. The Cycle Motor Manual, Temple Press Ltd., London, 1990
2. Encyclopedia of Motor cycling, 20 volumes, Marshall Cavensih, New York and London, 1989.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATCC81	AUTOMOTIVE ENGINE COMPONENTS LAB	Category	L	T	P	Credit
		FC(ES)	0	0	4	2

Preamble

The student will undergo training in the dismantling and assembly of engine components and acquire knowledge to modify them according to the need.

Prerequisite

Fundamentals of Automotive Engines (17ATCC01)

Course Objectives

1. To apply the knowledge in dismantling and assembling of single and multi cylinder engines.
2. Perform and analyze the application of valve mechanism of four stroke engines.
3. To Demonstrate the various fuel supply system for engines, service the Cooling systems and Lubrication systems.

Course Outcomes

On the successful completion of the course, students will be able to

CO1.	Experiment with the engines dismantling and assembling of single and multi cylinder engines.	Apply
CO2.	Apply valve mechanism.	Apply
CO3	Develop sub system for engines.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO2	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO3	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Dismantling and Assembling of single cylinder petrol engine.
2. Dismantling and Assembling of multi cylinder petrol engine.
3. Dismantling and Assembling of single cylinder diesel engine.
4. Dismantling and Assembling of multi cylinder diesel engine.
5. Dismantling and Assembling of cam shaft, timing gear.
6. Dismantling and Assembling of valve mechanism, and adjusting valve timing, valve clearance.
7. Dismantling and Assembling of fuel filter, fuel injection system, carburetor.
8. Removing and servicing of cooling system components.
9. Removing and servicing of lubrication system.
10. .Removing and servicing of oil pump and oil Filter.

Reference Books

1. 'Automotive Engine Components Lab Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC82	AUTOMOTIVE CHASSIS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

Preamble

To impart knowledge in the assembling and dismantling of different types of systems like steering system, transmission system and braking system.

Prerequisite

Automotive Chassis (17ATCC03)

Course Objectives

To employ the knowledge and measurement of light and heavy commercial Vehicle chassis
To demonstrate the knowledge to dismantling, study and Assembling of front and rear axle .
To demonstrate the knowledge to dismantling, study and Assembling of Clutch, Gearbox, Steering gearbox, Breaking and Differential systems

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Conduct measurement of light and heavy commercial Vehicle chassis	Apply
CO2. Develop Thoroughly develop knowledge of dismantling, study and Assembling of front and rear axle.	Apply
CO3. Develop the knowledge in dismantling, study and Assembling of clutch, gearbox, steering gearbox, breaking and differential systems	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	M	M	M	-	-	-	-	M	M	-	-
CO2	S	S	S	S	M	M	M	-	-	-	-	M	M	-	-
CO3	S	S	S	S	M	M	M	-	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Study and measurement of Light commercial vehicle chassis layout
2. Study and measurement of Heavy commercial vehicle chassis layout
3. Dismantling, study and Assembling of Front Axle Systems.
4. Dismantling, study and Assembling of Rear Axle Systems
5. Dismantling, study and Assembling of steering systems with different Steering gearboxes
6. Dismantling, study and Assembling of Clutch.
7. Dismantling, study and Assembling of Gear box with different gear box
8. Dismantling, study and Assembling of Differential.
9. Dismantling, study and Assembling of Braking system.
10. Dismantling, study and Assembling of different types of suspension system.

Text Books

1. **'**Automotive Chassis Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17CVCC92	FLUID MECHANICS AND STRENGTH OF MATERIALS LAB (COMMON TO AUTO,AERO AND MECT)	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The aim of the subject is to provide make the students to understand the basic mechanism of Fluids and strength of materials.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the concepts of fluid mechanics
2	To get hands on experience to conduct testing of materials.
3	To perform operations in hydraulic machineries and test various materials.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Measure the flow in pipe section using orificemeter and venturimeter and discharge in channels using notches	Apply
Co2. Determine the major and minor losses in pipes	Apply
Co3. Determine the behavior of structural elements, such as bars, beams and springs subjected to tension, compression, shear, bending, and torsion by means of experiments	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	L	-	-	-	M	-	-	-	M	L	L	-
CO2	S	M	M	L	-	-	-	M	-	-	-	M	L	-	M
CO3	M	M	M	M	--	L	--	M	L	M	M	L	-	L	-

S- Strong; M-Medium; L-Low

Syllabus

List of Experiments

1. A comparative analysis of Coefficient of discharge using Orifice meter & venturimeter.
2. Determination of pipe loses(major & minor).
3. Determination of Tensile strength and Compression strength on a given specimen.
4. Determination of shear strength of Mild steel and Aluminium rods
5. Determination of Torsional strength of mild steel rod
6. Determination of Impact strength
7. Conduct of Hardness test on metals - Brinell and Rockwell Hardness.
8. Conduct of Deflection test on beams

Text Books

1. Fluid mechanics and strength of materials lab manual', Department of Civil engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem.

Reference Books

1. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics Including Hydraulic Machines" Standard Book House" New Delhi, 20thEdition 2015.
2. Bansal R.K, "Fluid Mechanics and Hydraulic Machines" Laxmi Publications, New Delhi, 2015.
3. Rajput. R.K, "A Text book of Fluid Mechanics and Hydraulic Machines", S.Chand and Company, New Delhi, 2011.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr.T.Subramani	Professor & Head	Civil / VMKVEC	tsm2007@rediffmail.com
2	Dr.R.Divahar	Asso. Professor	Civil / AVIT	divahar.civil@avit.ac.in

17ATCC83	AUTOMOTIVE ELECTRICAL AND ELECTRONICS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

Preamble

To familiarize and train the students on the constructional arrangements of different electrical system of automobiles and study the automobile electronics components.

Prerequisite

Automotive Electrical and Electronics Systems (17ATCC04)

Course Objectives

1. To perform in battery tests, charging system and starting system trouble shooting.
2. To demonstrate the application knowledge in the operation of alternator and lighting system.
3. To describe the temperature and optical sensor.

Course Outcomes

On the successful completion of the course, students will be able to

CO1.Experiment with the battery, charging system and starting system.	Apply
CO2. Develop thoroughly develop knowledge in application of operation of alternator and lighting system.	Apply
CO3. Make use of temperature and optical sensor	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	M	M	M	-	-	-	-	M	M	-	-
CO2	S	S	S	S	M	M	M	-	-	-	-	M	M	-	-
CO3	S	S	S	S	M	M	M	-	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Testing, charging and discharging of lead acid battery used in automobiles.
2. Testing and troubleshooting of starting system in automobiles.
3. Starter motor component test.
4. Testing and troubleshooting of charging system in automobiles.
5. Alternator component test.
6. Testing and troubleshooting of lighting system in automobiles.
7. Testing of lighting conventional analog instrumentation, indicator light, warning devices.
8. Study of Temperature measurement using thermocouple.
9. Study of optical sensor

Text Books

1. 'Automotive Electrical and Electronics Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17MECC94	MANUFACTURING ENGINEERING LAB	Category	L	T	P	Credit
		CC	0	0	4	2

Preamble

To impart knowledge and skill in the field of machine tools used in the industries. To increase the level of confidence of students by working individually in various machine tools.

Prerequisite – NIL

Course Objective

1	To study the working principle and understand the basic operations in the lathe machine and various machine tools
2	To apply the knowledge and practical training in drilling machine, shaping machine operations
3	To apply the knowledge and the practical training by using milling, planning and grinding machines

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Explain the basic operations in lathe and Special Machine	Understand
CO2.	Apply the various operations in Drilling and shaping machines.	Apply
CO3.	Apply the various operations in using milling, planning and grinding machines	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	S	-	-	-	L	-	-	-	M	-	-	-	-	-	-
CO2	S	M	-	-	L	-	-	-	M	-	-	-	S	-	-
CO3	S	M	-	-	L	-	-	-	M	-	-	-	S	-	-
CO4	S	M	-	-	L	-	-	-	M	-	-	-	S	-	-

S- Strong; M-Medium; L-Low

SYLLABUS:

LIST OF EXPERIMENTS:

1. Plain turning and step turning on lathe.
2. Taper turning on lathe.
3. Thread cutting on lathe.
4. Drilling, reaming and tapping in a drilling machine.
5. Plain milling.
6. Making square shape job in shaping machine.
7. Making Cutting key ways in a slotting machine.
8. To Perform Grinding process using a grinding machine

Text Book				
MANUFACTURING ENGINEERING LAB - MANUAL				
Course Designers				
S.No	**Faculty Name**	**Designation**	**Department/ College**	**Email id**
1	S. ARUNKUMAR	Assistant Professor	MECH /VMKVEC	arunkumar@vmkvec.edu.in
2	S.PRAKASH	Assistant Professor	MECH/AVIT	prakash@avit.ac.in

17ATCC84	AUTOMOTIVE FUELS AND LUBRICANTS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

Preamble

To impart knowledge on fuel and lubricant properties and its measurement techniques

Prerequisite

Automotive Fuels And Lubricants (17ATCC08)

Course Objectives

1	To impart the knowledge of fuel property testing.
2	To understand the Temperature dependence of viscosity of lubricants & Fuels.
3	To understand the properties of gaseous fuel.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Apply properties of fuels	Apply
CO2.	Experiment with flash point, fire point and viscosity of various fuels.	Apply
CO3.	Conduct the properties of gaseous fuel.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	M	M	M	M	-	-	M	M		-
CO2	S	S	M	M	M	M	M	M	M	-	-	M	M		-
CO3	S	S	M	M	M	M	M	M	M	-	-	M	M		-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Study of International and National standards for fuels and lubricants.
2. Study of Octane and Cetane Number of fuels.
3. ASTM distillation test of gasoline.
4. Aniline Point test.
5. Calorific value of liquid fuel.
6. Calorific value of gaseous fuel.
7. Flash and Fire points of petrol, diesel and lubricants.
8. Temperature dependence of viscosity of lubricants & Fuels by Redwood Viscometer.
9. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
10. Drop point of grease and mechanical penetration in grease.

Text Books

1. 'Automotive Fuels and Lubricants Lab', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC85	VEHICLE BODY MODELING LAB	Category	L	T	P	C
		CC	0	0	4	2

Preamble

To impart knowledge on types of vehicles drafting using CAD software

Prerequisite

Vehicle Body Engineering (17ATCC12)

Course Objectives

1	To understand the drafting of various types of car models
2	To understand the tanker and tractor body model.
3	To impart the knowledge of Aerodynamic car models.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Analyze car models	Analyze
CO2.	Design tanker & Tractor body model.	Create
CO3.	Develop Aerodynamic car models.	Create

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	M	M	-	M	M	M	M	M	M	M
CO2	S	S	M	M	M	M	M	-	M	M	M	M	M	M	M
CO3	S	S	M	M	M	M	M	-	M	M	M	M	M	M	M

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Drafting Three-box type car model.
2. Drafting Fastback type car model.
3. Drafting Multi Utility Vehicle type model.
4. Drafting Sports Car model.
5. Drafting Bus Body model.
6. Drafting Tanker Body model.
7. Drafting Tractor and Trailer Body model.
8. Study of Aerodynamic car models.
9. Study of Articulated Vehicle body model.
10. Study of Double Decker Bus body model.

Text Books

1. 'Vehicle Body Modeling Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4.	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC86	ENGINE TESTING AND EMISSION MEASUREMENT LAB	Category	L	T	P	C
		CC	0	0	4	2

Preamble

To impart knowledge on performance and emission characteristics on petrol and diesel engine

Prerequisite

Automotive Pollution control (17ATCC10)

Course Objectives

1	To understand SI engine testing procedure
2	To impart knowledge on the various types pollution measuring instruments and methods.
3	To impart knowledge on the various types of exhaust gas analyzer

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Test for performance in SI engine.	Analyze
CO2.	Examine emissions.	Analyze
CO3.	Analyze exhaust gas analyzer and smoke meter	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	M	M	M	-	M	M	M	M	M	-	-
CO2	S	S	M	M	M	M	M	-	M	M	M	M	M	-	-
CO3	S	S	M	M	M	M	M	-	M	M	M	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. Heat Balance Test on 4 - stroke Diesel Engine.
4. Morse Test on Multicylinder Petrol Engine.
5. Retardation Test to find Frictional Power of a Diesel Engine.
6. Study of NDIR gas Analyser and FID.
7. Study of Chemiluminescent NOx Analyser.
8. Demonstration of HC, CO, CO_2, O_2 using exhaust gas analyzer.
9. Demonstration of diesel engine smoke Measurement.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4.	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC87	ENGINE RECONDITIONING LAB	Category	L	T	P	C
		CC	0	0	4	2

Preamble

To impart knowledge on training in engine reconditioning

Prerequisite

Vehicle Maintenance (17ATCC14)

Course Objectives

1	To understand the reconditioning of engine
2	To understand the silencer and valve cleaning.
3	To impart the knowledge of Clutch, Flywheel and Wheel Drum Grinding.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Experiment with the reboring of engine..	Apply
CO2.	Solve the carbon particles of silencer cleaning	Apply
CO3.	Experiment with Flywheel and Wheel Drum Grinding.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO2	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO3	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Engine Re boring
2. Crank shaft grinding
3. Valve Seat grinding and Valve Lapping.
4. Silencer De carbonising
5. Fuel Nozzle reconditioning
6. Fuel Injection Pump Calibration.
7. Clutch plate grinding.
8. Flywheel grinding.
9. Wheel drum grinding

Text Books

1. 'Automotive Engine Reconditioning Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4.	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC88	TWO AND THREE WHEELER LAB	Category	L	T	P	C
		CC	0	0	4	2

Preamble

To impart knowledge on clutch, gear box and performance on two and three wheeler

Prerequisite

Two and Three Wheeler Technology (17ATCC15)

Course Objectives

1	To understand the performance shock absorber and coil spring
2	To understand the two wheeler chain tension
3	To study three wheeler chassis frame.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Experiment with shock absorber and coil spring.	Apply
CO2.	Identify tension in the two wheeler	Apply
CO3.	Construct Three wheeler chassis frame.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO2	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO3	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Performance test of a shock absorber.
2. Performance test on coil spring.
3. Two wheeler chain tension test.
4. Brake and Clutch adjustment as per specification.
5. Dismantling and assembling of two wheeler gear box and finding gear ratio.
6. Dismantling and assembling of three wheeler gear box and finding gear ratios.
7. Dismantling and assembling of three wheeler steering system.
8. Study of three wheeler chassis frame and power transmission system.

Text Books

1. **'**Two and Three Wheeler Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4.	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

17ATCC89	VEHICLE MAINTENANCE AND SERVICING LAB	Category	L	T	P	C
		CC	0	0	4	2

Preamble

To provide in house training in vehicle servicing and maintenance

Prerequisite

Vehicle Maintenance (17ATCC14)

Course Objectives

1	To understand the clutch and gear box servicing
2	To understand the Differential unit
3	To understand the Ackermann Steering geometry

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Experiment with Gear box..	Apply
CO2.	Identify Differential unit.	Apply
CO3.	Make use of steering geometry available in four wheeler.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO2	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-
CO3	S	S	S	S	-	-	-	M	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Clutch assembly and servicing
2. Gearbox assembly and servicing
3. Differential unit assembly and servicing
4. Transaxle assembly and servicing
5. Different types of rear axle assembly and servicing
6. Brake system trouble shooting
7. Wheel alignment testing
8. Ackermann Steering geometry verification
9. Electrical signal and circuits
10. Servicing of accessories such as wiper motor, A/C system

Text Books

1. **'**Vehicle Maintenance and Servicing Lab Manual', Department of Automobile Engineering, VMKV engineering College, Vinayaka Mission's Research Foundation (Deemed to be University),Salem

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4.	N. Shivakumar	Assistant. Professor GRII	Auto / AVIT	shivakumar@avit.ac.in

C. Elective Courses (EC)

Programme Specific (PS)

17ATEC01	ADVANCED PRODUCTION PROCESS FOR AUTOMOTIVE COMPONENTS	Category	L	T	P	C
		EC	3	0	0	3

Preamble

Automotive Components are manufactured in the current scenario by advanced production processes developed by engineers working in different manufacturing companies. A widespread knowledge of all .these manufacturing methods is mandatory for an automobile engineer

Prerequisite

Manufacturing Engineering

Course Objectives

1	To detail on the use of powder metallurgy for manufacturing automotive components.
2	To describe the different methods of metal forming process for manufacturing automotive components.
3	To detail on the various methods of manufacturing gears.
4	To elucidate CNC machining for automobile components.
5	To brief the recent trends of methods of manufacturing automotive components.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Apply powder metallurgy as a method of manufacturing automotive components	Apply
CO2.	Analyze and devise appropriate method of forming for manufacturing automotive components.	Apply
CO3.	Devise a perfect method of manufacturing gears for an automotive application.	Analyze
CO4.	Apply an appropriate CNC Machine for manufacturing automotive components.	Analyze
CO5.	Choose a recent trend of manufacturing automotive components.	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

POWDER MERALLURGY
Process flow chart – production of metal powers and their raw materials – Manufacture of friction lining materials for clutches and brakes – testing and inspection of PM parts.
FORGING PROCESS
Forging – process flow chart, forging of valves – connecting rod, crank shaft, cam shaft, propeller shaft, transmission gear blanks, foot brake linkage, steering knuckles. Extrusion: Basic process steps, extrusion of transmission shaft, steering worm blanks, brake anchor pins, rear axle drive shaft, axle housing spindles, piston pin and valve tappets. Hydro forming: Process, hydro forming of manifold and comparison with conventional methods – Hydro forming of tail lamp housing stretch forming – process, stretch forming of auto body panels – super plastic alloys for auto body panels.
GEAR MANUFACTURING
Different methods of gear manufacture – Gear hobbing and gear shaping machines specifications – gear generation – different methods – gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching.
CONCEPT AND PROGRAMMING OF CNC MACHINES
NC, CNC & DNC – types of CNC -constructional features – drives and control systems – feedback devices – manual part programming – steps involved – sample program in lathe & milling.
RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS
Power injection moulding – Shot-peen hardening of gears – production of aluminum MMC liners for engine blocks – Plasma spray coated engine blacks and valves – Recent developments in auto body panel forming – Squeeze casting of pistons – aluminum composite brake rotors.

TEXT BOOK:

1. Heldt, P.M., High Speed Combustion Engines, Oxford Publishing Co., New York, 1990
2. Groover. M.P. Automatic production systems and computer integrated manufacturing prentice – hall, 1990.

REFERENCES:

1. Haslehurst, S.E., Manufacturing Technology, ELBS, London, 1990
2. Rusinoff, Forging and Forming of metals, D.B. Taraporevala Sons & Co., Pvt. Ltd., Mumbai, 1995.
3. Subroff, A.M. & Other, Forging Materials & Processes, Reinhold Book Corporation, New York, 1998.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC02	NEW GENERATION AND HYBRID VEHICLES	Category	L	T	P	C
		EC	3	0	0	3

Preamble

To teach the students about the new generation and hybrid vehicles

Prerequisite

Nil

Course Objectives

1	To elucidate different modes of hybrid vehicles in current scenario.
2	To describe the different modes of power system for new generation vehicles .
3	To understand the operation and control of modern vehicle.
4	To detail the roads, highways and automated tracks for next generation automotive.
5	To explain the advanced technology in braking systems, suspension, aerodynamics and safety.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Discuss the various methods of developing hybrid vehicle technology available in the present scenario.	Understand
CO2.	Apply an appropriate power system for a new generation vehicle	Apply
CO3.	Apply a right choice of source of power for a modern vehicle	Apply
CO4.	Appraise about the roads, highways and automated tracks for next generation automotive.	Analyze
CO5.	Analyze and apply the exact method braking, suspension and safety .	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	M	M	M	M	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	S	S	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	S	S	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION TO HYBRID ELECTRIC VEHICLES
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.
HYBRID ELECTRIC DRIVE-TRAINS
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis
ELECTRIC PROPULSION UNIT
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives
ENERGY STORAGE
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices
SIZING THE DRIVE SYSTEM
Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power, selecting the energy storage technology,

TEXT BOOK:

1. Bosch Hand Book, SAE Publication, 2010
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

REFERENCES:

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

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC03	MODERN AUTOMOBILE ACCESSORIES	Category	L	T	P	C
		EC	3	0	0	3

Preamble

Automobile vehicles are being provided with lot of accessories as part of controlled operation and passenger safety and comfort. In that sense, it is mandatory to have an understanding of the different technological options available and its application.

Prerequisite

Nil

Course Objectives

1	To describe electronic engine management systems.
2	To explain the new methods of suspension systems applicable for modern day vehicles.
3	To detail the different options of vehicle air-conditioning.
4	To impart the various systems for accessories of an automobile in the present scenario.
5	To detail on the systems for passenger safety of an automotive

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Elucidate electronic engine management system for an automotive.	Understand
CO2.	Appropriately choose a suspension based on the requirement of a modern day vehicle.	Apply
CO3.	Appraise a suitable air-conditioning system for an automotive	Apply
CO4.	Appropriately choose a perfect accessory for an automotive vehicle's requirement.	Apply
CO5.	Recommend a safety device for an automotive vehicle.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

ENGINE MANAGEMENT
Electronically controlled SI and CI engine fuel injection systems, related hardware and software. Closed loop ignition system. Catalytic converters and particulate traps.
CHASSIS
Active suspension control, Pneumatic suspensions
HEATING AND AIR CONDITIONING
Principles of vehicle air conditioning and heating.
COMFORT AND CONVENIENCE
Adaptive cruise control, car entertainment, power windows, navigation system, adaptive noise control, electric seats, driver information system. Power windows, power steering.
SAFETY AND SECURITY SYSTEMS
Airbags, seat belt tightening system, collapsible and tilt able steering column, Anti-theft system, anti-lock braking system, electronic stability control system/traction control system, roll over protection system

TEXT BOOK:

1. Bosch Hand Book, SAE Publication, 2010

REFERENCES:

1. Tom Denton - "Automobile Electrical and Electronic Systems" - Edward Arnold, London - 1995.
2. Eric Chowanietz - „Automotive Electronics" - SAE International USA - 1995.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC04	SPECIAL TYPES OF VEHICLES	Category	L	T	P	C
		EC	3	0	0	3

Preamble

This course reviews the fundamental concepts of earth moving equipments, power train concepts, sub systems of special types of vehicles, farm equipment, military and combat vehicles and special purpose vehicles for industrial applications.

Prerequisite

Nil

Course Objectives

1	To detail the working of earth moving and constructional equipments
2	To describe power train concepts
3	To explain the sub systems of special types of vehicles
4	To describe the working of farm equipments, military and combat vehicles
5	To explain the working of special purpose vehicles for industrial applications

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Describe the construction and working of earth moving and constructional equipments	Understand
CO2.	Appraise on the power trains applicable for for earth moving and constructional equipments.	Apply
CO3.	Appraise on the function of all the sub-systems for earth moving and constructional equipments.	Apply
CO4.	Appraise on the various farm equipments and military vehicles.	Apply
CO5.	Appraise on the various specially designed vehicles for industrial applications.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES
Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multivalve vehicles.
EARTH MOVING MACHINES
Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types- bulldozers, excavators, backhoe loaders, scrappers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earthmoving machines.
SCRAPPERS, GRADERS, SHOVELS AND DITCHERS
Scrappers, elevating graders, motor graders, self powered scrappers and graders, Power shovel, revolving and stripper shovels – drag lines – ditchers – capacity of shovels.
FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES
Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.
VEHICLE SYSTEMS, FEATURES
Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics. Hydro-pneumatic suspension cylinders. Power steering system. Kinematics for loader and bulldozer operational linkages. Safety features, safe warning system for dumper. Design aspects on dumper body, loader bucket and water tank of sprinkler.

TEXT BOOK:

1. Off the road wheeled and combined traction devices – Ash gate Publishing Co.Lt.
2. Satyanarayana. B., Construction planning and equipment, standard publishers and distributors, New Delhi.

REFERENCES:

1. Abrosimov.K. Branberg.A and Katayer.K, Road making machinery, MIR Publishers, Moscow, 1971.
2. Bart H Vanderveen, Tanks and Transport vehicles, Frederic Warne and Co Ltd.,London.
3. Nakra C.P., “Farm machines and equipments” Dhanparai Publishing company Pvt. Ltd.
4. Robert L Peurifoy, “Construction, planning, equipment and methods” Tata McGraw Hill Publishing company Ltd.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC05	POLYMER COMPONENTS AND RUBBER MATERIALS IN AUTOMOBILE APPLICATIONS	Category	L	T	P	C
		EC	3	0	0	3

Preamble

Non-metals are used for various automotive components apart from metals. Polymers and rubber materials are sometimes applicable for specific components.

Prerequisite

Nil

Course Objectives

1	To detail on the plastics as a material for automotive components
2	To describe the properties of rubber and its suitablility for automotive components.
3	To explain about rubber spring and its usage in vibration control.
4	To describe about the function of fluid coupling and sealings.
5	To describe the methods of manufacture of rubber sealings.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize plastics and rubber materials for use in automotive components.	Understand
CO2.	Apply rubber as a material for automotive applications.	Apply
CO3.	Apply suitable springs for vibration dampening in automtives.	Apply
CO4.	Appraise on the use of fluid couplings and sealings for different automtive applications	Apply
CO5.	Appraise on compounding and manufacture of rubber sealings.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Identification of plastics / rubber components in automobiles - function - selection criteria.
STRUCTURE-PROPERTY RELATIONSHIP OF RUBBER
Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types- bulldozers, excavators, backhoe loaders, scrappers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earthmoving machines.
VIBRATION AND RUBBER SPRING
Principle of vibration isolation - Rubber mounts - spring design - comparison with metallic springs - shape factor and its effect - forced and free vibrations with damping - typical mounts, compounding.
FLUID SEALINGS AND FLEXIBLE COUPLING AND HOSES
Seals for static and dynamic applications - effect of heat/ oil ageing - frictional behavior - fundamental of seal ability.
COMPOUNDING AND MANUFACTURE
Types of couplings - specification and selection- torque Vs deflection relationships - brake fluid /hydraulic hoses, materials and manufacture.

TEXT BOOK:
1. Freakley.P.K., and Payne A.R., Theory and Practice of Engineering with Rubber., Applied Science Publishers Ltd.
REFERENCES:
1. Hobel,E.F., Rubber Springs Design 2. Blow,C.M. and Hepburn.C, Rubber Technology and Manufacture

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC06	AUTOMOTIVE SAFETY	Category	L	T	P	C
		EC	3	0	0	3

Preamble

Safety in automotive vehicles is most significant factor and has various sub-systems.

Prerequisite

Nil

Course Objectives

1	To describe on the parameters for designing a vehicle for safety.
2	To detail on the various concepts for designing devices for safety.
3	To detail on the design of components and systems for providing safety to the vehicle and passengers.
4	To describe on collision awareness and avoidance.
5	To detail on the systems for comfort and convenience system standards

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Explain the parameters for safety of a vehicle.	Understand
CO2.	Describe on the concepts of designing safety devices for vehicles.	Understand
CO3.	Recommend applicable components for passenger and vehicle safety.	Apply
CO4.	Recommend methods for avoidance of collision and devices for passenger safety.	Apply
CO5.	Recommend on systems for passenger safety and comfort as per standards.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone
SAFETY CONCEPTS
Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, deformation behavior of vehicle body, speed and acceleration characteristics of passenger compartment on impact
SAFETY EQUIPMENTS
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety
COLLISION WARNING AND AVOIDANCE
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions
COMFORT AND CONVENIENCE SYSTEM
Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TEXT BOOK:

1. Bosch, "Automotive Handbook", 8th Edition, SAE publication, 2011.
2. Powloski. J., "Vehicle Body Engineering", Business books limited, London, 1969.

REFERENCES:

1. Ronald.K.Jurgen, "Automotive Electronics Handbook", Second Edition, McGraw-Hill Inc.,

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC07	AUTOMOTIVE INSTRUMENTATION	Category	L	T	P	C
		EC	3	0	0	3

Preamble

This course reviews the fundamental concepts of measurements of linear and angular dimensions, screw thread and gear dimensions, pressure, flow, temperature, load and torque.

Prerequisite

Nil

Course Objectives

1	To describe on the linear and angular measurements
2	To describe about the measurement of screw thread and gear.
3	To explain pressure & flow measurement.
4	To explain temperature measurement.
5	To explain load and torque measurement.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize linear and angular measurements	Understand
CO2.	Classify measurement of screw thread and gear.	Understand
CO3.	Apply measurement methods for flow and pressure.	Apply
CO4.	Apply appropriate methods for temperature measurement.	Apply
CO5.	Apply suitable methods load and torque measurement.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	M	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	M	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

LINEAR AND ANGULAR MEASUREMENTS
Errors in measurement &calibration - Length standards - Length measuring instruments -Vernier, micrometers, dial gauges, comparators, Limits, fits, tolerances. Gauges and their types - Angular measuring instruments -bevel protractor, spirit level, sine bar - measurement of straightness and flatness
MEASUREMENT OF SCREW THREAD AND GEAR
Various elements of thread - Two wire & three wire method – Thread gauge - Various elements of gears – Various gear tooth measurement methods, composite error measurement.
PRESSURE & FLOW MEASUREMENT
Diaphragm-Various elastic elements- Transduction methods-Potentiometric strain gauge, variable reluctance and capacitive device, LVDT type transducer, piezo electric transducers and its application to high speed engine. Farnboro Engine indicator. Low pressure measurement –McLeod gauge, pirani guage.
TEMPERATURE MEASUREMENT
Temperature scales- Mechanical temperature sensors - liquid in glass, vapour pressure bimetal-resistance type temperature sensors and their measuring circuits – Thermistors, Thermocouples, laws, types- Construction, circuits - Radiation methods- Optical pyrometer.
LOAD AND TORQUE MEASUREMENT
Force measuring devices, balances, platform scale, weigh bridges, load cells. Torque measurement, prony brake, rope brake. Dynamometers. Electric cradle dynamometer, Eddy current dynamometer. Hydraulic dynamometer – Transmission and chassis dynamometer.

TEXT BOOK:

1. Jain.R.K. " Engineering Metrology", Khanna Publishers, New Delhi, 2002.
2. Rangan.C.S., SarmaG.E .and Mani V.S.V., "Instrumentation Devices and Systems", Tata McGraw Hill Publishing Co.,New Delhi 1990.

REFERENCES:

1. Patranabisj.D., "Principles of Industrial Instrumentation". Tata McGraw Hill Publishing Co..New Delhi, 1996.
2. Beckwith.tG. &Buck.N L., "Mechanical Measurements". Oxford and IBH Publishing House. New Delhi, 1990.
3. Jain.R.K.," Mechanical & industrial Measurements". Khanna Publishers, New Delhi. 2003

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC08	TRACTOR AND FARM EQUIPMENTS	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

Tractors are equipments with automotive engines functioning with different design off the road for agricultural purpose. Most of the components are designed and developed based on a separate set of parameters.

Prerequisite

Nil

Course Objectives

1	To detail on the fundamental operation of tractors and its engine.
2	To describe about the various components of engine for a tractor and farm equipment.
3	To describe the design of engine framework and valve mechanism for tractors .
4	To describe engine cooling, lubrication and fuel supply system
5	To detail about various farm equipments

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize safety rules of tractors and their components.	Understand
CO2.	Classify operation of engine cycles and performance of tractors.	Understand
CO3.	Appraise on the engine framework design for tractors.	Apply
CO4.	Appraise on the cooling ,lubrication and fuel supply systems for a tractor.	Apply
CO5.	Appraise on the different farm equipments.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

GENERAL DESIGN OF TRACTORS
Classification of tractors –Main components of tractor – safety rules, Control of the Tractor and Fundamentals of Engine Operation
CONTROL DESIGN OF THE TRACTOR AND FUNDAMENTALS
Tractor controls and the starting of the tractor engines – basic notions and definition – Engine cycles – operation of multi cylinder engines - General engine design – Basic engine performance characteristics.
ENGINE FRAME WORK AND VALVE MECHANISM OF TRACTORS
Cylinder and pistons –Connecting rods and crankshafts – Engine balancing – Construction and operations of the valve mechanism – Valve mechanism troubles
COOLING SYSTEM, LUBRICATION SYSTEM AND FUEL SYSTEMS OF TRACTOR
Cooling system – Classification – Liquid cooling systems – Components, Lubricating system servicing and troubles – Air cleaner and turbo charger – Fuel tanks and filters – Fuel pumps
FARM EQUIPMENTS
Working attachment of tractors –Farm equipments – Classification – Auxiliary equipment – Trailers and body tipping mechanism.

TEXT BOOK:
1. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987
REFERENCES:
1. Kolchin A., an dV.Demidov, Design of Automotive Engines for Tractor.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC09	COMBUSTION ENGINEERING	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

This course reviews the fundamental concepts of combustion chemical reaction of various fuels, stages of combustion, flammability and ignition in IC engines.

Prerequisite

Nil

Course Objectives

1	To describe the combustion mechanism of various fuels
2	To detail on the mathematical/thermodynamic relations involved in combustion
3	To explain on kinetics of combustion
4	To describe various combustion stages in IC engines
5	To explain the method of flammability and ignition in IC engines

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize on the mechanism of combustion of various fuels	Understand
CO2.	Appraise on the different mathematical relations of combustion reactions.	Apply
CO3.	Appraise on the kinetics of combustion.	Apply
CO4.	Appraise on the stages of combustion in internal combustion engines.	Apply
CO5.	Categorize flammability and ignition in IC engines	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	-	--
CO2	S	M	M	M	--	--	-	-	-	--	--	-	S	-	--
CO3	S	S	S	M	--	--	-	-	-	--	--	-	S	-	--
CO4	S	S	S	M	--	--	-	-	-	--	--	-	S	-	--
CO5	S	S	S	M	--	--	-	-	-	--	--	-	S	-	--

S- Strong; M-Medium; L-Low

Syllabus

COMBUSTION OF FUELS
Combustion equations, Theoretical air, excess air, air-fuel ratio, equivalence ratio, exhaust gas composition, Air-fuel ratio from exhaust gas composition, heating value of fuels.
THERMODYNAMICS OF COMBUSTION
Thermo-chemistry, First law analysis of reacting systems, Adiabatic combustion temperature, Second law analysis of reacting systems, criterion for chemical equilibrium, Equilibrium constant for gaseous mixtures, Evaluation of equilibrium composition, chemical availability.
KINETICS OF COMBUSTION
Rates of reaction, Reaction or demand molecularity complex reactions, chain reactions, Arrhenius rate equation, Collection theory, activated complex theory, Explosive and general oxidative characteristics of fueled.
ENGINE COMBUSTION
Combustion in SI and CI engines, stages of combustion in SI and CI engines, Normal combustion and Abnormal combustion, Emissions from premixed combustion, Emission from Non-premixed combustion.
FLAMES
Laminar and Turbulent flames, Premixed and Diffusion flames, burning velocity and its determination, Factors affecting burning velocity, Quenching, Flammability and Ignition.

TEXT BOOK:

1. Heywood. J. B, Internal Combustion Engine Fundamentals, McGraw Hill Book Co., 2002.
2. Ganesan. V., Internal Combustion Engines, 5th edition, Tata McGraw Hill Co, 2013.

REFERENCES:

1. Stephen R. Turns, An Introduction to Combustion, McGraw Hill Book Company, 1996.
2. Irwin Glassman, Combustion, Third Edition, Academic Press, 1996.
3. Sharma. S. P and Chandramohan, Fuels and Combustion, Tata McGraw Hill Book Co., 1984.
4. Samir Sarkar, Fuels and Combustion, Orient Longman, 1984.
5. Kuo. K. K, Principles of Combustion, John Wiley & Sons, 1984.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC10	ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

Petroleum based fuels are the energy sources for almost all automotive vehicles. With fossil fuels expecting to get depleted, new and alternate sources of energy for automotive vehicles are on the search since decades. Many known forms of energy are being explored for use in automotive.

Prerequisite

Nil

Course Objectives

1	To brief the various available options as alternate energy sources for automotive vehicles.
	To detail on the use of alcohol based chemicals as an alternate source of energy for automotive vehicles.
3	To describe on the possibilities of using LPG, CNG, Hydrogen and Biogas as a form of alternate source of energy for automotive vehicles.
4	To explain on the methods of using vegetable oils as alternate fuel for automotive engines.
5	To describe on the modes of systems developed for using electrical energy and solar energy as an alternate energy source for automotive vehicles.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize on the various alternate energy sources for an automotive vehicle	Understand
CO2.	Recommend a suitable alcohol based chemical fuel as an alternate energy source for an automotive engine.	Understand
CO3.	Appraise on the utility of gases as a possible source of energy for automotive engines.	Apply
CO4.	Appraise on the exact method of generating alternate fuel from vegetable oils.	Apply
CO5.	Appraise on the different systems for developing an electric and a solar vehicle.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	M	M	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	M	M	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	M	M	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Estimation of petroleum reserve - Need for alternate fuel - Availability and properties of alternate fuels– general use of alcohols - LPG - Hydrogen - Ammonia, CNG, and LNG - Vegetable oils and Biogas - Merits and demerits of various alternate fuels.
ALCOHOLS
Properties as engine fuel, alcohols and gasoline blends, performance in SI engine. Methanol and gasoline blends Combustion characteristics in engines - emission characteristics.
CNG, LPG, HYDROGEN AND BIOGAS
Availability of CNG, properties, modification required to use in engines - performance and emission characteristics of CNG using LPG in SI & CI engines. Performance and emission for LPG - Hydrogen – Storage and handling, performance and safety aspects.
VEGETABLE OILS
Various vegetable oils for engines - Esterification - Performance in engines - Performance and emission Characteristics
ELECTRIC AND SOLAR POWERED VEHICLES
Layout of an electric vehicle - Advantage and limitations - Specifications - System component. Electronic control system - High energy and power density batteries - Hybrid vehicle - Solar

TEXT BOOK:

1. K. K. Ramalingm, internal Combustion Engines, Scitech publications, Chennai, 2003.
2. MaheswarDayal, " Energy today & tomorrow ", I & B Horishr India, 1982

REFERENCES:

1. " Alcohols and motor fuels progess in technology ", Series No.19, SAE Publication USA 1980.
2. SAE Paper Nos. 840367, 841156, 841333, 841334.
3. " The properties and performance of modern alternate fuels " - SAE Paper No.841210.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC16	VEHICLE DYNAMICS	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

Automotive Vehicles are to be designed with utmost care providing all sub-systems for effective operation on roads balancing all the forces that occurs during its motion. Vehicle Dynamics, as it is termed is a significant factor for any automotive.

Prerequisite

Nil

Course Objectives

1	To provide an understanding of vibrations, degrees of freedom, and methods of controlling them in an automotive during its usage on roads.
2	To elucidate the various methods of mathematical models of automotive under vibration .
3	To explain the different numerical methods of closed couple systems.
4	To describe about vehicle stability and handling.
5	To explain about the forces acting under automotive suspension and function of tires.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize on the different aspects of vehicle dynamics.	Understand
CO2.	Develop mathematical models of vibration in automotive vehicles,	Apply
CO3.	Solve numerical methods of closed couple systems.	Apply
CO4.	Devise methods of stability of vehicles when in motion.	Analyze
CO5.	Recommend an appropriate suspension and tires.	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	-	-	-	--	--	-	M	--	--
CO2	S	M	M	M	--	--	-	-	-	--	--	-	M	--	--
CO3	S	S	S	M	--	--	-	-	-	--	--	-	M	--	--
CO4	S	S	S	M	--	--	-	-	-	--	--	-	M	--	--
CO5	S	S	S	M	--	--	-		-	--	--	-	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Fundamentals of vibration, single degree of freedom, two degree of freedom, multidegree freedom, free, forced and damped vibrations, modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber
MULTI DEGREE FREEDOM SYSTEMS
Closed and far coupled system, Eigen value problems, orthogonality of mode shapes, modal analysis, forced vibration by matrix inversion
NUMERICAL METHODS
Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched systems
VEHICLE HANDLING AND STABILITY OF VEHICLES
Load distribution, calculation of acceleration, tractive effort and reactions for different drives, stability of a vehicle on a curved track, slope and a banked road. Oversteer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.
SUSPENSION, TYRES
Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of damper characteristics and suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft direction, roll axis and vehicle under the action of side forces. Tyre – Requirements, types, testing, dynamics, ride characteristics, power consumed by a tyre.

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

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC12	FUEL CELL TECHNOLOGY	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

New energy sources being worked out for automotive engines to replace conventional methods of using liquid fuels. Fuel cells are one of the promising sources in the development of electric vehicles in the present scenario.

Prerequisite

Nil

Course Objectives

1	To impart knowledge of various Fuel cell Technology as an option for automotive energy source.
2	To describe the vehicle structure for a fuel cell based energy source.
3	To detail on the various hybrid electric technology.
4	To explain hybrid electric vehicles.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize on the various modes of fuel cell technology for automotive.	Understand
CO2.	Recommend a suitable structure for a fuel cell vehicle.	Apply
CO3.	Appraise on technology for developing hybrid powered vehicles.	Apply
CO4.	Appraise on the electric vehicle technology and its development.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	M	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	M	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	M	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

FUELCELL TECHNOLOGY
Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell) -Characteristics. Electrochemical energy conversion – Theoretical efficiency – Factors affecting electrochemical energy conversion-Helmholtz double layer model
FUEL CELL BASED VEHICLES STRUCTURE
PEMFC: Operating principle (membranes, electrodes and electrolysis, optimization of membrane and electrode assembly, impurities) – Technology development (single cell and stacks, composite plates) – Fuel processing – Modeling studies (membrane, electrode, membrane-electrode assembly, fuel cell, stack and system) – Technology development and applications. DMFC: Operating principle – Noble metal issue – Electro-oxidation of methanol (Catalysts, oxygen electroreduction, electrolyte, non catalytic aspects) - Methanol crossover.
HYBRID ELECTRIC TECHNOLOGY AND ELECTRIC DRIVETRAIN
Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental impartance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.
HYBRID ELECTRIC VEHICLES
Principles of Hybrid Electric Drivetrains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - (Charge Sustaining, Charge Depleting), Practical Models – Toyota Prius, Honda Insight. Hybridization Effects. 42 V System for Traction Applications - Lightly Hybridized vehicles, Low –Voltage Storage System, Low – Voltage main system with High voltage bus for propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavy duty vehicles.
HYBRID VEHICLE TECHNOLOGY
Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems. Energy Management Strategies in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOK:

1. Basu .S, “Recent Trends in Fuel cell Science and Technology”, Anamaya Publishers, New Delhi.,2007
2. Viswanathan, B. and Aulice Scibioh, M., “Fuel Cells Principles and Applications”, Universities Press (India) Pvt. Ltd., Hyderabad, 2006
3. Hoogers, G., Edr. “Fuel Cell Technology Handbook”, CRC Press, Washington D. C,2003

REFERENCES:

1. Larminie, J. and Dicks, A., “Fuel Cell Systems Explained” John Wiley & Sons, Ltd., New York,2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, “Vehicular Electric Power Systems”, Marcel Dekker,Inc., 2004

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC13	COMPUTER SIMULATION OF IC ENGINE PROCESSES	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

This course includes the study of adiabatic flame temperature, analysis of actual and ideal cycles and simulation of S.I, and C.I engine performance

Prerequisite

Nil

Course Objectives

1	To describe the methods of measurement of HRR and calculation of adiabatic flame temperature of IC engines.
2	To explain the methods of simulation of IC Engines.
3	To learn the simulation of IC engines with gas exchange processes and engine performance simulation
4	To know the Simulation of S.I engine with intake and exhaust charging
5	To study the simulation of C.I engine performance

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize the measurement of HRR and calculation of Adiabatic flame temperature	Understand
CO2.	Apply the I.C engine simulation with Adiabatic combustion	Apply
CO3.	Apply the simulation of IC engines with gas exchange processes and engine performance simulation	Apply
CO4.	Examine Simulation of S.I engine with intake and exhaust charging	Analyze
CO5.	Analyze Simulation of C.I engine performance	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	M	--	--	--	M	M	--	--
CO2	S	M	M	M	--	--	M	M	M	--	--	M	M	--	--
CO3	S	S	S	M	--	--	M	M	M	--	--	M	M	--	--
CO4	S	S	S	M	--	--	M	M	M	--	--	M	M	--	--
CO5	S	S	S	M	--	--	M	M	M	--	--	M	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Introduction – Heat of reaction – Measurement of URP – Measurement of HRR – Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature – Isentropic changes
ENGINE SIMULATION WITH AIR AS WORKING MEDIUM
Deviation between actual and ideal cycle – problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation – efficiency calculation, part – throttle operation, super charged operation.
PROGRESSIVE COMBUSTION
SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.
SIMULATION OF SI ENGINE
Intake – Exhaust - Charging and Combustion Simulation for two stroke and four stroke spark ignition Engine
DIESEL ENGINE SIMULATION
Zero, one and multi zone model for combustion, different heat release and heat transfer models, equilibrium calculations, simulation of engine performance.

TEXT BOOK:

1. Ganesan. V - "InternalCombustion Engines" - Tata McGraw-Hill, 2013.
2. Ganesan.V. – Computer Simulation of compression ignition engines – Orcent

REFERENCES:

1. Ramoss A.L. Modeling of Internal Combustion Engines process, McGraw Hill Publishing Co., 1992
2. Ashley Cambel, Thermodynamics analysis of combustion engines, John Wiley & Son, New York, 1986.
3. Benson, R.S., Whitehouse, N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakar@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

gma

17ATEC14	COMPUTER CONTROLLED VEHICLE SYSTEMS	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

This course introduces the role of sensors and actuators for controlling the engine, drive line. It also provide knowledge about the transportation and safety devices controlled by computer

Prerequisite

Nil

Course Objectives

1	To explain the concepts of speed control, suspension for autonomous vehicles .
2	To detail on the advanced methods of control of management systems towards adaptive cruise control automotive vehicles.
3	To describe about intelligent transportation system.
4	To detail on the smart safety devices for automotive vehicles.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Apply the concepts of control systems of vehicles towards autonomous driving.	Apply
CO2.	Apply the different components for developing an adaptive cruise control.	Apply
CO3.	Appraise on the intelligent transportation system.	Apply
CO4.	Recommend smart safety devices for automotive vehicles	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	-	--	--	-	S	--	--
CO2	S	M	M	M	M	--	-	-	-	--	--	-	S	--	--
CO3	S	S	S	M	M	--	-	-	-	--	--	-	S	--	--
CO4	S	S	S	M	M	--	-	-	-	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Understanding autonomy – Review of the role of control in autonomy (speed control, suspension control & integrated vehicle dynamics) - Role of sensors and actuators. Examples of autonomy cruise control
ENGINE CONTROL SYSTEM
Fuel control-Ignition control in SI engines- Lambda control- idle speed control- Knock control- cylinder balancing
DRIVE LINE CONTROL SYSTEM
Speed control – gear shifting control – traction /braking- steering- suspension – vehicle handling and ride characteristics of road vehicles- adaptive cruise control
INTELLIGENT TRANSPORTATION SYSTEM
Overview – control architecture – collision avoidance, pitch, yaw, bounce control – traffic routing system- automated high way systems- lane warning system- driver information system- data
SAFETY IMPACTING DEVICES
Vision enhancement- driver conditioning warming- anti-lock braking systems – route guidance and navigation systems – in-vehicle computing – commercial vehicle diagnostic/ prognostics – hybrid/ electric and future cars- case study.

TEXT BOOK:

1. Automotive control systems, U.Kienckeand L. Nielson, SAE and springer-Verlag, 2000

REFERENCES:

1. Crouse, W.H. & Anglin, D.L., Automotive Mechanics, Intl. Student edition, TMH, New Delhi.
2. Artamonov, M.D., Harionov, V.A. & Morin, M.M. Motor Vehicle, Mir Publishers, Moscow 1978.,
3. Heitner, J., Automotive Mechanics, CBS Publishers, New Delhi 1987.
4. Stockel Martin W and Stocker Martin T., Auto Mechanics Fundamentals, Goodheart Wilcox,

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC15	VEHICLE TRANSPORT MANAGEMENT	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

This course reviews the methods of training and training procedure in the transport management, scheduling and fare structure of various public and private and state government undertaking vehicles , maintenance and motor vehicle act

Prerequisite

Nil

Course Objectives

1	To provide an insight on the different procedures of selecting persons for job and personnel management
2	To inculcate the various aspects of incorporating and managing a transportation system.
3	To elucidate on the calculation of costs of transportation, fare fixation and scheduling.
4	To provide the rules and regulations of transport system as per motor vehicle act of India.
5	To inculcate the aspects of maintenance of automotive vehicles.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Appraise on the various aspects of personnel management of a transport system.	Understand
CO2.	Devise a transport system for a typical town with proper systems for effective operations.	Apply
CO3.	Construct a fair table and prepare a schedule for a typical transportation system,	Apply
CO4.	Appraise on the various rules and regulations of transport system as per motor vehicle act of India.	Apply
CO5.	Develop a perfectly applicable maintenance schedule for an automotive.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO2	S	M	M	M	--	--	--	-	--	--	--	-	S	--	--
CO3	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO4	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--
CO5	S	S	S	M	--	--	--	-	--	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.
TRANSPORT SYSTEMS
Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. Chain of responsibility forms of ownership by state, municipality, public body and private undertakings
SCHEDULING AND FARE STRUCTURE
Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling
MOTOR VEHICLE ACT
Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, Power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.
MAINTENANCE
Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

TEXT BOOK:
1. John Duke, "Fleet Management", McGraw-Hill Co, USA, 1984.
REFERENCES:
1. Government Motor Vehicle Act, Publication on latest act to be used as on date

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC16	VEHICLE DYNAMICS	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

Automotive Vehicles are to be designed with utmost care providing all sub-systems for effective operation on roads balancing all the forces that occurs during its motion. Vehicle Dynamics, as it is termed is a significant factor for any automotive.

Prerequisite

Nil

Course Objectives

1	To provide an understanding of vibrations, degrees of freedom, and methods of controlling them in an automotive during its usage on roads.
2	To elucidate the various methods of mathematical models of automotive under vibration .
3	To explain the different numerical methods of closed couple systems.
4	To describe about vehicle stability and handling.
5	To explain about the forces acting under automotive suspension and function of tires.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize on the different aspects of vehicle dynamics.	Understand
CO2.	Develop mathematical models of vibration in automotive vehicles,	Apply
CO3.	Solve numerical methods of closed couple systems.	Apply
CO4.	Devise methods of stability of vehicles when in motion.	Analyze
CO5.	Recommend an appropriate suspension and tires.	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	-	-	-	--	--	-	M	--	--
CO2	S	M	M	M	--	--	-	-	-	--	--	-	M	--	--
CO3	S	S	S	M	--	--	-	-	-	--	--	-	M	--	--
CO4	S	S	S	M	--	--	-	-	-	--	--	-	M	--	--
CO5	S	S	S	M	--	--	-		-	--	--	-	M	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Fundamentals of vibration, single degree of freedom, two degree of freedom, multidegree freedom, free, forced and damped vibrations, modeling and simulation studies, model of an automobile, magnification factor, transmissibility, vibration absorber
MULTI DEGREE FREEDOM SYSTEMS
Closed and far coupled system, Eigen value problems, orthogonality of mode shapes, modal analysis, forced vibration by matrix inversion
NUMERICAL METHODS
Approximate methods for determining fundamental frequency, Dunkerleys lower bound, Rayleighs upper bound, Holzer method for closed coupled system and branched systems
VEHICLE HANDLING AND STABILITY OF VEHICLES
Load distribution, calculation of acceleration, tractive effort and reactions for different drives, stability of a vehicle on a curved track, slope and a banked road. Oversteer, under steer, steady state cornering, effect of braking, driving torques on steering, effect of camber, transient effects in cornering.
SUSPENSION, TYRES
Requirements, sprung mass frequency, wheel hop, wheel wobble, wheel shimmy, choice of damper characteristics and suspension spring rate, calculation of effective spring rate, vehicle suspension in fore and aft direction, roll axis and vehicle under the action of side forces. Tyre – Requirements, types, testing, dynamics, ride characteristics, power consumed by a tyre.

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

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC17	VEHICLE AIR- CONDITIONING	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

Air conditioning of automotive vehicles are an integrated part in the current scenario. Air-conditioning is also a mandatory sub-system for an automotive to provide passenger comfort.

Prerequisite

Nil

Course Objectives

1	To inculcate the principles of air conditioning systems for an automotive.
2	To detail on the air-conditioning systems of various branded vehicles.
3	To describe the significance of refrigerant for an automotive vehicle.
5	To describe troubleshooting of air-conditioner.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarizeon the principle and working of air-conditioning systems for an automotive	Understand
CO2.	Appraise on the different methods of air-conditioning systems of various popular brand of automotives.	Apply
CO3.	Recommend an appropriate system of air-conditiong for an automotive.	Apply
CO4.	Troubleshoot an air-conditioning system of an automotive.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	--	--	-	-	-	--	--	-	S	--	--
CO2	S	M	M	M	--	--	-	-	-	--	--	-	S	--	--
CO3	S	S	S	M	-	--	-	-	-	--	--	-	S	--	--
CO4	S	S	S	M	M	--	-	-	-	--	--	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

AUTOMOTIVE 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 and Orifice tube – expansion valve calibration – evaporator temperature controls for air conditioning systems
AIRCONDITIONER – HEATING SYSTEM
Manually controlled air conditioner- Heater system- ford automatically controlled air conditioner- Heater systems- Chrysler automatically controlled air conditioner- heater system, general motors automatically controlled Air conditioner- heater system- Flushing and evacuating
REFRIGERANT
Containers- handling refrigerant – discharging, charging and leak detection – refrigeration system Diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures
AIR ROUTING AND TEMPERATURE CONTROL
Objectives – Evaporators case air flow through the Dash recalculating unit – Automatic Temperature control – Duct system- Controlling flow – vacuum reserve – testing the air control and handling systems.
HEATER- AIR CONDITIONER TROUBLE SHOOTING
Air conditioner maintenance and service- servicing heater system. Removing and replacing components. trouble shooting of air conditioner- heating system- compressor service

TEXT BOOK:

1. William H Crouse and Donald L Anglin, Automotive Air Conditioning McGraw Hill inc; 1990.

REFERENCES:

1. Mitchell information services, Inc., Mitchell Automotive Heating and Air conditioning systems, prentice Hall Inc, 1989.
2. McDonald K.L., Automotive Air conditioning., Theodore Audel series., 1978
3. Goings.L.F., Automotive Air conditioning., American Technical services, 1974
4. Paul Weisler, Paul Weisler, Automotive Air conditioning, Restone Publishing Co. Inc., 1990.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

17ATEC18	ALTERNATIVE FUELS	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

Conventional fuels used in automotive are sourced from fossil fuels and in the current scenario, fossil fuels are depleting . Alternate fuels for use in internal combustion engines are increasing as a replacement of fossil fuels .

Prerequisite

Nil

Course Objectives

1	To provide the biochemistry of alternate fuels for use in automotive engines.
2	To detail on the different methods of generation of alternate fuels from various bio resources.
3	To describe the composition and properties of bio-diesel for use in automotive engines.
4	To elucidate the different options available for production of new alternate fuels.

Course Outcomes:

After Successful completion of this course, the students will be able to:

CO1.	Summarize on the biochemistry of alternate fuels that are used in automotive engine.	Understand
CO2.	Summarize on the various methods of production of alternate fuels for internal combustion engines.	Understand
CO3.	Appraise on the composition and properties of bio-diesel as an alternate fuel.	Apply
CO4.	Appraise on the various options for production of new alternate fuels.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	M	--	-	-	-	--	-	--	S	--	--
CO2	S	M	M	M	M	--	-	--	-	--	-	-	S	--	--
CO3	S	S	S	M	M	--	-	-	-	--	-	--	S	--	--
CO4	S	S	S	M	M	--	-	--	-	--	-	-	S	--	--
CO5	S	S	S	M	M	--	-	-	-	--	-	-	S	--	--

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Chemistry, Biochemistry, and Microbiology of Lignocellulosic Biomass, Biomass as an Energy Source: Traditional and Modern Views, Structural and Industrial Chemistry of Lignocellulosic Biomass, Lignocellulose as a chemical resource, Physical and chemical pretreatment of lignocellulosic biomass, Biological pretreatments, Acid hydrolysis to saccharify pretreated lignocellulosic biomass,
BIOCHEMISTRY
Cellulases: Biochemistry, Molecular Biology, and Biotechnology, Enzymology of cellulose degradation by cellulases, Cellulases in lignocellulosic feedstock processing, Molecular biology and biotechnology of cellulase production, Hemicellulases: New Horizons in Energy Biotechnology, A multiplicity of hemicellulases, Hemicellulases in the processing of lignocellulosic biomass, Lignin-Degrading Enzymes as Aids in Saccharification, Commercial Choices of Lignocellulosic Feedstocks for Bioethanol Production, Biotechnology and Platform Technologies for Lignocellulosic Ethanols
BIOCHEMICAL ENGINEERING
Biochemical Engineering and Bioprocess Management for Fuel Ethanol, Biomass Substrate Provision and Pretreatment, Wheat straw — new approaches to complete saccharification, Switchgrass, Corn stover, Softwoods, Sugarcane bagasse, Other large-scale agricultural and forestry, biomass feedstocks, Fermentation Media and the "Very High Gravity" Concept, Fermentation media for bioethanol production, Highly concentrated media developed for alcohol fermentations,
COMPOSITION OF BIO DIESEL
Vegetable oils and chemically processed biofuels, Biodiesel composition and production processes, Biodiesel economics, Energetics of biodiesel production and effects on greenhouse gas emissions, Issues of ecotoxicity and sustainability with expanding biodiesel production, Fischer-Tropsch Diesel: Chemical Biomass–to–Liquid Fuel Transformations
DEVELOPMENT OF ALTERNATE FUELS
Radical Options for the Development of Biofuels, Biodiesel from Microalgae and Microbes, Biohydrogen, The hydrogen economy and fuel cell technologies, Bioproduction of gases, Production of H_2 by photosynthetic organisms, Emergence of the hydrogen economy, Microbial Fuel Cells: Eliminating the Middlemen of Energy Carriers Biofuels as Products of Integrated Bioprocesses

TEXT BOOK:

1. David M. Mousdale, Biofuel-Biotechnology, Chemistry, and sustainable Development, 1st Ed., CRC Press Taylor & Francis Group, 2008
2. Joseph M Norbeck, Hydrogen fuel for surface transportation, Society of Automotive Engineers, 1996.

REFERENCES:

1. Ayhan Demirbas, Green Energy and Technology, Biofuels, Securing the Planet's Future Energy Needs, 1st edition, Springer, 2009.
2. James D. Halderman, James Linder. Automotive Fuel and Emission Control system, Prentice Hall, 2005.

CourseDesigners:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	T.Raja	Associate Professor	Auto / VMKVEC	rajat@vmkvec.edu.in
2	R. Prabhakar	Associate Professor	Auto / VMKVEC	prabhakarr@vmkvec.edu.in
3	M.Saravana Kumar	Assistant. Professor GRII	Auto / AVIT	saravanakumar@avit.ac.in
4	B. Samuvel Michael	Assistant. Professor GRII	Auto / AVIT	samuvelmichael@avit.ac.in

C. Elective Courses (EC)

Open Elective (OE)

17AREC03	UNMANNED AIRCRAFT SYSTEMS	Category	L	T	P	Credit
		ELECTIVE	3	0	0	3

Preamble

This course is designed to develop hands on skills in operation of unmanned aerial vehicles which is the latest demand of present situation.

Prerequisite

NIL

Course Objectives

1	To provide information on Unmanned Aerial Vehicles (UAV) and its types.
2	To create interest in developing and operating UAV.
3	To model and add additional features in unmanned vehicles.

Course Outcomes

In the successful completion of the course, students will be able to

CO1.	Define and label parts of unmanned aerial vehicles.	Remember
CO2.	Explain principle and operation of aerial vehicles.	Understand
CO3.	Demonstrate analytical skills to develop a new system.	Apply
CO4.	Categorise the system for highest reliability and performance.	Analyze
CO5.	Recommend modification in the system.	Evaluate
CO6.	Build a new vehicle with additional features.	Create

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	L	L	L	L	-	-	-	-	-	-	-	-	M	M	M
CO2.	L	L	L	L	-	-	-	-	-	-	-	-	M	M	M
CO3.	S	M	L	L	L	M	-	-	S	-	-	-	M	M	M
CO4.	S	S	M	M	M	S	-	-	M	M	-	-	S	M	M
CO5.	S	S	S	S	S	S	-	-	S	S	S	S	S	S	S
CO6.	S	S	S	S	S	S	-	S	**S**	**S**	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION TO UNMANNED AIRCRAFT SYSTEMS
History of unmanned aerial vehicles- types- Introduction to Unmanned aircraft systems-Unmanned aerial vehicles –Micro aerial vehicles definitions, history, classification- applications-recent research and development in civil and defense applications – autonomous vehicles -future research in autonomous vehicles – design standards and regulatory aspects introduction to design and selection of systems.
ASPECTS OF UNMANNED AIRCRAFT SYSTEMS
Involvement of different aspects in the development of UAV-aerodynamic configurations -Aspects of airframe design- Stealth design, payload types, communication, navigations & guidance systems, control & stability, launch, recovery and support systems, reliability design.
MODELING AND CONTROL HELICOPTER MODEL
Modeling and control of small and miniature unmanned helicopters –single rotor helicopter design – coaxial rotor helicopter design - autonomous control of a mini quad-rotor vehicle using LQG controllers – linearization and identification of helicopter model.

UNMANNED AERIAL VEHICLE DESIGN MODELING & CONTROL	
Development of autonomous quad tilt wing – advanced flight control systems for rotorcraft UAV and MAV – mathematical modeling and non- linear control of VTOL aerial vehicles.	
DEPLOYMENT OF UAS/UAV SYSTEMS	
Only application point of view of various UAS roles played in civil, defense applications -vision based navigation company trails- certification of UAS/UAV/MAV systems.	
TEXT BOOK:	
1. Barnhart, Hottman, Marshall, Shappee, *Introduction to Unmanned Aircraft Systems*, CRC Press, Taylor and Francis Group 2. Kenzo Nonami, Farid Kendoul, Satoshi Suzuki, Wei Wang, Daisuke Nakazawa, Modeling and Control of Unmanned Small Scale Rotorcraft UAVs & MAVs, Springer, New York, 2010 3. Laurence R. Newcome, Unmanned Aviation: A Brief History of Unmanned Aerial Vehicles, American Institute of Aeronautics and Astronautics, New York, 2004	
REFERENCES:	
1. Reg Austin, *Unmanned Aircraft Systems*, Wiley and Sons Ltd, 2010. 2. Elizabeth Bone, Christopher Bolkcom, *Unmanned Aerial Vehicles*, Novinka Books, United Kingdom 2004 3. Rogelio Lozano, *Unmanned Aerial Vehicles Embedded Control*, John Wiley & Sons, 2010 4. Pedro Castillo, Rogelio Lozano, Alejandro E. Dzul, *Modelling and Control of Mini-Flying Machines*, *Advances in Industrial Control (Aic)*, Springer-Verlag, London,2005	

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Sanjay Singh	Professor	Aero / VMKVEC	sanjay@vmkvec.edu.in
2	M.Senthil kumar	Assistant Professor	Aero / VMKVEC	senthil@vmkvec.edu.in
3	R.Gowri Shankar	Assistant Professor	Aero / VMKVEC	gowrishankar@vmkvec.edu.in

17ARSE21	ROCKETS AND MISSILES	Category	L	T	P	Credit
		Elective	**3**	**0**	**0**	**3**

Preamble

This course provides and creates a base for the students to develop concepts of rocket propulsion and its applications in day to day life.

Prerequisite

NIL

Course Objectives

1	To understand the basic concepts of rockets.
2	To provide an in-depth study of rocket propulsion.
3	To develop skills for selection of propellants.
4	To develop skills for modification and designing components.
5	To develop entrepreneurial skills.

Course Outcomes

In the successful completion of the course, students will be able to

CO1.	Define principles of operation and label components of a rocket.	Remember
CO2.	Explain working of internal combustion engines.	Understand
CO3.	Apply skills for finding troubles.	Apply
CO4.	Categorise the structure and analyze.	Analyze
CO5.	Evaluate for the best efficiency of the system.	Evaluate
CO6.	Formulate and create a new rocket for basic appplications.	Create

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	L	L	L	L	-	-	-	-	-	-	-	-	M	M	M
CO2.	L	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO3.	S	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO4.	S	S	S	S	S	-	-	-	S	-	-	S	S	S	S
CO5.	S	S	S	S	S	-	-	-	S	-	-	S	S	S	S
CO6.	S	S	S	S	S	-	-	-	S	-	-	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

CLASSIFICATION OF ROCKETS AND MISSILES

Various methods of classification of missiles and rockets – Basic aerodynamic characteristics of surface to surface, surface to air, air to surface and air to air missiles – Examples of various Indian space launch vehicles and missiles – Current status of Indian rocket programme with respect to international scenario

AERODYNAMICS OF ROCKETS AND MISSILES

Airframe components of rockets and missiles – forces acting on a missile while passing through atmosphere – classification of missiles – slender body aerodynamics – method of describing forces and moments – lift force and lateral moment –lateral aerodynamic damping moment – longitudinal moment – drag estimation –

upwash and downwash in missile bodies – rocket dispersion.

ROCKET MOTION IN FREE SPACE AND GRAVITATIONAL FIELD

One dimensional and two-dimensional rocket motions in free space and homogeneous gravitational fields – description of vertical, inclined and gravity turn trajectories – determination of range and altitude – simple approximations to determine burn out velocity and altitude – estimation of culmination time and altitude.

STAGING OF ROCKETS AND MISSILES

Design philosophy behind multi staging of launch vehicles and ballistic missiles – optimization of multistage vehicles – stage separation techniques in atmosphere and in space – stage separation dynamics and lateral separation characteristics.

CONTROL OF ROCKETS AND MISSILES

Introduction to aerodynamic and jet control methods – various types of aerodynamic control methods for tactical and short range missiles- aerodynamic characteristics - various types of thrust vector control methods including secondary injection thrust vector control for launch vehicles and ballistic missiles

TEXT BOOK:

TEXT BOOKS:

1. Cornelisse, J.W., "Rocket Propulsion and Space Dynamics", J.W. Freeman & Co., Ltd, London,1982
2. Sutton, G.P., "Rocket Propulsion Elements", John Wiley & Sons Inc., New York, 5th Edition, 1993.

REFERENCES:

1. Parker, E.R., "Materials for Missiles and Spacecraft", McGraw Hill Book Co. Inc. 1982.
2. Mathur, M.L., and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers and Distributors, Delhi, 1988.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Sanjay Singh	Professor	Aero / VMKVEC	sanjay@vmkvec.edu.in
2	M.Senthil kumar	Assistant Professor	Aero / VMKVEC	senthil@vmkvec.edu.in
3	R.Gowri Shankar	Assistant Professor	Aero / VMKVEC	gowrishankar@vmkvec.edu.in

17ARSE35	ADVANCED MATERIALS AND NDT FOR AEROSPACE APPLICATIONS	Category	L	T	P	Credit
		Elective	**3**	**0**	**0**	**3**

Preamble

This course provides knowledge about advanced materials and creates a base for the students to develop good concepts in metallurgy.

Prerequisite

NIL

Course Objectives

1	To understand the basics of metallurgy.
2	To develop skills for selection of materials.
3	To develop analytical skills for selection of precise method.
4	To develop criticizing skills for modification and designing components.
5	To develop entrepreneurial skills.

Course Outcomes

In the successful completion of the course, students will be able to

CO1.	Understand principles of operation of metallurgical processes involved.	Remember
CO2.	Identify best material for its precise applications.	Understand
CO3.	Demonstrate analytical skills for trouble shooting and further provide solutions.	Apply
CO4.	Categorize the materials depending on reliability.	Analyze
CO5.	Evaluate and modify the parts and components.	Evaluate
CO6.	Formulate and design a new component.	Create

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1.	L	L	L	L	-	-	-	-	-	-	-	-	M	M	M
CO2.	L	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO3.	S	S	S	S	-	-	-	-	-	-	-	-	M	M	M
CO4.	S	S	S	S	-	-	-	-	-	M	-	S	S	S	S
CO5.	S	S	S	S	-	-	-	-	-	M	S	-	S	S	S
CO6.	S	S	S	S	-	-	-	-	-	M	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

SUPERALLOYS

Iron base, Nickel base and Cobalt base super alloys, composition control, solid solution strengthening, precipitation hardening by gamma prime, grain boundary strengthening, TCP phase, Embrittlement, solidification of single crystals, Inter-metallics, high temperature ceramics.

CERAMICS

Introduction – powder metallurgy - modern ceramic materials – cermets - cutting tools – glass ceramic –production of semi fabricated forms - plastics and rubber – carbon/carbon composites, fabrication processes involved in metal matrix composites - shape memory alloys – applications in aerospace vehicle design, open and close mould processes.

HIGH TEMPERATURE MATERIALS CHARACTERIZATION

Classification, production and characteristics – determination of mechanical and thermal properties of materials at elevated temperatures – heat treatment of carbon steels – aluminium alloys, magnesium alloys and titanium alloys – effect of alloying treatment, heat resistance alloys – tool and die steels, magnetic alloys, application of these materials in thermal protection systems of aerospace vehicles – super alloys – high temperature material characterization.

CREEP AND FRACTURE RESISTANCE

Design of transient creep time, hardening, strain hardening, expressions of rupture life of creep, ductile and brittle materials, types of fracture, brittle to ductile from low temperature to high temperature, cleavage fracture, ductile fracture due to micro void coalescence-diffusion controlled void growth; fracture maps for different alloys and oxides.

NON DESTRUCTIVE TESTING

Principle of NDT, types of cracks and their growth, Red Dye Penetrant method, Fluorescent Penetrant method, X-Ray, Magnetic Particle Inspection method, Ultra sonic method, Eddy Current Inspection method of crack detection.

TEXT BOOKS:

1. Titterton.G., "Aircraft Materials and Processes", V Edition, Pitman Publishing Co., 1995.
2. Hertzberg R. W., "Deformation and Fracture Mechanics of Engineering materials", 4th Edition, John Wiley, USA, 1996.
3. Courtney T.H, "Mechanical Behavior of Materials", McGraw-Hill, USA, 1990.

REFERENCES:

1. Martin, J.W., "Engineering Materials, Their properties and Applications", Wykedham Publications (London) Ltd., 1987.
2. Van Vlack.L.H., "Materials Science for Engineers", Addison Wesley, 1985.
3. Raghavan.V., "Materials Science and Engineering", Prentice Hall of India, New Delhi, 1993.
4. Bressers. J., "Creep and Fatigue in High Temperature Alloys", Applied Science, 1981.
5. McLean D., "Directionally Solidified Materials for High Temperature Service", The Metals Society, USA, 1985.

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Sanjay Singh	Professor	Aero / VMKVEC	sanjay@vmkvec.edu.in
2	M.Senthil kumar	Assistant Professor	Aero / VMKVEC	senthil@vmkvec.edu.in
3	R.Gowri Shankar	Assistant Professor	Aero / VMKVEC	gowrishankar@vmkvec.edu.in

17ARSE32	AIRCRAFT MAINTENANCE AND REPAIR	Category	L	T	P	Credit
		ELECTIVE	3	0	0	3

Preamble

This subject provides the knowledge and maintenance aspect of airframe systems and rectification of snags. Similarly it gives the in depth knowledge of various technologies behind those systems. It also provides the knowledge of hydraulic and pneumatic system along with aircraft jacking, assembly and rigging

Prerequisite

NIL

Course Objectives

1.	To understand the basic concepts welding in aircraft structural components
2.	To Study the plastics and composites in aircraft
3.	To Study the aircraft jacking, assembly and rigging
4.	To Study the review of hydraulic and pneumatic system
5.	To Study the safety practices

Course Outcomes

In the successful completion of the course, students will be able to

CO1.	Recall the knowledge of fundamental principles of welding in aircraft	Remember
CO2.	Explain the function and operations of various systems in aircraft	Understand
CO3.	Demonstrate the function and operations of aircraft jacking, assembly and rigging	Apply
CO4.	Illustrate the concept and finding out the parameters of hydraulic and pneumatic system	Analyze
CO5.	Formulate the performance of safety practices and its instruments.	Create

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1.	S	L	L	-	-	-	-	-	-	-	-	L	M	M	M
CO2.	M	L	-	L	M	-	-	-	-	-	-	-	S	M	S
CO3.	S	M	M	S	M	-	-	-	L	-	-	L	S	S	S
CO4.	S	S	S	S	M	-	-	-	-	-	-	-	S	S	S
CO5.	S	S	S	M	S	-	-	-	-	--	-	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

WELDING IN AIRCRAFT STRUCTURAL COMPONENTS

Equipments used in welding shop and their maintenance – Ensuring quality welds – Welding jigs and fixtures – Soldering and brazing - Sheet Metal Repair And Maintenance - Inspection of damage – Classification – Repair or replacement – Sheet metal inspection – N.D.T. Testing – Riveted repair design, Damage investigation – reverse technology

PLASTICS AND COMPOSITES IN AIRCRAFT

Review of types of plastics used in airplanes – Maintenance and repair of plastic components – Repair of cracks, holes etc., various repair schemes – Scopes. Inspection and Repair of composite components – Special precautions – Autoclaves

AIRCRAFT JACKING, ASSEMBLY AND RIGGING

Airplane jacking and weighing and C.G. Location. Balancing of control surfaces – Inspection maintenance. Helicopter flight controls. Tracking and balancing of main rotor

REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM

Trouble shooting and maintenance practices – Service and inspection. – Inspection and maintenance of landing gear systems. – Inspection and maintenance of air-conditioning and pressurization system, water and waste system. Installation and maintenance of Instruments – handling – Testing – Inspection. Inspection and maintenance of auxiliary systems – Fire protection systems – Ice protection system – Rain removal system – Position and warning system – Auxiliary Power Units (APUs)

SAFETY PRACTICES

Hazardous materials storage and handling, Aircraft furnishing practices – Equipments. Trouble shooting - Theory and practices

TEXT BOOK:

1. KROES, WATKINS, DELP, “Aircraft Maintenance and Repair”, McGraw-Hill, New York, 1992

REFERENCES:

1. LARRY REITHMEIR, “Aircraft Repair Manual”, Palamar Books, Marquette, 1992.
2. BRIMM D.J. BOGGES H.E., “Aircraft Maintenance”, Pitman Publishing corp. New York, 1940

Course Designers:

S.No	Name of the Faculty	Designation	Department/College	Mail ID
1	Sanjay Singh	Professor	Aero / VMKVEC	sanjay@vmkvec.edu.in
2	M.Senthil kumar	Assistant Professor	Aero / VMKVEC	senthil@vmkvec.edu.in
3	R.Gowri Shankar	Assistant Professor	Aero / VMKVEC	gowrishankar@vmkvec.edu.in

17BTCC15	FOOD PROCESSING TECHNOLOGY	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Food Processing Technology deals with the study of food production, processing, packaging, preservation and the use of technology and Engineering techniques in aiding the above-mentioned stages. It also deals with artificial food, artificial edible items, nutrition science and its Chemistry. It allows students to learn about food and nutrients, role of functional foods and the strategies to produce specific food ingredients.

PRERQUISITE - NIL

COURSE OBJECTIVES

1.	To explain different types of foods, factors affecting food & food products and the micro-organisms which cause food borne diseases
2.	To explain the concepts of food spoilage and different food preservation methods, and their impact on the shelf life, quality, and other physical and sensory characteristics of foods
3.	To discuss the different food processing methods and its applicability in food product preparations
4.	To choose appropriate modern methods of food preservation for industrialization
5.	To Choose the materials and types of packaging for foods and its quality testing

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Identify different microbes associated with foods, and food borne diseases.	Understand
CO2. Infer the role of microbes in food spoilage and food preservation	Apply
CO3. Illustrate all food processing methods and demonstrate its application in food product	Apply
CO4. Utilize the modern methods for foods preservation using biotechnology.	Apply
CO5. Inspect the packing methods, materials and factors affecting food packing.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	M	-	-	L	M	L	-	-	-	-	-	-	-	-
CO2	M	M	M	M	L	L		-	-	-	-	-	-	-	-
CO3	M	M	M	L	M	S	M	-	-	-	-	-	-	-	M
CO4	S	S	S	S	S	M	L	-	-	-	-	-	-	-	-
CO5	S	M	M	M	M	L	M	-	-	-	-	-	-	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

FUNDAMENTALS OF FOOD MICROBIOLOGY

Microbiology of different types of foods-Vegetables, fruits, milk and milk products, meat and meat products. Factors affecting the food products. Food borne diseases and causative organisms. Food intoxication.

FOOD SPOILAGE

Food Spoilage types & causes. Spoilage of foods and Shelf –life – Vegetables and fruits, Milk and milk products, meat and meat products, cereals and cereals products, Alcoholic beverages. Factors influencing food spoilage. Control of microbes in foods.

PROCESSING OF FOODS

Heating, boiling, oxidation, toxic inhibition, dehydration, drying-Yeast based products, Milk products, Jams and jellies, Pickles, Meat and meat products. Labeling Instructions.

INDUSTRIALIZATION/ MODERN FOOD PRESEVERVATION

Pasteurization, Vacuum packing, irradiation, bio preservation, Modified atmosphere packing, cryopreservation, Pickling, salting, drying, freezing, refrigeration. Food additives- Intentional and Nonintentional additives, Food colorants- natural and artificial, food flavours.

PACKAGING AND QUALITY TESTING

Methods of packaging of foods-Solid, liquid, semi solids, Modified atmosphere packing. Factors affecting packaging. Packaging materials.

TEXT BOOKS

1. Frazier. Food Microbiology. McGraw Hill Publication.4th Edition.2001
2. Sivashankar.B.Food processing Preservation, Prenlice Hall of India.Pvt.Ltd.2002

REFERENCE BOOKS

1. James M Jay, Martin J, Loessner and David A Golden. Food Microbiology, Springer Publication, 7th Edition. 2005
2. Shetty K, Paliyath, Food Microbiology, 2nd Edition, Taylor and Francis, 2006

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.R.Subbaiya	Associate Professor	Biotechnology	subbaiya@avit.ac.in
2	Dr.M.Sridevi	Professor & Head	Biotechnology	sridevi@vmkvec.edu.in

17BTEC24	BIOFERTILIZER TECHNOLOGY	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

This course will provide knowledge of comprehensive understanding of the biofertilizer technology and its current trends. It develops the entrepreneurship to catch with the current trends as well as creating the industry ready professionals.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To state the basic knowledge on biofertilizer in agriculture.
2	To discuss about the role of biofertilizer in crop production
3	To implement the production and application of biofertilizer technology
4	To outline the marketing strategies of biofertilizer.

COURSE OUTCOMES

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

CO1. Explain the types and importance of biofertilizer.	Understand
CO2. Outline in detail about the different chemical fertilizer, green manuring and its role in crop production	Understand
CO3. Identify the functions of microorganism from various sources and their mass production	Apply
CO4. Inspect in detail about the application and limitation of biofertilizer in crop field	Analyze
CO5. Examine the promotion and strategies improvement in distribution system.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	-	L	-	-	L	-	-	-	L	L	-	-	-
CO2	S	M	S	-	-	-	S	-	-	-	L	L	-	-	-
CO3	M	-	M	M	-	-	M	-	-	-	L	-	-	-	M
CO4	L	-	-	L	-	-	S	-	-	-	-	-	-	-	-
CO5	S	M	L	L	-	-	-	-	-	-	L	S	-	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

BIOFERTILIZER

Definition and types, importance of biofertlizers in agriculture, Characteristics of biofertilizers- *Rhizobium, Azotobactor, Azospirillum*, Phosphate solubilizing microorganisms, cyanobacteria, *Azolla,* Mycorrhizae. Symbiosis- Physiology, biochemistry and molecular genetics of symbiosis, Enzymes and their regulation: Nitrogenase, hydrogenase

BIOFERTILIZER AND ITS ROLE IN CROP PRODUCTION SYSTEM

Different chemical fertilizer, its function and effect on agriculture. Role of organic matter on crop production and soil health. Various type of bio-inocula and techniques application and keep soil environment free from pollution. Green manuring, its sources, use and role in cropping system.

FUNCTION AND MASS SCALE PRODUCTION

Total and differential count of microorganisms from soil, water and carrier material. Nitrogen cycle andnitrogen fixation technology. Isolation, purification, screening, selection, mass scale production and preservation of *Rhizobia/Bradyrhizobia, Azotobacter, Azospirillum*, PSB and KSB. General biology, function, use and important of

green manuring, particularly Sesbania and Azolla.

APPLICATION TECHNOLOGY

Strain selection, sterilization, growth and fermentation, mass production of various biofertilizers. Application technology: Standards and quality control, application for field and tree crops, nursery plants and seedlings. Limitation of bio-fertilizer and bio-pesticide application in agriculture.

EXTENSION, PROMOTION AND MARKETING

Extension strategies, diagnosis for the effectiveness of inoculation, improvement in distribution system.

TEXT BOOKS:

1. Dr. HLS Tomdon, Fertilizers, organic manures, recyclable water and biofertilizer, Fertilizer development and consultation organization 204-204 A New Delhi.
2. S.L. Tisdale, J.D. Beaton, W.L. Nelson, J.L. Havling, Soil fertility and fertilizers, fifth edition, Mc millan publishing company 866 third avenue new yark.
3. R. Serraj, Symbiotic nitrogen fixation prospects for enhanced application in tropical agriculture, Oxford & IBH publishing Co Pvt. Ltd New Delhi.

REFERENCES:

1. HLS. Tandan, Biofertilizer technology marketing and uses, Fertilizer development.
2. N.S. Subba Rao, Biofertilizer in Agriculture, Oxford & IBH Publishing co.pot ltd.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	R. Deepa Priya	Assistant professor	Biotechnology	deepapriya.biotech@avit.ac.in
2	Dr M.Sridevi	Professor & Head	Biotechnology	sridevi@vkvec.edu.in

17BTEC25	BIOLOGY FOR NON BIOLOGISTS	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

PREREQUISITE –NIL

COURSE OBJECTIVES

1	To list out the students with the basic organization of organisms and subsequent building to a living being
2	To summarize about the machinery of the cell functions that is ultimately responsible for various daily activities.
3	To implement the knowledge about biological problems that requires engineering expertise to solve them.

COURSE OUTCOMES

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

CO1: Outline the structure and cell theory of living organism.	Understand
CO2: Infer about the biological diversity of life.	Understand
CO3: Utilize the application of enzymes in industrial level.	Apply
CO4: Identify the uses of Bioremediation and Biosensors using molecular machines.	Apply
CO5: Analyse in detail about the principles of cell signalling in nervous system and immune system.	Analyse

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	-	-	-	-	-	-	-	-	-	L	-	-	-
CO2	S	M	S	-	-	M	S	-	L	L	-	L	-	-	-
CO3	-	L	M	-	L	S	M	-	M	M	L	L	-	-	-
CO4	L	L	L	L	-	L	S	M	S	L	-	M	-	M	-
CO5	S	M	L	L	-	-	-	-	-	S	L	S	-	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO BIOLOGY – CELL AND CELL STRUCTURE AND FUNCTION

Introduction, Scope, Disciplines of biology –An over View of plants, animal, Microorganism.

INTRODUTION TO BIOLOGY – BIO CHEMISTRY, ENZYME, INDUSTRIAL USE

Prokaryotes – Eukaryotes, Cell, Cell structure, Organelles and their functions, Yeast, Bacteria –Friends and Foe.

FOOD DIET NUTRITION

Major constituents of food – carbohydrate, protein, lipids, vitamins and minerals. Balanced diet-BI-Junk food, Fermented food, nutritional values.

ENVIRONMENT

Clean environment-Reduce, Recycle and Reuse-Renewable energy-Waste management –water-waste water management – personal hygiene, Global Climatic Changes -Tsunami, global warming, storms, vardha, Okhi. Recycled products -Paper, No to plastic, go green.

HEALTH, IMMUNE SYSTEM AND MEDICINE

Immunology- Blood Grouping – Antigen- Antibody. Antibiotics, Vaccines their significance. Diagnosis –Parameters in Urine and Blood. Instruments – ECG, ECHO, MRI, X-ray. Prophylaxis, Chemotherapy and Allergy.

TEXT BOOKS:

1. J.M.Berg, J.L.Tymosczko and L.Sryer. Biochemistry, W.H Freeman publication.
2. Student Companion to accompany Biochemistry, Fifth Edition-Richard I. Gum port.
3. Frank H.Deis, Nancy Count Gerber, Roger E.Koeppe, 2 Molecular motors

REFERENCE BOOKS:

1. Albert's, 2003, Molecular Biology of the cell
2. Lodish, 2004, Molecular cell Biology

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. R. Deepapriya	Assistant Professor	Biotechnology	deepapriya21@gmail.com
2	Dr M.Sridevi	Professor & Head	Biotechnology	sridevi@vkvec.edu.in

17BTEC30	NATURAL RESOURCES MANAGEMENT	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

Bioresource management showers the knowledge on importance of various resource available in the world and its economic importance. Students will gain the knowledge in wide spectrum of bioresource availability and its culturing method. This paper also deals with the conservation of wild resource and cultivation of valuable products for the sophistication of human life.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To state about the kinds and importance of bioresource management.
2	To describe about the various types of aquaculture and its breeding types.
3	To construct the characteristics of vermiculture and its scope and importance.
4	To categorise and preserve the afforestation process with certain conservation policies.
5	To develop the economic importance of value-added products.

COURSE OUTCOMES

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

CO1. Interpret the basic concepts and importance of Bioresource management	Understand
CO2. Explain the culturing process and various types of aquaculture.	Understand
CO3. Identify the scope and economic importance of vermiculture and sericulture.	Apply
CO4. Categorize the strategies on conservation and management of forest resource.	Analyze
CO5. Analyze the crop improvement technologies in the production of bioresource products.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	-	L	LM	-	-	L	-	-	-	-	M	-	-	-
CO2	L	-	M	L	L	-	M	-	S	-	L	M	-	-	-
CO3	S	S	-	-	-	-	M	L	-	-	L	-	-	-	-
CO4	L	-	L	L	-	L	S	L	-	-	-	-	-	M	-
CO5	L	L	-	L	-	-	L	-	-	-	-	S	M	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS OF BIORESOURCE MANAGEMENT

Basics of Bioresources - Concept, kinds, importance. Human Resource: Management, scope and importance of human resource management (HRM) and personnel management; human development index (HDI). Animal Resources Conservation and Management: Concept on livestock and livestock production management; role in livelihood and nutritional securities; sustainable livestock production, problems and opportunities

AQUACULTURE

Introduction to aquaculture; Prawn culture, Methods of prawn fishing, Preservation and processing of prawn; Pearl culture and status of pearl culture in India; Economically important of fishes. Setting up of a fish farm, Monoculture and composite fish culture, Bundh breeding, Induced breeding, methods of fishing, Fish preservation and processing; Identification of fish diseases and their control.

VERIMICULTURE AND SERICULTURE

Introduction and scope, Species of earthworm, Characteristics features of earthworm. Overview of methods of vermicomposting, Role of earthworm in solid waste management. Vermiwash- its importance, Vermicompost as bio-

fertilizer. Overview of scope, economic importance and the product of Sericulture.

FOREST MANAGEMENT AND PLANTS CULTIVATION

Classification and distribution of forests, current strategies of conservation and management of forest resource; agro-forestry, social forestry; Joint Forest Management; National Forest Policy; Forest (conservation) Act, 1980. A brief account of Harlan and Hawkes theories; practices of floriculture, agroforestry, BT crops (brief account).

VALUE ADDED BIORESOURCE PRODUCTS

Economic uses of important cereals, legumes (pulses and fodders), fruits and vegetables, spices and condiments, beverages, oils and fats, essential oils, medicinal plants, hallucinogens (psychotropic drugs), timber plants, fibre plants, natural rubber, resins, raw materials for paper. A brief account of crop improvement technologies, biosafety considerations, natural products.

TEXT BOOKS:

1. Manju Yadav. 2010. "Economic Zoology" Discovery publishing housePvt.Ltd., New Delhi
2. Trivedi, T, R. (2011) "Forest Management"Discovery Publishing Pvt.Ltd. New Delhi
3. Milton Fingerman, RachakondaNagabhushanam 2000. "Recent Advances in Marine Biotechnology" IstEdition Science Pub Inc.

REFERENCES:

1. Peter Bettinger Kevin Boston Jacek Siry Donald Grebner 2017. Forest Management and Planning 2nd Edition. Academic press.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.Chozhavendhan. S	Associate professor	Biotechnology	chozhavendhan@avit.ac.in
2	Mrs.R.Subashini	Assistant Professor	Biotechnology	subashini@vmkvec.edu.in

17BTEC31	APPLICATIONS OF ENZYME IN WASTE MANAGEMENT	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

This course explains about different waste generation in environment, management of waste, general characters of enzymes, their immobilization process, makes an attempt to bring students in direct contact with nature, to find the environmental problems and possible solutions. To empower the students to enrich their knowledge on waste treatment using biocatalyst to solve the environmental pollution.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To state the basic knowledge on different wastes
2	To discuss about the waste management methods
3	To perform the waste treatment using enzymes
4	To implement the basics of enzyme immobilization process
5	To outline the students to basic knowledge concerning biodegradation with the usage of enzymes

COURSE OUTCOMES

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

CO1. Illustrate and classify the different wastes in environment	Understand
CO2. Outline about the general waste management methods	Understand
CO3. Develop waste treatment using enzymes	Apply
CO4. Identify the basics of enzyme immobilization process	Apply
CO5.Analyze different method of biodegradation of waste using enzymes	Analyse

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	-	-	-	-	-	-	-	-	-	-	-	-		-
CO2	M	M	-	-	-	-	M	-	-	-	-	-	-	-	-
CO3	M	M	-		L	-	-	S	-	-	-	S	-	-	-
CO4	M	M	-	-	S	-	L	-	-	-	-	-	-	-	-
CO5	M	M	L	L	S	S	-	L	-	-	-	-	M	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

CLASSIFICATION AND TECHNOLOGIES IN REDUCING WASTE

Definition of waste, and its classification, Waste treatment technologies including waste incineration and energy from waste, advanced conversion technologies of pyrolysis and gasification, anaerobic digestion, composting and biological treatment of wastes.

WASTE AND RESOURCE MANAGEMENT

3 RS, Advances in waste recycling and recovery technologies to deliver added value products; Landfill engineering, Sustainability and resource efficiency with consideration for materials flow through the economy, steps towards designing out waste and maximizing the value of outputs from waste treatment processes.

ENZYME IN WASTE TREATMENT

Enzymes in enhanced oil recovery; treatment of wastewater of brewery, pharmaceutical, textile dyeing, metal processing, petrochemical, pulp and paper industry; role of natural/stimulated, dead/spent microbial cultures, GMOs, phytoremediation. Biological indicators of waste by enzyme.

ENZYME ACTION AND IMMOBILIZATION

Action of enzyme on xenobiotic compound, phenolic compounds, pesticides (organo chlorinated, organo phosphorous and carbonated) immobilization techniques.

BIOSENSOR AND OPTICAL INSTRUMENTS

Birth of biosensors, advantages and disadvantages, construction of biosensors- enzyme and microbial biosensor. Transducers- piezoelectric, potentiometric, amperometric and fiber optics.

TEXTBOOKS:

1. Instant Notes in Ecology by A. Mackenzie, A.S. Ball and S.R. Virdee, Bios Scientific Publishers Ltd., UK, 1999.
2. Biotechnology-Applications to Environmental Protection by M.M. Pandey, Himalaya Publishing House, 1993.
3. Pesticide Properties in the Environment by A.G. Hornsky, R.D. Wauchope and A.E. Herner, Springer-Verlag, New York Inc., 1996.
4. Basic Environmental Science by G.S.P. Iyer, Educational Publishers and Distributers, New Delhi, 1997.

REFERENCES:

1. Popular Biotechnology Lecture Series Focus: Bioremediation by Division of Biotechnology, PSCST, 2013.
2. Pesticide Properties in the Environment by A.G. Hornsky, R.D. Wauchope and A.E. Herner, Springer-Verlag, New York Inc., 1996.
3. Introduction to Environmental Technology by A.K. Chatterji, Prentice Hall of India Pvt. Ltd., New Delhi, 2002.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. A. Nirmala	Assistant professor (Gr-II)	Biotechnology	nimmi_aruna@yahoo.com
2	Ms.R.Subashini	Assistant Professor	Biotechnology	subashini@vmkvec.ac.in

17CVSE35	QUALITY CONTROL AND ASSURANCE IN REAL ESTATE	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

To introduce the students to understand about the quality, strategic planning, and competitive advantage in real estate, principles of total quality management, customer relationship management techniques, quality control and quality assurance and benefits of control charts and applications

PREREQUISITE - NIL

COURSE OBJECTIVES

1	To study about the concept of quality, planning and quality and market share
2	To learn about the elements and benefits of total quality management
3	To understand about the customer satisfaction measurement techniques and customer relationship management techniques.
4	To learn about the quality control and quality assurance
5	To know about the benefits of control charts and applications

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Understand the concept of quality, planning and quality and market share	Understand
CO2. Remember the elements and benefits of total quality management	Remember
CO3. Understand the customer satisfaction measurement techniques and customer relationship management techniques.	Understand
CO4. Remember the quality control and quality assurance	Remember
CO5. Understand the benefits of control charts and applications	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	L	-	-	M	-	-	-	-	M	M	L
CO2	S	L	L	S	-	-	-	-	-	-	-	-	-	--	--
CO3	L	M	M	S	M	M	-	-	-	M	-	-	M	L	--
CO4	S	L	M	M	-	-	-	S	-	M	-	-	--	L	L
CO5	S	L	M	-	-	-	-	-	-	-	M	L	--	--	M

S- Strong; M-Medium; L-Low

SYLLABUS

QUALITY, STRATEGIC PLANNING, AND COMPETITIVE ADVANTAGE: Brief History -Definitions of Quality. Quality in Manufacturing and Service Systems. Quality and Price - Quality and Market Share - Quality and Cost - Quality & Competitive Advantage.

PRINCIPLES OF TOTAL QUALITY MANAGEMENT: Introduction - Elements of Total Quality Management - Malcolm Baldrige National Quality Award Criteria. Benefits of Total Quality Management. The Deming Management Philosophy – The Juran Philosophy – The Crosby Philosophy.

CUSTOMER FOCUS: The Customer-Driven Quality Cycle - Quality Function Deployment –Customer Satisfaction Measurement Techniques – Customer Relationship Management Techniques.

QUALITY CONTROL AND QUALITY ASSURANCE Concept of Quality Control – Concept of Process Variation – Acceptance Sampling – Sampling Inspection Vs. 100% Inspection – Attributes and variable sampling plans – OC Curves – Producer and Consumer Risk – AQL, RQL, TQL, AOQL and AOL. (10%)

STATISTICAL PROCESS CONTROL : Control Charts – X-R, P, np and C Charts – Benefits of Control Charts and Applications

TEXT BOOKS:

1. Quality Control - Dale H Besterfield – Pearson Education
2. Total Quality Management – S. Sundarrajan
3. Quality Control & Total Quality Management – Jain

REFERENCES:

1. The essence of Total Quality Management – Hansen & Ghare
2. Managing for Total Quality – Logothetic
3. Quality Problem Solving – Smith
4. ISO 9000 – Kairon
5. Manuals of various standards

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	Dr.S.P.Sangeetha	HOD-Civil	AVIT	sangeetha@avit.ac.in
2.	Mr.P.Sankar	Asst. Professor	Civil / VMKVEC	Sankarp35vidhu@gmail.com

17CVSE42	GREEN AND ENERGY EFFICIENT BUILDING	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

Before starting with this course one must get a clear knowledge on the basics of green building, learning the plan details of HVAC for a building, energy efficient modeling.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Development & Plan Implementation.
2	To learn about the fundamentals of electric power systems and building electric wiring.
3	To study about the Bioclimatic design and concepts.
4	To gain the knowledge about Water conservation & water management systems.
5	To learn about the Key components of remodelling project.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Describe what green building	Apply
CO2. Understand the benefits and advantages of green building practices	Apply
CO3. Identify and describe green systems and features in residential and commercial buildings	Analyze
CO4. Define what makes up a healthy building	Apply
CO5. Describe green and sustainable materials and practices	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	-	M	-	S	-	-	M	-	--	--	M
CO2	M	L	L	M	-	-	S	-	M	L	-	-	L	--	--
CO3	S	M	M	L	-	-	-	-	-	-	M	L	--	--	--
CO4	S	M	M	M	-	M	-	-	-	-	-	-	--	M	L
CO5	M	L	L	-	-	-	M	-	-	M	L	L	L	M	L

S- Strong; M-Medium; L-Low

SYLLABUS

GREEN BUILDING BASICS AND PRACTICES: Site Design / Development & Plan Implementation, Resource Efficiency, Energy Efficiency, Water Efficiency, Indoor Environmental Quality and Homeowner Education, Operation, Maintenance & Practices. Assessment of building design and construction, emission of CO2, SO2, and NO2 of building materials, elements, and construction process.

ENERGY MANAGEMENT SYSTEM OF BUILDINGS: The objective of the course is to provide students the necessary tools to control, monitor and optimize the building's facilities, mechanical and electrical equipment for comfort, safety, and efficiency. It starts with the fundamentals of electric power systems and building electric wiring and then works through building automation systems (BAS) principles. The course allows students to acquaint applying BAS to commercial HVAC equipment, lighting systems, fire systems and security/observation systems.

LOW ENERGY ARCHITECTURE, PASSIVE BUILDING DESIGN: Solar geometry, climate/regional limitations, natural lighting, passive design and sustainability initiatives, insulating and energy storing material. Bioclimatic design and

concepts. Case studies will be used extensively as a vehicle to discuss the success/failure of ideas and their physical applications.

WATER MANAGEMENT, BUILDING METHODS & MATERIALS : Water conservation, water management systems, water efficient landscaping, green roofing, rainwater harvesting, sanitary fixtures and plumbing systems, wastewater treatment and reuse, and process water strategies. AAC (Aerated Auto clave Concrete), ICF (Insulated Concrete Forms), new Advanced Framing & Insulation Techniques, SIPs (Structural Insulated Panels), Straw Bale and Pumice-crete Rammed Earth, Timber Frame, Straw Clay, and Earth ship buildings.

ENERGY EFFICIENT REMODELING : Key components of remodeling projects-windows, walls, roofs, heating and ventilation, insulation, tighten up the building envelope, Advances in building technology and materials, Incorporate active and passive solar into the home or commercial building, Mistakes to avoid, various improvements cost

TEXT BOOKS:

1. Kibert, C. J. "Sustainable Construction: Green Building Design and Delivery," Second Edition, New York: John Wiley & Sons, Inc., 2008.
2. Thermal analysis and design of passive solar buildings by A. K. Athienitis and Mat Santamouris.
3. Passive building design by N.K. Bansal, G. Hauser, and G. Minke

REFERENCES:

1. McDonough, W. and Braungart, M. "Cradle to Cradle: Remaking the Way We Make Things," New York: Farrar, Straus and Giroux, 2002

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	R. Abirami	Asst. Prof-I	AVIT	abirami.civil@avit.ac.in
2	Mr.S.Prakash	Asst. Professor	Civil / VMKVEC	tsprakashcivil@gmail.com

17CVSE41	INFRASTRUCTURE PROJECT DEVELOPMENT	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

To study the elements of construction planning and scheduling and to apply appropriate tools and techniques like networks and coding systems. To study the elements of quality control and safety of construction projects. To study the monitoring of projects through cost control.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Concepts environment relationship with focus on issues of population
2	To learn about the Application of ecological principles in sustainability.
3	To study about the Land capability and suitability analysis in location and planning of urban.
4	To gain the knowledge about Urban interference in hydrological cycle.
5	To study about the Concepts of effects of air pollution and solid wasted is posalin cavities.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Understand infrastructure organizations	Apply
CO2. Prepare infrastructure master plan	Analyze
CO3. Schedule infrastructure project activities	Analyze
CO4. Prepare project development plan	Apply
CO5. Prepare tender documents for infrastructure project contract	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	L	L	L	M	-	L	-	L	-	-	-	M	L	--
CO2	S	M	L	S	-	-	-	-	-	-	-	-	--	L	L
CO3	S	M	M	L	-	-	-	M	-	M	M	-	M	--	--

CO4	M	M	L	M	-	L	-	-	-	-	L	-	--	--	--
CO5	M	L	L	-	-	-	-	M	-	-	-	L	M	--	L

S- Strong; M-Medium; L-Low

SYLLABUS

INFRASTRUCTURE: Definitions of infrastructure, Governing Features, Historical overview of Infrastructure development in India, Infrastructure Organizations & Systems.

INFRASTRUCTURE PLANNING: Typical infrastructure planning steps, Planning and appraisal of major infrastructure projects, Screening of project ideas, Life cycle analysis, Multi-criteria analysis for comparison of infrastructure alternatives, Procurement strategies, Scheduling and management of planning activities, Infrastructure Project Budgeting and Funding, Regulatory Framework, Sources of Funding.

PROJECT MANAGEMENT IN CONSTRUCTION: Introduction to project management processes - Initiating, Planning, Executing, Controlling, and Closing processes; Project Integration Management - Project plan development, Project plan execution, and Overall change control; Project Scope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scope change control.

CONTRACTS AND MANAGEMENT OF CONTRACTS: Engineering contracts and its formulation, Definition and essentials of a contract, Indian Contract Act 1872, types of contracts and clauses for contracts, Preparation of tender documents, Issues related to tendering process, Awarding contract.

AIR QUALITY & SOLID WASTE MANAGEMENT: Sources, types and effects of air pollution and solid wasted is posalinc activities, urban industrial processes and land use and transportation implications in air and solid waste pollution; norms, standards, laws, organizations and policies in urban air quality control and solid waste management; example stabilized organic fraction best practices.

TEXT BOOKS:

1. A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
2. J. Parkin and D. Sharma, Infrastructure planning, Thomas Telford, London, 1999.
3. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.

REFERENCES:

1. J. Kelly, S. Male and D. Graham, Value management of construction projects, Blackwell Publishing, Oxford, 2003.
2. Vasant Desai, “Project Management”, Himalaya Publishing , 1st Edition, 2010
3. James C. Van Horne, John M. Wachowicz, “Fundamentals of Financial Management”,
4. PHI, 2nd Edition, 2000 Ronald W Hudson, “Infrastructure Management: integrating design, Construction, maintenance, rehabilitation and renovation”, MGH, 1st Edition, 1997.

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	R. Abirami	Asst. Prof-I	AVIT	abirami.civil@avit.ac.in
2	Mr.J. Karthick Rajan	Asst. Professor	Civil / VMKVEC	Karthickrajan078@gmail.com

17CVSE28	URBAN TRANSPORTATION INFRASTRUCTURE– PLANNING AND DESIGN	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

Helps in Design of Intersections, Interchanges, Parking and Terminal Facilities to be provided inan urban area

PREREQUISITE – NIL

COURSE OBJECTIVES

1	Helps in Design of Intersections, Interchanges, Parking and Terminal Facilities to be provided inan urban area
2	The students would have gained knowledge on Rail Infrastructure Management
3	The students would have gained knowledge on Design of Grade Separators and intersections
4	The students would have gained knowledge on Design of Multi-Storey and Surface Parking facility
5	The students would have gained knowledge on Design and Case Studies of Inter Modal Transfer Facilities

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. The students would have gained knowledge on Rail Infrastructure Planning, Operation and Management.	Apply
CO2. The students would have gained knowledge on Rail Infrastructure Management.	Understand
CO3. The students would have gained knowledge on Design of Grade Separators and intersections	Apply
CO4. The students would have gained knowledge on Design of Multi Storied and Surface Parking facility	Apply
CO5. The students would have gained knowledge on Design and Case Studies of Inter Modal Transfer Facilities	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	-	-	-	S	-	-	L	-	-	S	L
CO2	S	-	L	S	M	-	M	-	-	-	-	-	M	-	-
CO3	S	-	M	S	-	M	-	-	-	-	-	-	-	-	-
CO4	S	M	-	-	-	-	M	-	L	-	-	-	M	L	L
CO5	S	M	M	-	-	-	-	-	-	-	-	M	-	L	-

S- Strong; M-Medium; L-Low

SYLLABUS

PRINCIPLES OF INTERSECTION DESIGN: Basic considerations – simplicity – uniformity – Manoeuvre Elements – Separation of conflict points – Design Elements – Design Speed – Intersection Curves – Super elevation for curves at Intersection – Intersection Sight Distance

DESIGN OF AT-GRADE INTERSECTIONS: Capacity and LOS, Design of Rotary and Signalised Intersections, Vehicle Actuated Signals, Signal Co-ordination, Area Traffic Control System (ATCS), Pedestrian Planning at Grade Intersections

DESIGN OF GRADE SEPARATED INTERSECTIONS: Design of Grade Separators – Principles , Design Criteria – Layout Design, GAD Preparation – Pedestrian Foot Over-bridge and Subway Design – Pedestrian Planning for Grade Separated Intersections

PARKING FACILITIES : Parking – Demand – Characteristics – Space Inventory – Accumulation – Duration – Turn over – Index – Design of Multi Storey and Surface Parking facility

DESIGN OF TERMINAL FACILITIES: Bus Terminus – Design Principles – Design Elements – Design and Case Studies of Inter Modal Transfer Facilities – Design – Case Studies of Bus and Rail Terminals.

TEXT BOOKS:

1. Robert F Baker, (Edition) "Hand Book of Highway Engineering, Van Nostrand Reinhold Company, New York, 1975

2. Kanna, S.K. and Justo, C.E.G. "Highway Engineering, Nemchand.

REFERENCES:

1 .New Jersy, "Transportation and Traffic Engineering Hand Book, Institute of Transportation Engineers, Prentice Hall, INC, 1982

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr.T.Subramani	Professor & Head	Civil / VMKVEC	tsm2007@rediffmail.com
2	Dr.R.Divahar	Asso. Professor	Civil / AVIT	divahar.civil@avit.ac.in

17EECC14	ELECTRICAL MACHINES AND DRIVES	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

In a modern world the electric drives are essential for all the applications especially in mechanical engineering the Electrical drives represent a dominant source of mechanical power in various applications in production, material handling, and process industries etc. hence the course provides the magnificent knowledge about basic concepts, performance analysis of conventional and solid state control of electric drives which can help the mechanical engineer to understand and implement the concepts to various applications in engineering sector.

Prerequisite

17EEES03 - Basics of Electrical & Electronics Engineering, A. Basic Electrical Engineering

Course Objectives

1. To select appropriate electrical drive system based on their thermal factors.
2. To interpret the characteristics of DC motors and perform appropriate conventional control techniques for desired applications.
3. To interpret the characteristics of AC motors and perform appropriate conventional control techniques for desired applications.
4. To employ the solid state speed control techniques for DC drives for efficient control.
5. To employ solid state speed control techniques for AC drives for proficient and loss less control.

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Define the conceptsof an electrical drive system and choose a suitable motor drive for different applications.	Remember
CO2. Explain the working principle with their characteristics and Predetermine the performance of DC drives with various load and unload conditions.	Understand
CO3.Interpret the conventional speed control methods of DC motors with starting, braking Methods.	Apply
CO4.Identify the parts of AC motors, Predetermine the performance of AC motors with their characteristics and Interpret the conventional speed control methods of AC motors with starting and braking methods.	Analyze
CO5. Evaluate the proficient control of AC and DC drives by utilize the power electronics concepts.	Evaluate

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	S	M	--	--	L								S	M	S
CO2.	S	S	M	--	--								M	M	M
CO3.	M	L	M	S	--								M	M	M
CO4.	S	S	--	M	--								M	M	M
CO5.	S	M	S	M	M						M	M	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

Introduction

Electrical Drives - Basic Elements of a drive system – Types of Electrical Drives –Multi quadrant operation of Electric Drive -Classes of duty – Selection of power rating for drive motors -Factors influencing the choice of electrical drives – Heating and cooling curves – Applications .

DC Drives

Constructional details of DC Motor – Principle of operation DC Motor – Back EMF and torque equations – Types of DC Motors – Characteristics of DC Motors – Starting of DC Motors – Types of Braking – Conventional Speed Control of DC Motors: Armature Voltage Control, Field Flux Control, Ward Leonard Control. Stepper motor: Permanent magnet stepper motor – Principle of operation – Applications.

AC Drives

Construction and operational details of Single and Three Phase Induction Motors – Types – Slip – Torque Equations – Speed-Torque Characteristics – Types of Starters – Types of Braking – Conventional Speed Control of Induction Motors – Construction and operational details of synchronous motor – Starting methods- types of Excitation -V curve and inverted V curve-Servomotor- Applications.

Solid State Drives and Speed Control of DC Drives

Introduction of Solid state Drives- Functional block diagram and advantages of Solid state Drives – Converter – Phase control- Single Phase and Three Phase Fully controlled Converter: Principle of operation and waveforms of single phase and three phase fully controlled converter fed DC drive – Chopper - Control strategies- Choppers Fed DC Motor Drive – Applications.

Solid State Speed Control of AC Drives

Inverter, AC voltage controller and Cycloconverter - Voltage Source Inverter and Current Source Inverter – VSI fed Three Phase Induction Motors – CSI Fed Three Phase Induction Motors- Cycloconverter Fed Induction Motor Control - Voltage/Frequency Control of induction motor, Static Rotor Resistance Control – Static Scherbius and static Kramer Drives block diagram and explanation – Applications.

TEXTBOOKS

1 Gopal.K.Dubey,"Fundamentals of Electrical Drives" Narosa Publishing House, 2001

2 Theraja,B.L and Theraja, A.K., "A text book of Electrical Technology – Volume II (AC & DC Machines)" S.Chand& Company Ltd., New Delhi, 2016.

REFERENCES

1 VedamSubrahmanyam, "Electric Drives Concepts and Applications" Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.

2 M.D.Singh and K.B. Khanchandani, "Power Electronics", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2008

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.G.Ramakrishnaprabu	Associate Professor	EEE/VMKVEC	ramakrishnaprabu@vmkvec.edu.in
2	Mr.N.P.Gopinath	Assistant Professor	EEE/AVIT	gopinathnp@avit.ac.in

17EECC04	MEASUREMENTS AND INSTRUMENTATION	Category	L	T	P	C
	Total Contact Hours – 45	CC	3	0	0	3
	Prerequisite – Basic Electrical & Electronics Engineering					
	Co-requisite - NIL					

Preamble

This course introduces principle of operation of basic analog and digital measuring instruments for measurement of current, voltage, power, energy etc. Measurement of resistance, inductance and capacitance by using bridge circuits will be discussed in detail.

COURSE OBJECTIVES

1	To introduce the fundamentals of electrical and electronic instruments
2	To understand the working principles of the electrical and electronic meters
3	To Understand the working principle of AC, DC bridges.
4	To introduce various data storage and display devices.
5	To introduce various transducers and the data acquisition systems.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

CO 1	Explain the functional elements, characteristics, standards and calibration of measuring instruments.	Apply
CO 2	Describe the working of various electrical and electronic meters	Understand
CO 3	Determine unknown values using bridges.	Understand
CO 4	Describe the operation of storage and display devices.	Understand
C0 5	Explain the working of various transducers, ADC and DAC.	Apply

Mapping with Programme outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	M	-	M	-	-	S	-	M	-	L		
CO2	M	L	M	M	-	-	-	-	-	-	-	-	L		
CO3	S	M	S	L	-	-	-	S	M	-	-	-	L		
CO4	M	M	L	S	-	-	-	M	-	-	M	M	L		
CO5	S	S	M	M	-	-	-	-	-	-	-	M	L		

SYLLABUS

UNIT - I	**INTRODUCTION**	**9**
Functional elements of an instrument - static and dynamic characteristics – errors in measurement - statistical evaluation of measurement data - standard and calibration		
UNIT - II	**ELECTRICAL AND ELECTRONICS INSTRUMENTS**	**9**
Principle and types analog and digital ammeters and voltmeters – single and three phase Wattmeters and Energy meter– instrument transformers – instruments for measurement of frequency and phase.		
UNIT - III	**COMPARISON METHODS OF MEASUREMENTS**	**9**
D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops – Electrostatic and electromagnetic interference – Grounding techniques.		
UNIT - IV	**STORAGE AND DISPLAY DEVICES**	**9**
Magnetic disc and tape recorders – digital plotters and printers – CRT displays – digital CRO – LED, LCD and Dot matrix displays. Data Logger		
UNIT - V	**TRANSDUCERS**	**9**
Classification of transducers – selection of transducers – resistive, capacitive and inductive transducers – piezo electric transducers – optical and digital transducers- Elements of data acquisition system – A/D, D/A converters – Smart sensors.		

TEXTBOOK

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.
2. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.

REFERENCES

1. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.
2. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
3. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.
4. John P. Bentley, 'Principles of Measurement Systems', III Edition, Pearson Education, 2000.

COURSE DESIGNERS				
Sl No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. P.Selvam	Professor	EEE	selvam@vmkvec.edu.in
2	D.Saranya	AP (Gr-II)	EEE	srnlekha@gmail.com
3	Dr. R. Sankarganesh	Associate Professor	EEE	sankarganesh@vmkvec.edu.in

17EECC16	POWER ELECTRONICS AND DRIVES	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Power electronics deals with the processing and control of 'raw' electrical power from an electrical source such as an AC mains supply, a battery bank, a photovoltaic array, or a wind turbine into a form and quality suitable for a particular electrical load. It is an enabling technology with a very wide range of applications, such as a cell phone charger, a personal computer, a microwave oven, an MRI system, a hybrid electric car, or even the electrical grid. As can be noted, the power levels handled can vary from a few watts to several hundreds of megawatts. In this course, we will study the basic principles behind the power electronic circuits used in most such power processing applications. These circuits include power converters for DC to DC, DC to AC and AC to DC applications.

PREREQUISITE-NIL

COURSE OBJECTIVES

1	To get an overview of different types of power semiconductor devices and their switching characteristics.
2	To understand the operation, characteristics and performance parameters of controlled rectifiers.
3	To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
4	To learn the different modulation techniques inverters and to understand harmonic reduction methods.
5	To study the operation of AC voltage controller.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1:Thebasic semiconductor physics to the properties of real power semiconductor devices and differentiate from low power devices.	Remember
CO2:Theconcepts of operation of AC-DC converters in steady state and transient state of both continuous and discontinuous modes.	Understand
CO3: Classify and design choppers for simple electrical application	Apply
CO4: Identify the proper gating sequence and control circuit in operating the single phase and three phase inverter circuits.	Analyze
CO5:Analyze the performance parameter, various techniques for analysis and design of AC voltage controller and also list the various control schemes in cycloconverter.	Analyze
CO6:Describe the concepts of electric machines.	Understand
CO7: Implement the power electronics concepts to AC & DC drives to made the effective control	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**S**	**M**	**M**	**M**	**L**	L	-	L	L	L	L	L	M	S	-
CO2	**S**	**S**	**M**	**M**	**L**	-	M	-	-	-	-	-	M	S	-
CO3	**S**	**S**		**M**	**L**	M	M-	-	M	M	-	-	M	S	-
CO4	**S**	**S**	**S**	**M**	**S**	-	M	-	M	M	-	-	M	M	-
CO5	**M**	**S**	-	**M**	**S**	-	M	-	-	M	-	-	M	M	-
CO6	**M**	**S**	**M**	**S**	-	-	M	-	-	M	-	-	M	M	-

CO7	**M**	**M**	**M**	**S**	**M**	M	-	-	-	-	-	-	M	M	-

S- Strong; M-Medium; L-Low-

POWER SEMI-CONDUCTOR DEVICES

Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT, MOSFET – Computer simulation of PE circuits.

RECTIFIERS & CHOPPERS

Introduction-2 pulse / 3 pulse and 6 pulse converters – Dual converters. Basic Principles of Choppers - Stepdown and stepup chopper – Time ratio control and current limit control – Buck, Boost, Buck-Boost converters.

INVERTERS & AC - AC CONVERTERS

Single phase and three phase [120º& 180º mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM.

Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverter.

ELECTRICAL DRIVES

Type of Electrical Drives – Selection & factors influencing the selection – heating and cooling curves – loading condition and classes of duty – determination of power rating – simple problems.

SOLID STATE DRIVES (QUALITATIVE TREATMENT ONLY)

Advantages of solid state drives – D.C. motor control using rectifiers and choppers – control of induction motor by V, V/f and slip power recovery scheme using inverters and A.C. power regulators.

Total Hours : 45

TEXT BOOKS:

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.
2. G.K. Dubey “Fundamental Electrical Drives” second edition 2002, Narosa Publications, Second edition, 2002.

REFERENCES:

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004Edition.
4. N.K.De.,P.K.Sen “Electric Drives”, Prentice Hall, First edition 1999.
5. Pillai, S.K., “ A First course on Electrical Drives”, Wiley Eastern Ltd., New Delhi, 1982

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.A.Balamurugan	Assistant Professor	EEE/VMKVEC	balamurugan@vmkvec.edu.in
2	Mr.N.P.Gopinath	Assistant Professor (Gr-II)	EEE/AVIT	Gopinathnp@avit.ac.in

17ECCC07	MICROCONTROLLERS & ITS APPLICATIONS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Microcontroller is used as the main controller in most of the embedded systems nowadays. Due to the development in VLSI technology, microcontrollers evolve which function similar to microprocessors but they have most of the peripherals built on-chip. This course makes the students to be familiar with the architecture and programming of Microcontrollers. This course also introduces the architecture and hardware features of PIC 16F877 and ARM7 (LPC2148) microcontrollers.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To learn the concepts of microprocessors and knowledge of interfacing devices.
2	To study the Architecture of 8051 microcontroller
3	To develop skill in simple program writing of microcontroller
4	To study the interfacing and applications of microcontroller
5	To study the advanced microcontrollers.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Explain the concept of microprocessor and interfacing devices.	Understand
CO2. Explain the architecture and function of 8051 microcontroller	Apply
CO3. Design and implement programs on 8051 Microcontroller	Analyze
CO4. Design and implement applications using 8051 Microcontroller	Analyze
CO5. Illustrate various applications using advanced Microcontrollers.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	-	M	-	-	-	-	-	-	M	S	-	-
CO2	S	S	S	-	M	-	-	-	-	-	-	M	-	-	-
CO3	S	M	M	-	M	M	-	-	-	-	-	M	-	-	-
CO4	S	S	M	-	M	M	-	-	-	-	-	M	M	M	-
CO5	S	M	S	-	M	M	-	-	-	-	-	M	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTEL 8086 MICROPROCESSOR & I/O INTERFACING

Introduction to 8086 - Architecture of 8086 - Register organization – Signal Description of 8086 - Addressing modes – Data Transfer Instruction – Arithmetic Instruction - Branching Instruction - Program Transfer Instruction – simple programs- Programmable Peripheral Interface 8255 – Programmable Communication Interface 8251 USART – Programmable Interrupt Controller 8259A – Direct Memory Access Controller 8257- Programmable Interval Timer 8253 – Keyboard/Display Controller 8279.

INTEL 8051 MICROCONTROLLER

Introduction to 8 bit microcontroller – architecture of 8051- Signal descriptions of 8051- Role of PC and DPTR- Flags and PSW- CPU registers- Internal RAM & ROM- Special Function Register-Counter & Timers- Serial Communication.

ASSEMBLY LANGUAGE PROGRAM OF INTEL 8051

Interrupt- Addressing Mode- Data Transfer Instruction- Arithmetic Instruction- Logical Instruction- Jump Loop & Call Instruction- I/O Port Programming.

INTERFACING AND APPLICATION OF INTEL 8051

LCD Interfacing - A/D and D/A Interfacing- Sensor Interfacing- Relays and Optoisolators- Stepper Motor Interfacing- DC Motor Interfacing.

ADVANCED MICROCONTROLLERS

PIC 16F877 microcontroller – Architecture On chip ADC, I^2C – SPI – Watchdog timer – ARM7 (LPC2148) microcontroller – Architecture and applications.

TEXTBOOKS:

1. Muhammad Ali Mazidi and Janica Gilli Mazidi, The 8051 microcontroller and embedded systems, Pearson Education, 5th Indian reprint, 2003.
2. Frank D. Petruzella. “Programmable Logic Controllers”, McGraw–Hill Book, Company, 1989

REFERENCE BOOKS:

1. B.P. Singh, Microprocessors and Microcontrollers, Galcotia Publications (P) Ltd, First edition, New Delhi, 1997.
2. Embedded Controller Hand book, Intel Corporation, USA.
3. Microcontroller Hand Book, INTEL, 1984.
4. Ajay V.Deshmukh, “Microcontrollers- Theory and applications”, Tata McGraw-Hill, publisher,2005.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.S.Selvam	Assistant Professor	ECE	selvam@avit.ac.in
2	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
3	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECCC18	INTERNET OF THINGS FOR ELECTRONICS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

PREREQUISITE - Nil

COURSE OBJECTIVES

1	Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2	Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3	Market forecast for IoT devices with a focus on sensors
4	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi
5	To study the advanced internet of things for electronics

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Explain the concept of Internet of Things.	Understand
CO2. Explain the IOT Sensors To Appear	Apply
CO3. Design and implement of technological sensors	Analyze
CO4. Design and implement applications using internet of things	Analyze
CO5. Explain the advanced internet of things used in different applications.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	L	L	-	L	-	-	-	-	-	-	M	S	-	-
CO2	L	S	S	-	M	-	-	-	-	-	-	M	-	-	-
CO3	S	M	M	-	L	M	-	-	-	-	-	M	-	M	-
CO4	S	L	L	-	L	S	-	-	-	-	-	M	M	-	M
CO5	M	M	S	-	M	L	-	-	-	-	-	M	M	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Internet of Things Promises–Definition–Scope–Sensors for IoT Applications–Structure of IoT–IoT Map Device

SEVEN GENERATIONS OF IOT SENSORS TO APPEAR

Industrial sensors –Description & Characteristics–First Generation –Description & Characteristics–Advanced Generation –Description & Characteristics–Integrated IoT Sensors –Description & Characteristics–Polytronics Systems –Description & Characteristics–Sensors' Swarm –Description & Characteristics–Printed Electronics –Description & Characteristics–IoT Generation Roadmap

TECHNOLOGICAL ANALYSIS

Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

IOT DEVELOPMENT EXAMPLES

ACOEM Eagle –EnOcean Push Button –NEST Sensor –Ninja Blocks -Focus on Wearable Electronics

PREPARING IOT PROJECTS

Creating the sensor project -Preparing Raspberry Pi -Clayster libraries -Hardware-Interacting with the hardware -Interfacing the hardware-Internal representation of sensor values -Persisting data -External representation of sensor values -Exporting sensor data -Creating the actuator project-Hardware -Interfacing the hardware -Creating a controller -Representing sensor values -Parsing sensor data -Calculating control states -Creating a camera -Hardware -Accessing the serial port on Raspberry Pi -Interfacing the hardware -Creating persistent default settings -Adding configurable properties -Persisting the settings -Working with the current settings -Initializing the camera

REFERENCE BOOKS:

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 -2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things –From Research and Innovation to Market
4. Deployment', River Publishers, 2014
5. N. Ida, Sensors, 'Actuators and Their Interfaces', Scitech Publishers, 2014.
6. Qusay F. Hassan,'Internet of things a to z: technologies and applications' ,John Wiley and Sons Ltd,2018

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. L. K. Hema	Professor	ECE	hemalk@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandrang@vmkvec.edu.in
3	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
4	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECEC06	MEMS AND SENSORS	Category	L	T	P	Credits
		EC (PS)	3	0	0	3

PREAMBLE

To gain basic knowledge on MEMS (Micro Electro Mechanical System). This enables them to design, analyze, fabricate and test the MEMS based components.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To understand the concepts of basic MEMS structures.
2	To learn about the various MEMS Sensors and its construction.
3	To learn about the micro machining products.
4	To understand the functioning of various optical MEMS Sensors.
5	To study the various applications of MEMS Sensors

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Understand the basic fabrication of MEMS systems.	Understand
CO2. Design various MEMS sensors for required applications.	Apply
CO3.Apply the different micromachining process in MEMS sensor fabrication.	Apply
CO4. Analyze the light source utilization in MEMS sensors.	Analyze
CO5. Evaluate the various real time applications of MEMS Sensors.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	S	L	M	-	-	-	-	-	-	-	-	L	S	M	M
CO3	L	S	M	-	L	-	-	-	-	-	-	L	M	-	-
CO4	S	S	S	-	M	-	-	-	-	-	-	L	-	-	-
CO5	S	S	S	-	M	M	M	M	-	-	-	L	S	M	M

S – Strong; M – Medium; L – Low

SYLLABUS

INTRODUCTION

MEMS and Microsystems, Typical products of MEMS and Microsystem products, Micro sensors, Micro actuator, Evolution of Micro fabrication, Microsystems and Microelectronics, MEMS materials.

MICRO SENSORS AND MICROSYSTEMS

Micro sensors- Acoustic wave sensors, Biomedical Sensors and Biosensors, Optical Sensors, Pressure sensors, Micro actuation- Actuation using Thermal Forces, Piezoelectric Crystals,

Electrostatic Forces, MEMS with Micro actuators- Micro grippers , Micro motors , Micro valves, Micro accelerometers.

PRINCIPLES OF MICROMACHINING

Introduction, Photolithography, Bulk Micromachining, Thin Film Deposition, Etching, surface Micromachining, LIGA

.

OPTICAL MEMS

Fundamental Principle of MOEMS Technology, Review Properties of Light, Light Modulators, Beam Spliotter, Micro lens, Micro mirrors, Digital Micro mirror Device (DMD),Light Detectors, Grating Light Valve, Optical Switch.

REAL TIME UTILISATION OF MEMS SENSORS

Health Care, Micro fluid Dispenser, Micro needle, Micro pumps, Chem-Lab-On-A-Chip(CLOC), E-Nose, DNA sensors, Surface Acoustic Wave(SAW) Sensors.

TEXT BOOKS:

1. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002. Liu,"MEMS", Pearson education, 2000.
2. N. P. Mahalik, "MEMS",Tata McGraw hill, Sixth reprint, 2012.

REFERENCE BOOKS:

1. Stephen Santeria," Microsystems Design", Kluwer publishers, 2000.
2. Nadim Maluf," An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
3. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton, 2000

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in

17BMSE13	BIOMECHANICS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Biomechanics is the study of how the systems and structures of biological organisms, from the smallest plants to the largest animals, react to various forces and external stimuli. In humans, biomechanics often refers to the study of how the skeletal and musculature systems work under different conditions.Scientists often try to apply physics and other mathematically based forms of analysis to discover the limits and capabilities of biological systems.

PREREQUISITE - NIL

COURSE OBJECTIVES

1	Explain the principles of mechanics.
2	To study the fluid biomechanics of physiological systems.
3	Discuss the solidbiomechanics of physiological systems.
4	Explain the mechanics of joints.
5	Illustrate the mathematical models used in the analysis of biomechanical systems.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Discuss the principles of biomechanics.	Understand
CO2. Explain the fundamentals of biosolid mechanics in physiological systems	Understand
CO3. Apply the knowledge of joint mechanics.	Apply
CO4. Outline the bio fluid dynamics in biomechanical systems.	Analyze
CO5. Design computational mathematical modelling applied in biomechanics.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	--	--	--	--	--	--	--	--	--	--	M	--	--	--
CO2	M	--	--	--	--	--	--	--	--	--	--	M	--	--	--
CO3	S	M	--	--	--	--	--	--	--	--	--	S	M	--	M
CO4	S	S	--	M	--	L	--	L	M	--	--	S	M	--	M
CO5	S	S	S	S	M	M	--	M	M	--	M	S	S	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO MECHANICS

Introduction – Scalars and vectors, Statics – Force types, Resolution and composition of forces, Moments of force and couple, Resultant force determination, parallel forces in space, equilibrium of coplanar forces, Dynamics, Basic principles – Linear motion, Newton‘s laws of motion, Impulse and Momentum, Work and Energy Kinetics – Velocity and acceleration, Kinematics – Link segment models, Force transducers, Force plates, Introduction to Constitutive equations – Constitutive equations of Non-viscous fluid, Newtonian Viscous fluid and Hookean Elastic solid.

INTRODUCTION TO BIOFLUID MECHANICS

Intrinsic fluid properties – Density, Viscosity, Compressibility and Surface Tension, Viscometers Capillary, Coaxial cylinder and cone and plate, Rheological properties of blood, Pressure-flow relationship for Non-Newtonian Fluids, Fluid mechanics in straight tube – Steady Laminar flow, Turbulent flow, Flow development, Viscous and Turbulent Sheer Stress, Effect of pulsatility, Boundary Layer Separation, Structure of blood vessels, Material properties and modeling of Blood vessels, Heart – Cardiac muscle characterization, Native heart valves – Mechanical properties and valve dynamics, Prosthetic heart valve fluid dynamics.

BIOSOLID MECHANICS

Constitutive equation of viscoelasticity – Maxwell & Voight models, anisotropy, Hard Tissues – Structure, blood circulation, elasticity and strength, viscoelastic properties, functional adaptation, Soft Tissues – Structure, functions, material properties and modeling of Soft Tissues – Cartilage, Tendons and Ligaments Skeletal Muscle – Muscle action, Hill‘s models, mathematical modeling, Bone fracture mechanics, Implants for bone fractures.

BIOMECHANICS OF JOINTS

Skeletal joints, forces and stresses in human joints, Analysis of rigid bodies in equilibrium,Free body diagrams, Structure of joints, Types of joints, Biomechanical analysis of elbow, shoulder, spinal column, hip, knee and ankle, Lubrication of synovial joints, Gait analysis, Motion analysis using video.

MODELING AND ERGONOMICS

Introduction to Finite Element Analysis, finite element analysis of lumbar spine; Ergonomics-Musculoskeletal disorders, Ergonomic principles contributing to good workplace design, Design of a Computer work station, Whole body vibrations, Hand transmitted vibrations.

TEXT BOOKS:

1. Y.C. Fung, **“Bio-Mechanics-Mechanical Properties of Tissues”**, Springer-Verlag, 1998.
2. Subrata Pal, **“Text book of Biomechanics”**, Viva Books Private Limited, 2009.

REFERENCES:

1. Krishna B. Chandran, Ajit P. Yoganathan and Stanley E. Rittgers, **“Biofluid Mechanics: The Human Circulation”**, Taylor and Francis, 2007.
2. Sheraz S. Malik and Shahbaz S. Malik, **“Orthopaedic Biomechanics Made Easy”**, Cambridge University Press, 2015.
3. Jay D. Humphrey, Sherry De Lange, **“An Introduction to Biomechanics: Solids and Fluids, Analysis and Design”**, Springer Science Business Media, 2004.
4. Shrawan Kumar, **“Biomechanics in Ergonomics”**, Second Edition, CRC Press 2007.
5. Neil J. Mansfeild, **“Human Response to Vibration”**, CRC Press, 2005.
6. Carl J. Payton, **“Biomechanical Evaluation of movement in sports and Exercise”**, 2008.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. N.Babu	Professor	BME	babu@vmkvec.edu.in
2	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in
3	Ms.S.Mythrehi	Assistant Professor (Gr-I)	BME	mythrehi@avit.ac.in

17BMSE15	BIOMATERIALS AND ARTIFICIAL ORGANS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

A biomaterial is any substance that has been engineered to interact with biological systems for a medical purpose. These materials are synthesized in the laboratory using a variety of chemical approaches utilizing metallic components, polymers, ceramics or composite materials. It can be used every day in orthopedic application, dental applications, and surgery. The primary objective of this course is to impart the knowledge on biomaterials needed to solve challenges in the biomedical engineering.

PRERQUISITE : NIL

COURSE OBJECTIVES

1	To understand the properties of material for medical use.
2	To illustrate the applications of materials used in soft and hard tissue replacements.
3	To categorize classes of materials suitable for implant applications.
4	To outline the host response to the biomaterial and degradation of implant materials.
5	To the testing of material and analyze the various artificial organs.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Describe the characterization of material and different classes of biomaterials.	Understand
CO2. Illustrate the various soft tissue replacement and orthopedic implants in hard tissue replacements.	Apply
CO3. Illustrate the types, properties, manufacturing methods and applications of various biomaterials.	Analyze
CO4. Analyze the mechanism of host-tissue interaction and failure of materials.	Analyze
CO5. Analyze the protocol to test the biomaterials and the design criteria of artificial organs.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	--	--	--	--	--	--	--	M	--	--	M	--	--	--
CO2	M	M	M	--	-	--	--	--	S	--	--	S	--	--	--
CO3	S	S	--	--	--	L	--	--	S	--	--	S	M	M	M
CO4	S	S	--	--	--	M	--	--	S	--	--	S	M	M	M
CO5	S	S	M	--	--	M	--	--	S	--	--	S	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO BIOMATERIALS: Biomaterials – Definition, Classification of biomaterials, Structure of solids, Material characterization – Mechanical, thermal, Phase diagrams, Surface properties, Electrical, Optical, X-ray absorption, Acoustic and Ultrasonic, Density and porosity, Diffusion properties. Engineered natural materials, Technologies of biomaterials processing, Surface Coatings Methods, Surface modification of materials.

CLASSES OF BIOMATERIALS: Metals: Stainless steel, Cobalt-Chromium alloy, Titanium alloys. Polymers: Classification and Synthesis, Polyesters, Polyamides, Polyacrylates, Silicones, Hydrogels, Fluorocarbon polymers. Ceramics: Alumina, Zirconia, Hydroxyapatites. Composites as biomaterials.

SOFT AND HARD TISSUE APPLICATIONS: Sutures, Adhesives, Wound dressings, Maxillofacial and other Soft-tissue augmentation, Heart valve implant, Cardiovascular Grafts and Stents, Orthopedic fixation devices: Internal fixation devices- Wires, Pins, Screws, Fracture Plates and Intramedullary Devices. Joint replacement - Hip joint replacements, Knee joint replacements, Ankle joint replacement, Upper Extremity joint replacements, Dental implants.

HOST RESPONSE AND MATERIAL FAILURE: Host Reaction to Biomaterials - Inflammation, Wound healing, Foreign-body reaction, Blood–Materials Interactions. Degradation of Implanted Materials - Deterioration of polymers, Biodegradation of biostable and biodegradable polymers, Metal corrosion, Ceramic degradation. Device failure mode analysis.

BIOMATERIAL TESTING AND ARTIFICIAL ORGANS: Testing of biomaterials: In-vitro, In-vivo preclinical tests, Sterilization of implants and devices, Artificial Blood, Artificial skin, Artificial Heart, Artificial Kidney, Artificial lung (oxygenator), Artificial Pancreas, Eye and Ear implants.

TEXT BOOKS:

1. Joon park, R.S. Lakes, **"Biomaterials and introduction"**, 3rd Edition, Springer Science Business Media LLC, 2007.
2. BD Ratner, AS Hoffmann, FJ Schoen, JE Lemmons, **"An introduction to Materials in Medicine"**, 3rd Edition, Academic Press, 2013.

REFERENCES:

1. Sujata V. Bhatt, **"Biomaterials"**, Second Edition, Narosa Publishing House, 2005.
2. Joseph D. Bronzino, **"The Biomedical Engineering Hand Book"**, Second Edition, CRC Press LLC, 2000.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.K.Natarajan	Associate Professor	BME	natarajank@vmkvec.edu.in
2	Ms.B.Farhana Ansoor	Assistant Professor (G-I)	BME	farhanaansoor@avit.ac.in

17BMSE18	ROBOTICS & AUTOMATION IN MEDICINE	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

The purpose of learning this course on automation and robotics in medicine to acquire knowledge and understand the basic function and to create new application of robotic and automation system in medical field especially in surgery.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the basics of Robotics, Kinematics.
2	To understand the basics of Inverse Kinematics.
3	To explore various kinematic motion planning solutions for various Robotic configurations.
4	To study the basic inverse Kinematic motion planning solutions.
5	To explore various applications of Robots in Medicine.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Understand the basics of robotic systems.	Understand
CO2. Illustrate the application of automation and robotics in medicine.	Apply
CO3. Categorize the level of planning for various Robotic configurations.	Analyze
CO4. Compare Robotics system and formulate Kinematics.	Evaluate
CO5. Design Robotic systems for Medical application.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	--	L	L	--	--	--	--	L	--	--	M	--	M	M
CO2	S	--	M	M	--	--	--	M	M	--	--	S	M	M	M
CO3	S	S	S	M	M	--	L	M	M	--	L	S	M	M	M
CO4	S	S	S	S	S	S	M	S	S	M	M	S	S	M	S
CO5	S	S	S	S	S	S	M	S	S	M	S	S	S	S	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Introduction Automation and Robots, Classification, Application, Specification, Notations, Direct Kinematics Dot and cross products, Coordinate frames, Rotations, Homogeneous coordinates Link coordination arm equation – Five-axis robot, Four-axis robot, Six-axis robot.

KINEMATICS

Inverse Kinematics – General properties of solutions tool configuration, Five axis robots, Three Four axis, Six axis Robot, Workspace analysis and trajectory planning work envelope and examples, workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.

ROBOT VISION

Robot Vision Image representation, Template matching, Polyhedral objects, Shane analysis, Segmentation – Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured illumination, Camera calibration.

PLANNING

Task Planning Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp Planning, Fine-motion planning, Simulation of planar motion, Source and Goal scenes, Task Planner simulation.

APPLICATIONS

Applications in Biomedical Engineering – Bio Engineering, Biologically Inspired Robots, Neural Engineering, Application in Rehabilitation – Interactive Therapy, Bionic Arm, Clinical and Surgical – Gynaecology, Orthopaedics, Neurosurgery.

TEXT BOOKS:

1. Robert Schilling, "**Fundamentals of Robotics-Analysis and control"**, Prentice Hall, 2003.
2. J.J.Craig, **"Introduction to Robotics"**, Pearson Education, 2005.

REFERENCES:

1. Staugaard, Andrew C, **"Robotics and Artificial Intelligence: An Introduction to Applied Machine Learning"**, Prentice Hall Of India, 1987
2. Grover, Wiess, Nagel, Oderey, **"Industrial Robotics: Technology, Programming and Applications"**, McGraw Hill, 1986.
3. Wolfram Stadler, **"Analytical Robotics and Mechatronics"**, McGraw Hill, 1995.
4. Saeed B. Niku, **"Introduction to Robotics: Analysis, Systems, Applications"**, Prentice Hall, 2001.
5. K. S. Fu, R. C. Gonzales and C. S. G. Lee, **"Robotics"**, McGraw Hill, 2008.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.V.Prabhakaran	Assistant Professor (Gr-II)	BME	prabhakaran@avit.ac.in
2	Mr.R.Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in
3	Mr. S.Kannan	Assistant Professor	BME	kannan@vmkvec.edu.in

17BMSE22	CRITICAL CARE INSTRUMENTS AND THERAPEUTIC EQUIPMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This course is designed to enable students to understand the principles of monitoring of respiratory, cardiovascular and other systems of the patients in ICU. Many diagnostic and therapeutic devices such as ventilators, hemodialysis, pacemakers, infusion pumps, and deep-brain or spinal stimulators attempt to augment or, in some cases, replace certain critical physiological functionalities.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To describe the basic principles of monitoring system.
2	To identify the benefits and risks of ICU monitoring techniques.
3	To describe the functions of Pacemaker and defibrillator.
4	To understand the functions of therapeutic equipment.
5	To study ventilators and drug delivery systems.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Examine the critical care instruments.	Apply
CO2. Solve the critical situation.	Apply
CO3. Use the diathermy systems.	Apply
CO4. Illustrate hemodialysis and lithotripter techniques.	Analyze
CO5. Infer ventilator and drug delivery systems.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	--	M	--	L	M	S	M	--	--	S	--	--	--
CO2	S	S	--	M	--	L	M	S	M	S	--	S	--	--	--
CO3	S	S	--	M	--	L	--	--	M	--	--	S	--	--	--
CO4	S	S	--	S	--	M	--	--	S	--	--	S	M	M	S
CO5	S	S	--	S	--	M	--	--	S	--	--	S	M	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

CRITICAL CARE MONITORING SYSTEM

Objective of critical care monitoring system, cardiac monitor, Bed side monitoring system, Central monitors, Cardiac arrhythmia, Arrhythmia monitor, ST/AR arrhythmia algorithm, Ambulatory monitoring instruments, Fetal monitoring.

CARDIAC PACEMAKER AND DEFIBRILLATOR

Need for pacemaker. External pacemaker, Implantable pacemaker. Types of implantable pacemaker, Pacing modes, ventricular synchronous demand pacemaker, Power sources for implantable pacemaker.

Defibrillator – Need for defibrillator, Dc defibrillator, Implantable defibrillator, Pacer – cardioverter defibrillator, Defibrillator analyser.

ELECTRO THERAPHY AND SURGICAL DIATHERMY

Short wave diathermy, Microwave diathermy, Ultrasonic theraphy Unit, Electrotherapy, Pain relief through electrical stimulation. Principles of surgical diathermy, Types of electro surgery techniques, Surgical diathermy machine, Coagulation modes, Mono polar and bipolar technique, Electrodes used with surgical diathermy, Surgical diathermy analyzers.

HAEMODIALYSIS AND LITHOTRIPTOR

Function of kidney, Artificial kidney, Types of dialyzers, Performance analysis of dialyzer, Hemodialysis machine, Portable Kidney Machine. Lithotripter- Stone disease problem, First lithotripter machine, Modern lithotripter systems.

VENTILATORS AND DRUG DELIVERY SYSTEMS

Mechanics of Respiration, Ventilators, Ventilator terms, Classification of ventilators, Modern ventilator. Humidifier, Nebulizers and Aspirator. Drug delivery systems – infusion pomp, components of infusion pump, implantable infusion systems, Examples of typical infusion pumps.

TEXT BOOKS:

1. Khandpur R.S, **"Hand-book of Biomedical Instrumentation"**, Tata McGraw Hill, 2nd Edition, 2003.
2. Leslie Cromwell, Fred Weibell J, Erich Pfeiffer. A, **"Biomedical Instrumentation and Measurements"**, Prentice-Hall India, 2nd Edition, 1997.
3. Arumugam, M, **"Biomedical Instrumentation"**, Anuradha publications, 2008.

REFERENCES:

1. John G. Webster, **"Medical Instrumentation application and design"**, John Wiley, 3rd Edition, 1997.
2. Carr, Joseph J, Brown, John.M **"Introduction to Biomedical equipment technology"**, John Wiley and sons, New York, 4th Edition, 1997.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. N.Babu	Professor	BME	babu@vmkvec.edu.in
2	Ms.B.Farhana Ansoor	Assistant Professor (G-I)	BME	farhanaansoor@avit.ac.in
3	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in

17CSEC09	ETHICAL HACKING	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE
To analyze the basic concepts of security and hacking process

PREREQUISITE
NIL

COURSE OBJECTIVES

1	To understand Technical foundation of cracking and ethical hacking
2	To identify Aspects of security, importance of data gathering, foot printing and system hacking
3	To understand evaluation of computer security
4	To understand Practical tasks will be used to re-enforce and apply theory to encourage an analytical and problem based approach to ethical hacking
5	To discuss about security tools and its applications

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1: Identify and analyse the stages an ethical hacker requires to take in order to compromise a target system.	Understand
CO2: Identify tools and techniques to carry out a penetration testing.	Understand
CO3: Critically analyze security techniques used to protect system and user data.	Apply
CO4: Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.	Apply
CO5: To apply information security features in real time	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	-	-	-	-	S	-	-	-	M	M	M	-	M
CO2	M	M	S	M	-	-	-	-	-	-	L	M	M	-	M
CO3	M	M	M	M	-	M	-	L	-	-	L	-	M	M	M
CO4	M	S	M	-	-	M	-	-	-	M	-	M	M	M	M
CO5	M	M	-	-	S	M	-	L	-	-	M	M	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Introduction to Hacking, Types of Hacking, Hacking Process, Security – Basics of Security- Elements of Security, Penetration Testing, Scanning, Exploitation- Web Based Exploitation. Simple encryption and decryption techniques implementation.

HACKING TECHNIQUES

Building the foundation for Ethical Hacking, Hacking Methodology, Social Engineering, Physical Security, Hacking Windows, Password Hacking, and Privacy Attacks, Hacking the Network, Hacking Operating Systems- Windows & Linux, Application Hacking, Footprinting, Scanning, and Enumeration. Implementing System Level Hacking- Hacking Windows & Linux.

WEB SECURITY

Evolution of Web applications, Web application security, Web Application Technologies- Web Hacking, Web functionality, How to block content on the Internet, Web pages through Email, Web Messengers, Unblocking applications, Injecting Code- Injecting into SQL, Attacking Application Logic. Check authentication mechanisms in simple web applications. Implementation of Web Data Extractor and Web site watcher. Implementation of SQL Injection attacks in ASP.NET.

WIRELESS NETWORK HACKING

Introduction to Wireless LAN Overview, Wireless Network Sniffing, Wireless Spoofing, Port Scanning using Netcat, Wireless Network Probing, Session Hijacking, Monitor Denial of Service (DoS) UDP flood attack, Man-in-the-Middle Attacks, War Driving, Wireless Security Best Practices, Software Tools, Cracking WEP, Cracking WPA & WPA-II. Implementation- Locate Unsecured Wireless using Net-Stumbler/ Mini-Stumbler.

APPLICATIONS

Safer tools and services, Firewalls, Filtering services, Firewall engineering, Secure communications over insecure networks, Case Study: Mobile Hacking- Bluetooth-3G network weaknesses, Case study: DNS Poisoning, Hacking Laws. Working with Trojans using NetBus.

TEXT BOOKS

1. Stuart McClure, Joel Scambray, George Kurtz, "Hacking Exposed 6: Network Security Secrets & Solutions", Seventh edition, McGraw-Hill Publisher, 2012.

2. Kevin Beaver, "Hacking for Dummies" Second Edition, Wiley Publishing, 2007.

3. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws" Wiley Publications, 2007.

4. Ankit Fadia, "An Unofficial Guide to Ethical Hacking" Second Edition, Macmillan publishers India Ltd, 2006.

REFERENCES

1. Hossein Bidgoli, "The Handbook of Information Security" John Wiley & Sons, Inc., 2005.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.R.Jaichandran	Associate Professor(G-II)	CSE	rjaichandran@avit.ac.in
2	M. Annamalai	Assistant Professor	CSE	annamalaim@vmkvec.edu.in

17CSEC11	GREEN COMPUTING	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

To acquire knowledge to adopt green computing practices and To learn about energy saving practices

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To acquire knowledge to adopt green computing practices
2	To minimize negative impacts on the environment
3	To learn about energy saving practices
4	To learn about green compliance. And implementation using IT

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1: Explain the significance knowledge to adopt green computing practices	Understand
CO2: Design and develop the green asset used to minimize negative impacts on the environment	Apply
CO3: Identify an appropriate cooling technologies and infrastructure for optimizing the cost of data center operations	Apply
CO4: Make use of an knowledge about energy saving practices ,the impact of e-waste and carbon waste	Apply
CO5: Analyze about green compliance, implementation using IT and derive the case study.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	-	S	-	-	-	M	-	-	-	-	-	**S**	M	M
CO2	S	S	M	-	L	-	S	S	-	M	-	M	M	M	M
CO3	S	M	M	-	-	M	S	M	-	-	-	-	M	M	M
CO4	S	S	-	-	-	-	S	S	-	M	-	M	M	M	M
CO5	S	M	M	-	-	S	M	-	M	-	M	S	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

FUNDAMENTALS

Green IT Fundamentals: Business, IT, and the Environment – Benefits of a Green Data Centre - Green Computing:Carbon Foot Print, Scoop on Power–GreenITStrategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

GREEN ASSETS AND MODELING

Green Assets: Buildings, Data Centres, Networks, Devices, Computer and Earth Friendly peripherals, Greening Mobile devices – Green Business Process Management: Modelling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

GRID FRAMEWORK

Virtualizing of IT Systems – Role of Electric Utilities, Telecommuting, Teleconferencing and Teleporting – Materials Recycling – Best Ways for Green PC – Green Data Center – Green Grid Framework. Optimizing Computer Power Management, Systems Seamless Sharing Across. Collaborating and Cloud Computing, Virtual Presence.

GREEN COMPLIANCE

Socio-Cultural Aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, And Audits – Emergent Carbon Issues: Technologies and Future. Best Ways to Make Computer Greener.

GREEN INITIATIVES WITH IT and CASE STUDIES

Green Initiative Drivers and Benefits with IT - Resources and Offerings to Assist Green Initiatives. - Green Initiative Strategy with IT - Green Initiative Planning with IT - Green Initiative Implementation with IT - Green Initiative Assessment with IT. The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS

1.Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖,CRC Press, June 2011
2.Carl Speshocky, ―Empowering Green Initiatives with IT‖, John Wiley and Sons, 2010.

REFERENCES

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: Steps for the Journey‖, Shoff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on Regulations and Industry‖, Lulu.com, 2008.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	K.Karthik	Associate Professor	CSE	karthik@avit.ac.in
2	Mrs.T.Narmadha	Assistant Professor	CSE	narmadha@vmkvec.edu.in

17CSEC24	OPEN SOURCE SYSTEMS	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

The purpose of an open standard is to increase the market for a technology by enabling potential consumers or suppliers of that technology to invest in it without having to either pay monopoly rent or fear litigation on trade secret, copyright, patent, or trademark causes of action. No standard can properly be described as "open" except to the extent it achieves these goals.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Students will study common open source software licenses, open source project structure
2	To understand distributed team software development, and current events in the open source world
3	To learn free and open source components & tools
4	Students will also work on an open source project and will be expected to make a significant contribution

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1: Explain common open source licenses and the impact of choosing a license	Understand
CO2: Analyze the open source project structure and how to successfully setup a project	Analyze
CO3 Apply the linux based user profile, file security, and file link and management.	Apply
CO4: Knowledge of free and open source tools like libre office, open office.	Apply
CO5: Apply the libre office- presentation like create, open, adding slide, text, background.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	L	L	-	L	-	-	-	-	-	-	S	M	M	-
CO2	S	M	M	-	M	-	-	-	-	-	-	M	M	-	-
CO3	S	M	M	M	-	-	-	-	-	-	-	M	M	M	M
CO4	S	S	L	M	M	-	-	-	-	-	-	M	M	M	-
CO5	S	M	L	M	-	-	-	-	-	-	-	M	M	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

OPEN SOURCE LICENSING

Open Source Licensing, Contract, and Copyright Law-The MIT, BSD, Apache, and Academic Free Licenses-The GPL, LGPL, and Mozilla Licenses-Qt, Artistic, and Creative Commons Licenses-Non-Open Source Licenses.

OPEN SOURCE OPERATING SYSTEM

Linux history-distributions-licensing-installing Linux-working with directories-working with files-working with file contents-the Linux file tree. shell expansion: commands and arguments-control operators-shell variables-file globing. Pipes and commands: I/O redirection-filters -regular expressions. Introduction to vi – scripting: scripting introduction-scripting loops-scripting parameters

LINUX USER MANAGEMENT

local user management- introduction to users-user management-user passwords-user profiles -groups. file security: standard file permissions-advanced file permissions-access control lists-file links.

LIBRE OFFICE –WORD, SPREAD SHEET

Introduction of libre office- WRITER — THE WORD PROCESSOR: Opening a Document -Laying Out the Page-Setting paper size, margins, and orientation -Creating headers and footers -Numbering pages -Entering and Editing Text-Modifying text-Moving and copying text.

CALC — THE SPREADSHEET: Creating a Spreadsheet -Inputting Your Data -Entering your data -Editing your data -Filling cells automatically -Managing Columns and Rows-Copying, pasting, cutting, dragging, and dropping your cells -Adding the Art -Formula Basics.

LIBRE OFFICE- PRESENTATION

IMPRESS — THE PRESENTATION Creating a Presentation -Opening an existing presentation -Adding Slides - Adding text to a slide -Saving Your Presentation for Posterity - Making Presentations Picture Perfect -Adding Images - Clipping art -Drawing objects -Coloring Backgrounds - Creating a plain-colored background -Creating a gradient background.

TEXT BOOKS

1. Understanding Open Source and Free Software Licensing By Andrew M. St. Lauren , August 2004 , Pages: 207. (Unit I)

2. Linux study link : https://itsfoss.com/learn-linux-for-free/ (Unit II & Unit III).

3.https://www.libreoffice.org/assets/Uploads/Documentation/en/GS51-GettingStartedLO.pdf (Unit IV & V)

REFERENCES

1. Andy channelle (2009), “Beginning OpenOffice 3”, Aprèss.

2. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition, OReilly Media, 2009.

3. N. B. Venkateshwarlu (Ed); Introduction to Linux: Installation and Programming, B S Publishers; 2005.

4. Matt Welsh, Matthias Kalle Dalheimer, Terry Dawson, and Lar Kaufman, Running Linux, Fourth Edition, O'Reilly Publishers, 2002.

5. Carla Schroder, Linux Cookbook, First Edition, O'Reilly Cookbooks Series, 2004.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	K. Karthik	Assistant Professor	CSE	karthik@avit.ac.in
2	Mr.M.Annamalai	Assistant Professor	CSE	annamalaim@vmkvec.edu.in

17CSEC32	VIRTUAL REALITY	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE
This course provides a detailed understanding of the concepts of Virtual Reality and its application.

PREREQUISITE
NIL

COURSE OBJECTIVES

1	To Learn Geometric modeling and Virtual environment
2	To Learn Virtual Hardware and Software
3	To Learn Virtual Reality applications

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1: Differentiate between Virtual, Mixed and Augmented Reality platforms.	Understand
CO2: Identify appropriate design methodologies for immersive technology development, especially from a physiological perspective.	Apply
CO3: Demonstrate foundational literacy in designing gaming systems	Apply
CO4: Categorize the benefits/shortcomings of available immersive technology platforms.	Analyze
CO5: To apply the VR concepts to various applications	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	M	-	-	-	-	-	-	M	S	M	M
CO2	S	M	L	L	M	-	-	-	-	-	-	L	S	M	M
CO3	S	M	L	-	M	-	-	-	-	-	-	M	S	M	M
CO4	S	L	L	L	M	-	-	-	-	-	-	M	S	M	M
CO5	S	M	L	-	M	-	-	-	-	-	-	L	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics – Flight Simulation – Virtual environments –requirement – benefits of virtual reality- **3D Computer Graphics** : Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modelling – Illumination models – Reflection models – Shading algorithms

GEOMETRIC MODELLING

Geometric Modelling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - **Geometrical Transformations**: Introduction – Frames of reference – Modelling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection - **A Generic VR system**: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR System

CONTENT CREATION AND INTERACTION ISSUES

Gestalt perceptual organization - real world content - field of view - paradigm shift from real environment to virtual environment - reusing existing content - transition to VR content Human factors : Direct Vs Indirect Interaction - Modes and flow - Input device characteristics - viewpoint and control patterns.

DESIGN ISSUES

Optimizing performance - optimizing target hardware and software - **VR Hardware** : Introduction – sensor hardware – Head-coupled displays –Aquatic hardware – Integrated VR systems-**VR Software**: Introduction – Modelling virtual world –Physical simulation- VR toolkits - multiplayer environment - multiplayer networking architecture.

APPLICATION

Engineering – Entertainment – Science – Training – classroom.

TEXT BOOKS

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2002
2. Jason Jerald, "The VR book: Human centered design for virtual reality", CRC Press, 2015

REFERENCES

1. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology” , WileyInterscience,1 Edition,1994.
3. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 1st Edition,2002.
4. Jonathan Linowes, "Unity Virtual Reality Projects- Explore the world of virtual reality by building immersive and fun VR Projects using Unity 3D", Packt Publishing, 2015.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	S. Muthuselvan	Assistant Professor	CSE	muthuselvan@avit.ac.in
2	T.Geetha	Assistant Professor	CSE	geetha@vmkvec.edu.in

17CSEC30	UNIX INTERNALS	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

This talk is a brief guide to UNIX programming languages, tools and concepts. It is aimed at programming novices or programmers migrating from a Windows system. The aim is to introduce you to the concepts, the possibilities and the tools used in Unix programming.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand the design of the UNIX operating system
2	To become familiar with the various data structures used

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1: To learn The basic Unix operating systems and its basic commands.	Understand
CO2: To analyze the buffers and kernel representation.	Analyze
CO3: To analyze the UNIX system structure, system calls.	Analyze
CO4: To understand UNIX segmentation, scheduling, paging.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2	PSO3
CO1	S	M	L	L	M	-	-	-	-	-	-	M	-	M	-
CO2	S	M	L	L	M	-	-	-	-	-	-	M	M	M	-
CO3	S	M	L	-	L	-	-	-	-	-	-	M	M	M	-
CO4	S	M	L	L	M	-	-	-	-	-	-	M	M	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

General Review of the System-History-System structure-User Perspective-Operating System Services- Assumptions About Hardware. Introduction to the Kernel-Architecture System Concepts-Data Structures- System Administration

DISK BLOCKS

The Buffer Cache-Headers-Buffer Pool-Buffer Retrieval-Reading and Writing Disk Blocks - Advantages and Disadvantages. Internal Representation of Files-Inodes- Structure-Directories-Path Name to Inode- Super Block-Inode Assignment-Allocation of Disk Blocks -Other File Types

FILE SYSTEM

System Calls for the File System-Open-Read-Write-Lseek-Close-Create-Special files Creation -Change Directory and Change Root-Change Owner and Change Mode-Stat- Fstat-Pipes-Dup-Mount-Unmount-Link-Unlink-File System Abstraction-Maintenance.

PROCESS MANAGEMENT

The System Representation of Processes-States-Transitions-System Memory-Context of a Process-Saving the Context-Manipulation of a Process Address Space-Sleep Process Control-signals-Process Termination-Awaiting-Invoking other Programs-The Shell-System Boot and the INIT Process.

MEMORY MANAGEMENT

Memory Management Policies-Swapping-Demand Paging-a Hybrid System-I/O Subsystem-Driver Interfaces-Disk Drivers-Terminal Drivers.

TEXT BOOKS

1. Maurice J. Bach, "The Design of the Unix Operating System", Pearson Education 2002.

REFERENCES

1. UreshVahalia, "UNIX Internals: The New Frontiers", Prentice Hall, 2000.
2. John Lion, "Lion's Commentary on UNIX", 6th edition, Peer-to-Peer Communications, 2004.
3. Daniel P. Bovet & Marco Cesati, “Understanding the Linux Kernel”, O’REILLY, Shroff Publishers &Distributors Pvt. Ltd, 2000.
4. M. Beck et al, “Linux Kernel Programming

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr. S. Muthuselvan	Assitant Professor (G-II)	CSE	muthuselvan@avit.ac.in
2	V.Amirthalingam	Associate Professor	CSE	Amirthalingam@vmkvec.edu.in

17MESE32	COMPOSITE MATERIALS	Category	L	T	P	C
		EC(SE)	3	0	0	3

PREAMBLE

This course reviews the various composite materials their processing techniques and their behaviors , and to develop models and their applications in aerospace, automotive and medical fields

PREREQUISITE - NIL

COURSE OBJECTIVES

1	Understand about Fibre reinforced Plastics
2	Understand the manufacturing processes of the composite materials
3	Analyse about macro mechanical behavior of FRP
4	Analyse about micromechanical behavior of composite materials
5	Understand about material models of composites

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1 .Understand the types of reinforcements and fibers used in composite materials	Understand
CO2. Understand various manufacturing techniques in composite manufacturing	Understand
CO3. Analyse the macro mechanical behavior of Fiber Reinforced Plastics	Analyze
CO4. Analyse the Micro mechanical behavior of Fiber reinforced plastics	Analyze
CO5. Apply models for solving the composite material manufacturing	Apply

COS	PO 1	PO 2	PO 3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	**S**	-	**L**	-	-	**M**	**S**	-	-	-	-	-	M	M	-
CO2	**S**	-	**L**	-	-	**L**	**S**	-	-	-	-	-	M	M	-
CO3	**S**	**S**	**S**	**S**	**L**	**L**	**S**	-	-	-	-	-	M	M	-
CO4	**S**	**S**	**S**	**S**	**L**	**L**	**S**	-	-	-	-	-	M	M	-
CO5	**S**	**S**	**S**	**S**	**S**	**L**	-	-	-	-	-	-	M	M	-

S- Strong M-Medium L- Low

Syllabus

FIBRE REINFORCED PLASTICS (FRP)

Definition; Types; General properties and characteristics; Reinforcing materials – particles, fibers,

whiskers; Properties of reinforcing materials; Matrix materials; Additives; Properties of FRP materials; Applications

MANUFACTURING PROCESSES

Open mold processes – Hand layup, Spray up, Vacuum bag, Pressure bag & autoclave, Centrifugal casting,Filament winding; Closed mold processes – Compression molding, Resin transfer molding (RTM), Injection molding, Pultrusion; SMC & DMC products, etc.

MACROMECHANICAL BEHAVIOR OF FIBRE REINFORCED PLASTICS

Design variables; Selection of fiber-matrix and manufacturing process; Effects of mechanical, thermal, electrical and environmental properties, Fiber orientation, Symmetric and asymmetric structure; Effects of unidirectional continuous and short fibers; Lamination theory; Failure theories.

MICROMECHANICAL BEHAVIOR OF FIBRE REINFORCED PLASTICS

Strengthening methods, Elasticity of fibre composites, Plasticity and fracture of composites, Crack propagation in fibre composites, Failure under compressive loads.

MATERIAL MODELS

Law of Mixtures, Shear lag model,Laminated plate model, Eshelby's models, Other models.

Text Books:

1. Haslehurst.S.E., "Manufacturing Technology ", ELBS, London.

2. Krishnan K. Chawle. "Composite Material: Science and Engineering" Second Edition, Springer.

Reference:

1.. T.W.Clyne, P.J. Withers, "An Introduction to metal matrix composites", Cambridge University Press.

2. F.C. Campbell "Structural Composite Materials", Materials Park,ASM International,2010

Course Designers

S. No.	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	Dr.D.Bubesh Kumar	Associate Professor	Mechanical/ AVIT	bubeshkumarmech@gmail.com
2.	J.Santhosh	Assistant Professor	Mechanical/VMKVEC	santhosh@vmkvec.edu.in

17MESE19	PROCESS PLANNING AND COST ESTI MATION	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

This course reviews the various steps involved in process planning concepts and cost estimation for various products after process planning.

PREREQUISITE - NIL

COURSE OBJECTIVES

1	To know about Work study, Ergonomics
2	To demonstrate about process planning and its approaches.
3	To illustrate about elements of cost estimation.
4	To calculate the various Cost Estimation methods.
5	To analyze the total production cost estimation.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1	Understand the work study and ergonomics.	Understand
CO2	Demonstrate the various steps involved in process planning	Apply
CO3	Illustrate the various elements of cost estimation.	Apply
CO4	Apply the various cost estimation methods in production.	Apply
CO5	Analyze the cost estimation of various jobs involved in production	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO4	PO 5	PO6	PO 7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO1	PSO2	PSO3
CO1	S	L	L	L	-	-	-	-	-	-	L	-	M	L	-
CO2	S	M	M	M	-	-	-	-	-	-	M	-	M	L	-
CO3	S	M	M	M	-	-	-	-	-	-	M	-	M	L	-
CO4	S	M	M	M	-	-	-	-	-	-	S	-	M	L	-
CO5	S	M	M	M	-	-	-	-	-	-	S	-	M	L	-

S- Strong; M-Medium; L-Low

SYLLABUS

WORK STUDY AND ERGONOMICS:
Method study – Definition – Objectives-Motion economy- Principles – Tools and Techniques-Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard time –Ergonomics –principles – applications.

PROCESS PLANNING :
Definition – Objective – Scope – approaches to process planning- Process planning activities – Finished part requirements operating sequencesmachine selection material selection parameters- Set of documents for process planning Developing manufacturing logic and knowledge production time calculation – selection of cost optimal processes.

INTRODUCTION TO COST ESTIMATION:
Objective of cost estimation- costing – cost accounting- classification of cost-Elements of cost.

COST ESTIMATION:
Types of estimates – methods of estimates – data requirements and sources- collection of cost- allowances in estimation.

PRODUCTION COST ESTIMATION
Estimation of material cost, labour cost and over heads, allocation of overheads – Estimation for different types of jobs

TEXT BOOKS:
1. Sinha.B.P., "Mechanical Estimating and Costing", Tata McGraw-Hill, Publishing Co.2002

REFERENCES:
2. Russell.R.S and Tailor, B.W, "Operations Management", PHI, 4th Edition.
3. Chitale.A.V. and Gupta.R.C., "Product Design and Manufacturing", PHI, 2nd Edition.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	G.ANTONY CASMIR	Asst. Prof. - II	Mech/AVIT	antonycasmir@avit.ac.in
2	C THANGAVEL	Asst Prof	Mech/VMKVEC	thangavel@vmkvec.edu.in

17MECC15	FINITE ELEMENT ANALYSIS	Category	L	T	P	Credit
		CC	2	1	0	3

Preamble

Finite Element Analysis is an advanced computer technique based on numerical methods for solving wide variety of engineering problems. FEA can produce accurate, reliable approximate solutions, at a small fraction of the cost of more rigorous, closed-form analyses. This course provides the basic theoretical knowledge to competently perform finite element analysis for structural and thermal analyses. It also provides an introduction to the finite element analysis from engineering point of view.

Prerequisite

Strength of Materials.

Course Objective

1	To learn basic principles of finite element analysis procedure
2	Study the basics of Standard truss, beam, plane triangular and quadrilateral elements
3	Analysis of one and two-dimensional problems
4	Learn to model complex geometry problems and solution techniques
5	Understand the concepts of heat transfer and structural analysis

Course Outcomes: On the successful completion of the course, students will be able to

CO 1.	Solve the physical problem using functional approximation method.	Apply
CO 2.	Derive the shape functions and stiffness matrix for one dimensional structural and thermal problems	Apply
CO 3.	Derive the shape functions and stiffness matrix for two dimensional structural and thermal problems.	Apply
CO 4.	Derive the shape functions and stiffness matrix for Isoparametric elements.	Apply
CO 5.	Perform structural analysis of mechanical components like beams, trusses, corner bracket and plates	Apply
CO 6.	Perform thermal analysis of composite walss, composite cylinders and fins	Apply
CO 7.	Performm model and harmonic analysis of mechanical components like beams and spring-mass damper system	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1.	S	S	S	M	_	_	_	_	_	_	_	_	L	L	_

CO2.	S	S	S	M	_	_	_	_	_	_	_	_	L	L	_
CO3.	S	S	S	M	_	_	_	_	_	_	_	_	L	L	_
CO4.	S	S	S	M	_	_	_	_	_	_	_	_	L	L	_
CO5.	S	S	S	M	S	_	_	_	_	_	_	_	L	L	_
CO6.	S	S	S	M	S	_	_	_	_	_	_	_	L	L	_
CO7.	S	S	S	M	S	_	_	_	_	_	_	_	L	L	_

S- Strong; M-Medium; L-Low

SYLLABUS

BASIC CONCEPTS OF THE FINITE ELEMENT ANALYSIS

Basics of FEA, Derive the stiffness matrix of Spring, bar and beam elements – Derive the stiffness matrix of beam elements – Problems on spring and bar elements – Local and global coordinate systems – assembly of elements, calculation of element stress – simple applications, trusses, Drive the stiffness matrix – Problems on Trusses, stiffness matrix calculation, Member stress calculation.

VARIATIONAL AND WEIGHTED RESIDUAL APPROACHES

Variational problems, Euler's Equation – Problems on solving first order differential using 2-node 1D element – Example problems, solving first order differential equation using 1D-sub-parametric elements – Weighted residual approaches, Galerkin formulation and Point-collocation – Problems on Galerkin formulation and Point-collocation simple regular beam sections with different types of loads – Sub-domain collocation, Least-square minimization – Problems on Sub-domain collocation and Least-square minimization regular beam sections with different types of loads.

TWO DIMENSIONAL ISOPARAMETRIC ELEMENTS AND GAUSS NUMERICAL INTEGRATION

Natural coordinate systems – Interpolation function for Triangular Elements (CST, LST and QST) – Interpolation function for 4-node, 8-node and 9-node quadrilateral Elements – Element stiffness matrix formulation for two dimensional elements – Gauss Numerical Integration – Derivation of one point and two point formula (1D problems).

EIGEN VALUE PROBLEMS FOR ONE DIMENSION PROBLEMS (DYNAMIC CONSIDERATION)

Formulation – Hamilton's Principle – Characteristic polynomial Technique – Element mass matrix formulation for one dimensional Elements (2-node isoparametric and 3-node sup-parametric elements) – Problems for 1-D Problems to find eigenvalues and eigenvectors using 2-node isoparametric and 3-node isoparametric.

STEADY STATE HEAT TRANSFER ANALYSIS

Introduction, straight uniform fin analysis, Derivation 1D Element matrices – Problems on straight uniform fin analysis and Taper fin analysis Heat Flex Boundary Conditions – Analysis of uniform fins using 1D Quadratic Elements – Two Dimensional Steady state Problems using CST Elements – 1-D and 2-D simple Problems using any commercial FEA software.	
Text Books	
1	Hutton, D.V., "Fundamentals of Finite Element Analysis", McGraw Hill, International Edition, 2004.
2	Segerlind, L.J., "Applied Finite Element Analysis", John Wiley & Sons, 1984.
Reference Books	
1	Chandrupatla, T.R., Belegundu, A.D., "Introduction to Finite Elements in Engineering", Prentice Hall of Ind ia, 2002.
2	Zienkiewicz, O.C., "Finite Elements and Approximation", Dover International, 2006.
3	Cook R.D., Malkus, D.S., Plesha, M.E., Witt, R.J., "Concepts and Applications of Finite Element Analysis", 4th Edition, John Wiley & Sons, 2001.

Course Designers

S.No.	Faculty Name	Designation	Department/Name of the College	Email id
1	K.Vijayakumar	Assistant Professor	Mech / AVIT	vijayakumar@avit.ac.in
2.	J.Santhosh	Assistant Profesor	Mech/VMKVEC	santhosh@vmkvec.edu.in

17MESE05	WASTE ENERGY CONVERSION TECHNOLONGY	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

Preamble

This subject deals with various techniques involved in waste treatment, waste disposal and how to convert energy from that waste. Detailed study extends to the method of thermo chemical and bio chemical conversion techniques. Also deals a case study of environmental and health impact due to energy conversion from waste.

Prerequisite - NIL

Course Objective

1	To understand the waste and waste processes.
2	To understand waste treatment and disposal.
3	To apply the convert waste to energy from thermo chemical conversion.
4	To apply the convert waste to energy from bio chemical conversion.
5	To analysis the environmental impact due to waste with case study.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Known the types and source of waste	understand
CO2.	Familiarize the various waste treatment technique and disposal methods.	understand
CO3.	Apply the various techniques to convert waste to energy by thermo chemical conversion.	apply
CO4.	Apply various methods to convert waste to energy from bio chemical conversion.	apply
CO5.	Analyze the environmental and health impacts due to waste with case study.	analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	L	L	-	-	-	-	-	-	-	-	M	-	-
CO2	S	S	M	M	-	-	-	-	-	-	-	-	M	-	-
CO3	S	S	M	M	-	-	-	-	-	-	-	-	M	-	-
CO4	S	S	M	L	-	-	-	-	-	-	-	-	M	-	-
CO5	S	S	S	M	-	-	M	-	-	-	-	-	M	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO WASTE & WASTE PROCESSING

Definitions, sources, types and composition of various types of wastes; Characterisation of Municipal Solid Waste (MSW) , Industrial waste and Biomedical Waste (BMW), waste collection and transportation; waste processing-size reduction, separation; waste management hierarchy, waste minimization and recycling of MSW; Life Cycle Analysis (LCA), Material Recovery Facilities (MRF), recycling processes of solid waste.

WASTE TREATMENT AND DISPOSAL

Aerobic composting, incineration, different type of incineration; medical and pharmaceutical waste incinerations- land fill classification, types, methods and sitting consideration, layout and preliminary design of landfills: composition, characteristics, generation, movement and control of landfill leachate and gases, environmental monitoring system for land fill gases.

ENERGY FROM WASTE-THERMO CHEMICAL CONVERSION

Sources of energy generation, incineration, pyrolysis, gasification of waste using gasifiers, briquetting, utilization and advantages of briquetting,-environmental and health impacts of incineration; strategies for reducing environmental impacts.

ENERGY FROM WASTE- BIO-CHEMICAL CONVERSION

Anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, industrial waste, agro residues, anaerobic digestion- biogas production, land fill gas generation and utilization, present status of technologies for conversion of waste into energy, design of waste to energy plants for cities, small townships and villages.

ENVIRONMENTAL AND HEALTH IMPACTS-CASE STUDIES

Environmental and health impacts of waste to energy conversion, case studies of commercial waste to energy plants, waste to energy- potentials and constraints in India, eco-technological alternatives for waste to energy conversions - Rules related to the handling, treatment and disposal of MSW and BMW in India.

Text Books

1	Parker, Colin, & Roberts, "Energy from Waste An Evaluation of Conversion Technologies", Elsevier Applied Science, London, 1985.
2	Shah, Kanti L., "Basics of Solid & Hazardous Waste Management Technology", Prentice Hall, 2000.

Reference Books

1	Robert Green, From Waste to Energy, Cherry Lake Publication, 2009.
2	Velma I Grover and Vaneeta Grover, "Recovering Energy from Waste Various Aspects", Science Pub Inc, 2002.

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	R.CHANDRASEKAR	Assistant Professor	MECH / VMKVEC	chandrasekar@vmkvec.edu.in
2	R.MAHESH	Assistant Professor	MECH / AVIT	mahesh@avit.ac.in

17MEEC11	INDUSTRIAL ROBOTICS	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

To study the application of industrial robots and enhance the knowledge of students in industrial applications

PREREQUISITE - NIL

COURSE OBJECTIVES

1	To understand the Robotics and Robot drive system.
2	To Identify the controlling of Robots and devices system.
3	The Evaluate the latest technology of sensors used in robotics.
4	To classify the robot kinematics system.
5	To justify Application of robotics in industry.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1.	Understand the basics of Robot and its drive system.	Understand
CO2.	To Identify the steps involved in controlling system	Apply
CO3.	Demonstrate the various kinematics system used in robots.	Apply
CO4.	Demonstrate the various sensors used in robots.	Apply
CO5.	Apply the robot in day to day applications	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	L	M	M	M					S	M		
CO2	S	M	M	S	M	M	M					S	M		
CO3	S	S	S	S	M	M	M					S	M		
CO4	S	M	M	M	S	M	M					S	M		
CO5	S	S	S	S	S	S	S					S	M		

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION :

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems Hydraulic, Pneumatic

and Electric system Functions – Need for Robots – Different Applications.

END EFFECTORS AND ROBOT CONTROLS:

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions, Adaptive control.

ROBOT KINEMATICS:

Forward kinematics – Inverse kinematics – Differences: Forward kinematics and Reverse kinematics of manipulators with two and three degrees of freedom (In 2 dimensional), four degrees of freedom (In 3 dimensional) – Deviations and problems.

ROBOT SENSORS:

Sensor -principles and applications of the following types of sensors – Position of sensors (Piezo electric sensor, LVDT, Resolvers, Optical encoders, Pneumatic position sensors) – Range sensors (Triangulation principle, Structured, Lighting approach, Time of flight range finders, Laser range meters) – Proximity sensors (Inductive, Hall effect, Capacitive, Ultrasonic and Optical proximity sensors) – Touch sensors (Binary sensors, Analog sensors) – Wrist Sensors – Compliance Sensors – Slip Sensors.

INDUSTRIAL APPLICATIONS :

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments.

TEXT BOOKS:

1	K.S. Fu, R.C. Gonzalez, C.S.G. Lee, “Robotics – Control Sensing, Vision and Intelligence”, Tata McGraw-Hill Education.
2	Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012

REFERENCES:

1	Kozyrey, Yu. “Industrial Robotics” MIR Publishers Moscow.
2	Richard D.Klafter, Thomas A. Chmielewski and Michael Negin, “Robotic Engineering-An Integrated Approach”,Prentice Hall Inc,Englewoods Cliffs,NJ,USA

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	G.ANTONY CASMIR	Asst. Prof. - II	Mechanical, AVIT	antonycasmir@avit.ac.in
2	J.SANTHOSH	Assistant Professor	Mechanical/V MKVEC	santhosh@vmkvec.edu.in

17MESE25	COMPUTATIONAL FLUID DYNAMICS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

Preamble

This course introduces the finite difference methods as a means of solving different type of differential equations that arise in fluid dynamics. Fundamentals of numerical analysis, ordinary differential equations and partial differential equations related to fluid mechanics and heat transfer will be reviewed. Error control and stability considerations are discussed and demonstrated.

Prerequisite

1. Engineering Thermodynamics.
2. Fluid Mechanics and Machinery.
3. Heat and mass Transfer.
4. Numerical Methods.

Course Objective

1	To understand basic properties of computational methods
2	To introduce Governing Equations of viscous fluid flows
3	To enable the students to understand the various discretization methods and solution procedures.
4	To introduce numerical modeling and its role in the field of fluid flow and heat transfer
5	To learn computational solution techniques for time integration of differential equations and turbulence modeling.

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Discuss the basic properties of computational methods	Understand
CO2.	Discuss the Governing Equations of viscous fluid flows	Understand
CO3.	Determine the various discretization methods, solution procedures and turbulence modeling.	Apply
CO4.	Analyzes of numerical modeling and its role in the field of fluid flow and heat transfer.	Analyze
CO5.	Analyzes of computational solution techniques for time integration of differential equations	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	S	M	-	-	L	-	-	-	-	-	-	-	S	M	-
CO2	S	M	-	-	L	-	-	-	-	-	-	-	S	M	-
CO3	S	M	L	M	M	-	-	-	-	-	-	-	S	M	-
CO4	S	S	L	M	S	-	-	-	-	-	-	-	S	M	-
CO5	M	S	L	M	S	-	-	-	-	-	-	-	S	M	-

S- Strong; M-Medium; L-Low

SYLLABUS
INTRODUCTION
Computational Fluid Dynamics, Advantages, Applications, Future of CFD. Problem set up-pre-process, Numerical solution – CFD solver
GOVERNING EQUATIONS FOR CFD
Introduction, the continuity equation, the momentum equation, the energy equation, the additional equations for turbulent flows, generic form of the governing equations for CFD, boundary conditions.
CFD TECHNIQUES
Derivation of finite difference equations – Simple Methods – General Methods for first and second order accuracy- Finite volume formulation for steady state One, Two and Three -dimensional diffusion problems
FLOW FIELD ANALYSIS
Finite volume methods -Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, SIMPLE algorithm and its variants – PISO Algorithms.
TURBULENCE MODELS AND MESH GENERATION
Turbulence models, mixing length model, Two equation (k-Є) models – High and low Reynolds number models – Structured Grid generation – Unstructured Grid generation – Mesh refinement – Adaptive mesh – Software tools.

Text Books	
1	Versteeg, H.K., and Malalasekera, W.,"An Introduction to Computational Fluid Dynamics": The finite volume Method, Pearson Education Ltd. Third Edition – 2014.
2	Ghoshdastidar, P.S., "Computer Simulation of flow and heat transfer", Tata McGraw Hill Publishing Company Ltd.,
Reference Books	
1	John D. Anderson "Computational Fluid Dynamics - The basics with Applications", McGrawHill International Editions.
2	Anil W. Date, "Introduction to Computational Fluid Dynamics", Cambridge University Press, Reprinted 2010.
3	Yogesh Jaluria & Kenneth E. Torrance, "Computational Heat Transfer", CRC press, 2nd Edition.
4	John. F. Wendt, "Computational Fluid Dynamics – An Introduction", Springer, Third Edition, 2013.

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	S.PRAKASH	Assistant Professor (Gr-II)	Mech / AVIT	prakash@avit.ac.in
2	R CHANDRASEKAR	Assistant Professor	Mech / VMKVEC	chandrasekar@vmkvec.edu.in

17MESE20	RAPID PROTOTYPING AND TOOLING	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

This course provides to impart knowledge of the Rapid Prototyping and Tooling techniques, which is one of the recent manufacturing technologies.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To understand the history and development for rapid product development.
2	To discuss the various techniques of solid based process for rapid production.
3	To discuss the various techniques of based process for rapid production.
4	To discuss the various tooling used for Rapid manufacturing tooling techniques.
5	Optimize FDM process parameters to improve the quality of the parts.

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1.	Understand the working principle and various RPT techniques.	Understand
CO2.	Explain the various solid and liquid based methods for RPT techniques used to select suitable process.	Apply
CO3.	Explain the various powder based methods for RPT techniques used to select suitable process.	Apply
CO4.	Apply the tooling and molding devices used for RPT machining operations.	Apply
CO5.	Gain application oriented knowledge related to RPT in Reverse Engineering application process	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	-	-	-	-	-	-	-	-	-	M	L	-
CO2	S	M	L	-	M	-	-	-	-	-	-	-	M	L	-
CO3	S	M	M	-	M	-		-	-	-	-	-	M	L	-
CO4	S	S	S	-	M	-	-	-	-	-	-	-	M	L	-
CO5	S	S	S	-	M	-	-	-		-	-	-	M	L	-

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION

History – Development of RP systems – RP process chain - Impact of Rapid Prototyping on Product Development –Digital prototyping - Virtual prototyping-Rapid Manufacturing- Principle – Fundamental – File format – Other translators-Data Processing for Rapid Prototyping: CAD model preparation, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

LIQUID AND SOLID BASED PROCESS:

Classification – Liquid based system – Stereolithography (SLA)-Solid Ground Curing (SGC)- products, Advantages, Limitations, Applications and Uses. Solid based system – Fused Deposition Modeling- Laminated Object Manufacturing-Multi Jet Modeling System-principle, process, products, advantages, applications and uses

POWDER BASED PROCESS

Selective Laser Sintering – Three Dimensional Printing – Direct shell production casting –Laser Engineered Net Shaping (LENS)- -Direct Metal Deposition-Principle-Materials-process- products,-advantages- limitations-applications

RAPID TOOLING

Introduction-Need-Types -Advantages-Applications-Indirect rapid Tooling-silicone Rubber Tooling-Spray metal tooling-RSP Tooling-Reaction Injection Moulding-Direct Rapid Tooling-Direct AIM-DMLS-Copper Polyamide-Laminated Tooling

REVERSE ENGINEERING

Introduction-concept of Reverse Engineering - Generic Process - Scanning-measuring device- contact type and non-contact type -Point Processing- CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing – types of medical imaging, software for making medical models, medical materials, other applications

TEXT BOOKS:

1. Rafiq I. Noorani, Rapid Prototyping, “Principles and Applications”, Wiley & Sons, 2006.
2. Chua C.K, Leong K.F and Lim C.S, “Rapid Prototyping: Principles and Applications”, Second Edition, World Scientific, 2003.

REFERENCES:

1. N.Hopkinson, R.J.M, Hauge, P M, Dickens, “Rapid Manufacturing – An Industrial revolution for the digital age”, Wiley, 2006
2. Ian Gibson, “Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototying”, Wiley, 2006
3.Paul F.Jacobs, “Rapid Prototyping and Manufacturing : Fundamentals of Stereolithography”, McGraw Hill 1993.
4.Pham. D.T., and Dimov. S.S., “Rapid Manufacturing”, Springer Verlog 2001.

S.No	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	SAMUVEL MICHAEL	Asst.Prof	MECH/AVIT	samuvelmichael@avit.ac.in
2	S. ARUNKUMAR	Asst.Prof.	MECH/VMKVEC	arunkumar@vmkvec.edu.in

D. Project + Internship + Industry Electives

17ATPI01	PROJECT WORK AND VIVA VOCE	Category	L	T	P	C
		PI	0	0	18	9

OBJECTIVE

- The objective of the project work is to enable the students to form the groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.

- Formation of Group as follows
  - Category A : 8.5CGPA and above
  - Category B : 7 to 8.49 CGPA
  - Category C : 5 to 6.9 CGPA

  A group will be formed with atleast one student from each category.

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.

- This final report shall be typewritten form as specified in the guidelines.

- The continuous assessment shall be made as prescribed in the regulations

17MEP103	NOISE VIBRATION & HARSHNESS	Category	L	T	P	Credit
		PI	3	0	0	3

PREAMBLE

This course reviews the fundamental concepts of acoustics, noise propagation and vibrations. Focus is given to the theory and equipments pertaining to the measurement of automotive acoustics, sound quality and vibrations.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To introduce source of noise and vibration
2	To broaden the understanding of sound measurement and human sensitivity
3	To underline the importance of simulation, anechoic chamber and acoustic holography
4	To broaden the importance of statistical and frequency analysis
5	To introduce active control techniques

COURSE OUTCOMES

On the successful completion of the course, students will be able to

CO1. Understand the sources of noise and vibration	Understand
CO2. Illustrate sound intensity and human sensitivity	Apply
CO3. Apply methods to model the advanced acquisition techniques	Apply
CO4. Demonstrate active control techniques	Apply
CO5. Demonstrate the automotive noise sources	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	S	M	M	L	--	L	L	--	--	--	--	--	M		
CO2	S	M	M	M	M	L	L	--	--	--	--	--	M		
CO3	S	S	S	S	S	M	M	--	--	--	--	--	M		
CO4	S	S	S	S	S	M	M	--	--	--	--	--	M		
CO5	S	S	S	S	S	S	S	--	--	--	--	--	M		

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS OF VIBRATION ANALYSIS: Basic Concepts, Formulating the Equations of Motion, Free Undamped Vibrations- Free Damped Vibrations - Logarithmic Decrement, Forced Vibrations, Magnification Factor - Torsional System Characteristics, Single Disc And Two Disc- Two Degree of Freedom Systems under Harmonic Force, Modal Analysis- Coordinate Coupling.

NVH IN THE AUTOMOTIVE INDUSTRY: Sources of noise and vibration. Design features. Common problems. Marque values. Noise quality. Pass-by noise requirements. Target vehicles and objective targets. Development stages in a new vehicle programme and the altering role of NVH engineers.

SOUND AND VIBRATION THEORY: Sound measurement. Human sensitivity and weighting factors. Combining sound sources. Acoustical resonances. Properties of acoustic materials. Transient and steady state response of one degree of freedom system applied to vehicle systems. Transmissibility. Modes of vibration.

NVH MEASUREMENTS: Vibration and Noise Standards – Pass/Drive by Noise-Test Site- Meteorological Condition-Constant Speed Test- Wide Open Throttle Test - Interior Noise Test- Standards – Test Track Condition – Vehicle Operating Condition –Steady Speed – Full Throttle Test –Stationery Test- Microphone Positions.- Stationery Vehicle Test- Standards- Test Site- Preparation of The Vehicle-Vehicle Operating Condition.- NVH Measurement Tools And Techniques- Vibration and Noise Measurement Transducers.- Advanced Acquisition Techniques.

AUTOMOTIVE NOISE SOURCES AND CONTROL TECHNIQUES: Methods for Control of Engine Noise-Control Measures- Mufflers, Transmission Noise- Control Methods.- Intake And Exhaust Noise – Attenuation Of Intake and Exhaust Noise- Dissipative Silencers – Reactive Silencers – Resonators - Aerodynamic Noise, Its Sources And Control Methods- Tire Noise And Their Control Methods, Brake Noise.- Noise Control Strategy, Noise Control At Source.- Noise Control Along The Transmission Path- Barriers, Enclosures, Resonators.

TEXT BOOKS:

1. Singiresu S. Rao, "*Mechanical Vibrations*" 5th Edition, Pearson, September , 2010
2. Ambekar, A. G., "*Mechanical Vibrations and Noise Engineering*", Prentice Hall of India, New Delhi, 2006
3. Manasi P. Joshi, "*Noise &Vibration Measurement Techniquesin Automotive NVH*"2012

REFERENCES:

1. Beranek, L. L. and Ver, I, L., "*Noise and Vibration Control Engineering –Principles and Application*", John Wiley & Sons, Inc, 1992.
2. Malcolm J. Crocker, *"Handbook of Noise and Vibration Control"* John Wiley & Sons, Inc 2007

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	SHIVAKUMAR N	Asst. Prof. - II	Mechanical, AVIT	shiva.thermal@gmail.com
2	N. Rajan	Assoc. Prof.	Mech/VMKVEC	rajan@vmkvec.edu.in

17MEPI04	NON-DESTRUCTIVE TESTING	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

Prerequisite

NIL

Course Objective

1	To expose to the concept of overview of NDT
2	To familiarize with the applications of differential equations, surface NDE Methods
3	To understand the concept of thermography and Eddy current testing
4	To understand the concept of ultrasonic testing and acoustic emission
5	To understand the concept of Radiography (RT)

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Explain the concept of overview of NDT	Understand
CO2.	To familiarize with the applications of differential equations, surface NDE Methods	Understand
CO3.	Experiment with the concept of thermography and Eddy current testing	Apply
CO4.	Experiment with the concept of ultrasonic testing and acoustic emission	Apply
CO5.	Experiment with the concept of Radiography (RT)	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	-	L	M		-	-	-	-	-	-	-	M	L	-
CO2	S	M	M	M	L	-	-	-	-	-	-	-	M	L	-
CO3	S	L	M	M	M	-	-	-	-	-	-	-	M	L	-
CO4	S		S	S	M	-	-	-	-	-	-	-	M	L	-
CO5	S	M	L	M		-	-	-	-	-	-	-	M	L	-

S- Strong; M-Medium; L-Low

SYLLABUS
OVERVIEW OF NDT
NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterization. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided
SURFACE NDE METHODS
Liquid Penetrant Testing – Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results. Magnetic Particle Testing- Theory of magnetism, inspection materials Magnetisation methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.
THERMOGRAPHY AND EDDY CURRENT TESTING
Thermography- Principles, Contact and non contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation – infrared radiation and infrared detectors, Instrumentations and methods, applications.Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.
ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)
Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Acoustic Emission Technique –Principle, AE parameters, Applications
RADIOGRAPHY (RT)
Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films – graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography
Text Books
1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House. 2.Ravi Prakash, "Non-Destructive Testing Techniques", 1st revised edition, New Age International Publishers.
Reference Books
1.ASM Metals Handbook,"Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17. 2.Paul E Mix, "Introduction to Non-destructive testing: a training guide", Wiley, 2nd Edition New Jersey 3.Charles, J. Hellier," Handbook of Nondestructive evaluation", McGraw Hill, New York.
Course Designers

S.No	Faculty Name	Designation	Department/ Name of the College	Email id
1	S.ASHOKKUMAR	Asst.Professor G-II	Mech / Avit	ashokkumar@avit.ac.in

17MEP105	COAL MINING AND MECHANIZATION	Category	L	T	P	Credit
		PI	3	0	0	3

Preamble

This course enable the students to understand the various mining methods, methods of gasification and design of various machineries.

Prerequisite

NIL

Course Objective

1	Understand the recent trends of level of mechanisation for coal face
2	Understand the various advanced methods of coal mining
3	Understand basic mining using hydraulics
4	Apply the Concepts, Methodology at appropriate Mining techniques
5	Analyze the failure modes, Process, safety and criticality in design of underground mines

Course Outcomes: On the successful completion of the course, students will be able to

CO1.	Explain the basic concept of coal mining and types	Understand
CO2.	Describe the problems faced during mining operation from past experiences	Understand
CO3.	Explain the basic requirements, equipments and machinery for mining operation	Understand
CO4.	Apply the Concepts, Methodology at appropriate Mining techniques	Apply
CO5.	Analyze the failure modes, Process, safety and criticality in design of underground mines	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	L	-	-	-	-	-	-	-	-	-	-	L	-	-
CO2	S	S	M	S	-	S	-	-	-	-	-	-	L	-	-
CO3	S	L	L	-	-	-	-	-	-	-	-	-	L	-	-
CO4	S	M		L	-	-	M	-	-	-	-	-	L	-	-
CO5	S	S	S	M	L	S	S	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

COAL FACE MECHANISATION
Introduction to Coal mining - Recent Trends, mechanised board and pillar mining, case studies.
MINING OF THICK SEAMS
Problems, past experiences in India, current methods, mining of thick, contiguous, and steep seams
HYDRAULIC MINING
Applicability, operating parameters, equipment, layouts, Indian experience. Computer applications such as remote control and environmental monitoring in hydraulic mining.
LONGWALL MINING
Powered supports, development of powered supports, their types and designs, selection for different conditions, last drivages for longwall panelling, remotely operated powered support and longwall faces, Indian experiments, salvaging in longwall.
UNDERGROUND COAL GASSIFICATION
Scope, application, methods of gasification, design of gasification plants, coal bed methane. Environmental monitoring techniques and computer applications in coal gasification techniques.

Text Books	
1	Das S.K., Modern Coal Mining Technology, Lovely Prakashan, Dhanbad,
2	Singh, T.N., and Dhar, B.B. Thick Seam Mining, Problems and Issues, Oxford & IBH Publishers,

Reference Books	
1	Mathur, S.P., Mining Planning for Coal, M G Consultants, Bilaspur, Peng S.S. and Chiang,
2	H.S., Longwall Mining, John Willey and Sons, New York,
3	T.N. Singh, Underground Winning of Coal, Oxford IBH Publishers.
4	R.D. Singh, Principles and Practices of Modern Coal Mining, New Age International,

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	N.Rajan	Associate Professor	Mech / VMKVEC	rajann@vmkvec.edu.in
2	P.KUMARAN	ASST. PROF –GR-II	Mech / AVIT	kumaranp@avit.ac.in

E. Employability Enhancement Courses

VINAYAKA MISSIONS KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM
VINAYAKA MISSIONS RESEARCH FOUNDATION
(DEEMED TO BE UNIVERSITY)
DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY ORIENTED ENTREPRENEURIAL SKILL DEVELOPMENT PROGRAMME

Name of the Course – TWO AND FOUR WHEELER SERVICING (Automotive Servicing)

Aim	*The aim of the programme is to create skilled entrepreneurs in automotive servicing sector.*
Attribute	*Exposure to servicing of all types of automotive vehicles involving servicing of various components and their maintenance, providing an opportunity to sharpen their skills and acquire sufficient knowledge in the modern automotive sector.*
Objective	1. *To impart knowledge on different types of vehicles and their maintenance.* 2. *To provide hands on training in maintenance of modern vehicles.*

S.No	Content	Duration In Hours
1	Health and Safety requirements of a repair workshop	3
2	Engine Types and Configurations and Maintenance procedures	3
3	Lighting and Auxiliary Systems	3
4	Braking system (Cleaning & lining Replacement)	3
5	Steering System (Alignment)	3
6	Cooling System (Radiator)	3
7	Vehicle Starting and Charging System	3
8	Spark plug Cleaning, Replacing & Timing Adjustment	3
9	Lubrication Systems (Types of Oil changing)	3
10	Valve Cleaning, Replacing & Timing Adjustment	3
11	Carburetor Cleaning	3
12	Air and Oil filter cleaning	3
13	Exhaust pipe cleaning	3
14	Clutch ply adjustment & Plate replacement	3
15	Tyre replacement & Puncture work	3
16	Field Visit to the Automotive Authorized Servicing Center	5
	Total Hours	**50**

Outcome *The technical Skills and knowledge acquired will help the student to undertake maintenance work of modern vehicles with confidence in Automotive Service Sector.*

Job Opportunities
- *Automotive Service Sector(LCV, HCV and 2&3 wheelers)*
- *Entrepreneurs by initiating Startups in Automotive Service Sector.*

Resource Persons:
Prof. T. Raja, Associate Professor
Prof. R.prabhakar, Associate Professor
Prof. R. Chandrasekar, Assistant Professor

Technical Assistance: Mr. A. Palaniappan

17MEEE01	CNC Programming
Aim	*The aim of the course is to create skilled entrepreneurs in modern manufacturing sector.*
Attribute	*1. Understand the various machining processes using CNC machine tools.* *2. Acquire the knowledge in CNC practical applications.* *3. Apply the knowledge in CNC programming for applications.*
Objective	*1. To impart knowledge on CNC programming and CAM software.* *2. To provide hands on training in CNC trainer machines.*

Syllabus:

Introduction:	**6 Hrs**
1. Study of G and M codes	
2. Manual Part Programming for CNC Machines.	
3. Machining practice on CNC Machines..	
4. Simulation of tool path using any CAM Software	
Part programming in CNC Milling:	**15 Hrs**
1. Point to point motions	
2. Linear motions	
3. Circular interpolations	
4. Contour motions	
5. Rectangular pocketing	
6. Mirroring	
7. Circular Pocketing	
8. Fixed /canned cycles	
9. Subroutines	
Part programming in CNC Turning :	**15Hrs**
1. Turning and facing	
2. Step turning and Taper Turning	
3. Grooving	
4. Fixed/Canned Cycles	
5. Thread cutting Cycles	
6. Peck Drilling Cycles	
Field Visit to Industries using modern manufacturing Process:	**4 Hrs**

Total Hours – 40

Outcome	*The students undergoing the programme will be equipped with the required skill and knowledge to undertake complex machining work using CNC machines.*
Job Opportunities	➢ *In modern industries using advanced machine tools for manufacture of precision components.* ➢ *Entrepreneur by initiating Startups in Manufacturing Sector.*

Course Designers

S.No	Faculty Name	Designation	Department / College	Email id
1	**Mr.M.Saravanan**	Asst.Prof.	Mech/VMKVEC	saravanan@vmkvec.edu.in
2	Ms.S.Sangeetha	Asso.Prof.	Mech/AVIT	sangeetha@avit.ac.in

VINAYAKA MISSIONS KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM
VINAYAKA MISSIONS RESEARCH FOUNDATION
(DEEMED TO BE UNIVERSITY)
DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY ORIENTED ENTREPRENEURIAL SKILL DEVELOPMENT PROGRAMME

Name of the Course – 17MEEE02 – DESIGN AND FABRICATION OF FIBRE REINFORCED COMPOSITES (HANDS ON TRAINING)

Aim	*The aim of the course is to create skilled entrepreneurs in fabrication of fibre reinforced composites.*
Objective	*1. To impart knowledge on different types of composite materials.* *2. To provide hands on training in fabrication of fibre reinforced composite materials.*

S.No	Content	Duration In Hours
1	Introduction to Composite Materials.	2
2	Classification of Composite Materials.	3
3	Different types of Manufacturing processes of composite Materials	3
4	Mechanical behavior of Fibre reinforced Composite Materials	3
5	Introduction to Open Mould Processes	3
6	Hand Lay-up Method	3
7	Properties of different types of Resins, Fibres and accessories.	3
8	Manufacturing of Fibre reinforced composites by using different Mould shapes.	30
	Total Hours	**50**

Outcome	*The technical Skills and knowledge acquired will help the student to undertake fabrication of different fibre reinforced composite materials.*
Job Opportunities	➢ *Automotive Sector* ➢ *Entrepreneurs by initiating Startups in Manufacturing Sector.*

Course Designers

S.No	Faculty Name	Designation	Department / College	Email id
1.	Mr. J.Sathees Babu	Asso.Prof.	Mech/VMKV EC	satheesbabu@vmkvec.edu.in
2.	Dr.D.BUBESH KUMAR	Asso.Prof	Mech/AVIT	dbubeshkumar@avit.ac.in

VINAYAKA MISSIONS KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM
VINAYAKA MISSIONS RESEARCH FOUNDATION
(DEEMED TO BE UNIVERSITY)
DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY ORIENTED ENTREPRENEURIAL SKILL DEVELOPMENT PROGRAMME

Name of the Course – STRUCTURAL AND THERMAL ANALYSIS – ANSYS (HANDS ON TRAINING)

Aim	*The aim of the programme is to create knowledge and skills in simulation and analysis in the area of Structural and Thermal related problem.*
Attribute	*1. Ability to understand the various simulation and analysis software.* *2. Applying the acquired skills and knowledge in Industrial applications.*
Objective	*1. To impart knowledge on different software like ANSYS and FLUENT.* *2. To provide various industrial oriented problems and solutions.*

S.No	Content	Duration In Hours
1	Introduction to Simulation and Analysis and its Importance.	2
2	Introduction to ANSYS software and its basic commands.	2
3	Structural analysis of simple mechanical components.	4
4	Structural analysis of Truss	4
5	Thermal analysis of heat transfer based problems	4
6	Structural and thermal analysis of mechanical Equipments	6
7	Introduction to FLUENT software	2
8	Thermal and Flow analysis of Heat exchangers and IC Engines.	6
	Total Hours	**30**

Outcome	*The technical Skills and knowledge acquired will help the student to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration.*
Job Opportunities	➢ *Job on Design and Analysis based company.* ➢ *Students will do consultancy work to various small scale industries.*

Course Designers				
S.No	**Faculty Name**	**Designation**	**Department / College**	**Email id**
1.	R. Chandrasekar	Asst.Prof.	Mech/VMKV EC	rchandrasekar@vmkvec.edu.in
2.	N. Lakshminarayanan	Asso.Prof	Mech/AVIT	nlakshminarayanan@avit.ac.in