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

Faculty of Engineering and Technology

REGULATIONS 2021

Programme:

B.E. – MECHATRONICS

Full Time (4 Years)

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM

(Semester I to VIII)

DEPARTMENT OF MECHATRONICS

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 Mechatronics Engineering programme will be able to:

Sl. No.	Description
PSO 1	Have a strong foundation in science and focus in mechanical, electronics, control, software and computer engineering, and a solid command of the newest technologies.
PSO 2	Be able to design, analyze, and test "intelligent" products and processes that incorporate appropriate computing tools , sensors, and actuators.
PSO 3	Be able to work efficiently in multidisciplinary teams.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

Sl. No.	Description
PEO1	The Programme will prepare graduates to synergistically integrate mechanical engineering with electronic and intelligent computer control in the design and manufacture of industrial products and processes.
PEO2	The Programme will prepare graduates with strong team skills to solve multidisciplinary problems using Mechatronics approach.
PEO3	The Programme will prepare graduates with an understanding of their ethical and social responsibility.

VINAYAKA MISSION'S RESEARCH FOUNDATION
(DEEMED TO BE UNIVERSITY), SALEM

DEPARTMENT OF MECHATRONICS

CURRICULUM FOR REGULATION-2021

Credit Requirement for the Course Categories

Sl. No.	Category of Courses	Types of Courses		Suggested Breakup of Credits (min-max)
1.	A. Foundation Courses	Humanities and Social Sciences including Management Courses		9 – 12
2.		Basic Science Courses		18 – 25
3.		Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.		18 – 24
4.	B. Professional	Core Courses		48 – 54
5.	C. Elective Courses	Professional Electives		12
		Industry Designed/ Industry Supported/ Industry Offered/ Industry Sponsored Courses		6
		Open Electives	Innovation, Entrepreneurship, Skill Development etc.	6 – 9
			Emerging Areas like 3D Printing, Artificial Intelligence, Internet of Things etc.	6 – 9
6.	D. Courses for Presentation of technical Skills related to the specialization	Project Work		8
		Mini Project		3
		Seminar		1
		Internship in Industry or Elsewhere		3
7.	**E. Mandatory Courses	Yoga and Meditation, Gender Equity and Law, Essence of Indian Traditional Knowledge, Indian Constitution, NCC/NSS/ RRC/ YRC/ Student Clubs/ Unnat Bharat Abhiyan/Swachh Bharat , Sports and Games		Zero Credit Course (Minimum 2 Courses to be Completed other than Yoga and Meditation)
Minimum Credits to be earned				**160**

** The credits earned in category 'E' Courses will not be counted in CGPA calculation for awarding of the degree.

CURRICULUM

B.E - MECHATRONICS

SEMESTER
I TO VIII

B.E. – MECHATRONICS – SEMESTER I TO VIII

A. Foundation Courses

Humanities and Social Sciences including Management Courses – Credits (9-12)

SL. NO	COURSE CODDE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1.		TECHNICAL ENGLISH	ENG	FC-HS	3	0	0	3	NIL
2.		BUSINESS ENGLISH	ENG	FC-HS	3	0	0	3	NIL
3.		ENGLISH LANGUAGE LAB	ENG	FC-HS	0	0	4	2	NIL
4.		TOTAL QUALITY MANAGEMENT	MANAG	FC-HS	3	0	0	3	NIL
5.		PROFESSIONAL COMMUNICATION AND PERSONALITY DEVELOPMENT LAB	ENG	FC-HS	0	0	2	1	NIL
6.		UNIVERSAL HUMAN VALUES - UNDERSTANDING HARMONY	ENG	FC-HS	3	0	0	3	NIL
Basic Science Courses – Credits (18-25)									
1.		ENGINEERING MATHEMATICS	MATH	FC-BS	2	1	0	3	NIL
2.		PHYSICAL SCIENCES	PHY & CHEM	FC-BS	4	0	0	4	NIL
3.		DIFFERENTIAL EQUATIONS AND TRANSFORMS	MATH	FC-BS	2	1	0	3	ENGINEERING MATHEMATICS
4.		SMART MATERIALS AND NANO TECHNOLOGY	PHY	FC-BS	3	0	0	3	PHYSICAL SCIENCES
5.		PARTIAL DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	MATH	FC-BS	2	1	0	3	DIFFERENTIAL EQUATIONS AND TRANSFORMS
6.		NUMERICAL METHODS	MATH	FC-BS	2	1	0	3	DIFFERENTIAL EQUATIONS AND TRANSFORMS
7.		MATHEMATICAL AND STATISTICAL TOOL FOR RESEARCH	MATH	FC-BS	2	1	0	3	NIL
8.		NON-DESTRUCTIVE TESTING OF MATERIALS	PHY	FC-BS	3	0	0	3	NIL
9.		ENVIRONMENTAL SCIENCES	CHEM	FC-BS	3	0	0	3	NIL
10.		PHYSICAL SCIENCES LAB	PHY & CHEM	FC-BS	0	0	4	2	NIL
Engineering Science courses including Workshop, Drawing, Basics of Electrical/Mechanical/Computer etc., Credits – (18-24)									
1		FOUNDATIONS OF COMPUTING AND PROGRAMMING (THEORY AND PRACTICALS)	CSE	FC-ES	2	0	2	3	NIL
2		BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	EEE & ECE	FC-ES	4	0	0	4	NIL

3		PYTHON PROGRAMMING (THEORY AND PRACTICALS)	CSE	FC-ES	2	0	2	3	NIL
4		BASICS OF CIVIL AND MECHANICAL ENGINEERING	CIVIL & MECH	FC-ES	4	0	0	4	NIL
5		ENGINEERING GRAPHICS AND DESIGN	MECH	FC-ES	0	0	6	3	NIL
6		PROGRAMMING FOR PROBLEM SOLVING	CSE	FC-ES	3	0	0	3	NIL
7		BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB	EEE & ECE	FC-ES	0	0	4	2	NIL
8		ENGINEERING SKILLS PRACTICALS LAB	CIVIL & MECH	FC-ES	0	0	4	2	NIL

B.E. – MECHATRONICS – SEMESTER I TO VIII

B. Professional

Core Courses – Credits (48-54)

SL. NO	COURSE CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1.		BASIC CONCEPTS OF MECHATRONICS	MECHT	CC	3	0	0	3	NIL
2.		ELECTRICAL MACHINERY (THEORY AND PRACTICALS)	EEE	CC	3	0	2	4	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING
3.		SEMICONDUCTOR DEVICES AND CIRCUITS	ECE	CC	3	0	0	3	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING
4.		FLUID MECHANICS AND STRENGTH OF MATERIALS	CIVIL	CC	3	0	0	3	NIL
5.		ANALOG AND DIGITAL CIRCUITS (THEORY AND PRACTICALS)	ECE	CC	3	0	2	4	SEMICONDUCTOR DEVICES AND CIRCUITS
6.		SENSORS AND ELECTRONIC MEASUREMENTS	ECE	CC	3	0	0	3	NIL
7.		CONTROL SYSTEMS	EEE	CC	3	0	0	3	DIFFERENTIAL EQUATIONS AND TRANSFORMS
8.		DESIGN OF MACHINE ELEMENTS	MECH	CC	2	1	0	3	NIL
9.		MICROCONTROLLERS AND EMBEDDED SYSTEMS	ECE	CC	3	0	0	3	ANALOG AND DIGITAL CIRCUITS
10.		COMPUTER INTEGRATED MANUFACTURING (THEORY AND PRACTICALS)	MECH	CC	3	0	2	4	NIL
11.		ROBOTICS AND AUTOMATION	ECE	CC	3	0	0	3	NIL
12.		POWER ELECTRONICS AND DRIVES (THEORY AND PRACTICALS)	EEE	CC	3	0	2	4	SEMICONDUCTOR DEVICES AND CIRCUITS

13.		PROGRAMMABLE LOGIC CONTROLLERS (THEORY AND PRACTICALS)	MECHT	CC	3	0	2	4	NIL
14.		FLUID MECHANICS AND STRENGTH OF MATERIALS LAB	CIVIL	CC	0	0	4	2	NIL
15.		SENSORS AND ELECTRONIC MEASUREMENTS LAB	ECE	CC	0	0	4	2	NIL
16.		CONTROL SYSTEMS LAB	EEE	CC	0	0	4	2	NIL
17.		MICROCONTROLLERS AND EMBEDDED SYSTEMS LAB	ECE	CC	0	0	4	2	NIL
18.		ROBOTICS LAB	ECE	CC	0	0	4	2	NIL

B.E. – MECHATRONICS – SEMESTER I TO VIII

C. Elective Courses

Professional Elective - Credits(12)

SL. NO	COURSE CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1.		ELECTRIC VEHICLES	EEE	EC-PS	3	0	0	3	NIL
2.		INTRODUCTION TO MEMS	ECE	EC-PS	3	0	0	3	NIL
3.		NANO ELECTRONICS	ECE	EC-PS	3	0	0	3	NIL
4.		POWER CONVERTERS ANALYSIS AND DESIGN	EEE	EC-PS	3	0	0	3	NIL
5.		ETHICAL HACKING	CSE	EC-PS	3	0	0	3	NIL
6.		CLOUD COMPUTING	CSE	EC-PS	3	0	0	3	NIL
7.		SENSORS AND TRANSDUCERS FOR HEALTHCARE	ECE	EC-PS	3	0	0	3	NIL
8.		VIRTUAL INSTRUMENTATION	EEE	EC-PS	3	0	0	3	NIL
9.		HYDRAULICS AND PNEUMATICS SYSTEMS	MECH	EC-PS	3	0	0	3	NIL
10.		DESIGN FOR MANUFACTURING AND ASSEMBLY	MECH	EC-PS	3	0	0	3	NIL
11.		INDUSTRIAL SAFETY	MECH	EC-PS	3	0	0	3	NIL
12.		PRODUCT DEVELOPMENT	MECH	EC-PS	3	0	0	3	NIL
13.		DESIGN FOR QUALITY	MECH	EC-PS	3	0	0	3	NIL
14.		MODERN MANUFACTURING METHODS	MECH	EC-PS	3	0	0	3	NIL

Industry Designed/ Industry Supported/ Industry Offered/ Industry Sponsored Courses **- (6)**									
SL. NO	**COURSE CODE**	**COURSE**	**OFFERING INDUSTRY**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		BUSINESS INTELLIGENCE AND ITS APPLICATIONS	INFOSYS	EC-IE	3	0	0	3	NIL
2.		LEARNING IT ESSENTIALS BY DOING	INFOSYS	EC-IE	3	0	0	3	NIL
3.		MATH MODELLING AND CONTROL SYSTEMS (THEORY AND PRACTICALS)	REYNLAB	EC-IE	2	0	2	3	NIL
4.		ELECTRIC AND HYBRID ELECTRIC VEHICLES (THEORY AND PRACTICALS)	REYNLAB	EC-IE	2	0	2	3	NIL

Open Courses – Innovation, Entrepreneurship, Skill Development etc. - Credits (6-9)									
SL. NO	**COURSE CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		INNOVATION, PRODUCT DEVELOPMENT AND COMMERCIALIZATION	MANAG	OE-IE	3	0	0	3	NIL
2.		NEW VENTURE PLANNING AND MANAGEMENT	MANAG	OE-IE	3	0	0	3	NIL
3.		SOCIAL ENTREPRENEURSHIP	MANAG	OE-IE	3	0	0	3	NIL
4.		ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	MANAG	OE-IE	3	0	0	3	NIL
5.		INTELLECTUAL PROPERTY RIGHTS	MANAG	OE - IE	3	0	0	3	NIL
6.		LIFE SKILLS	MANAG	OE-IE	3	0	0	3	NIL

Open Courses – Electives from other Technical and /or Emerging Courses Credits (6-9)									
SL. NO	**COURSE CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		PRINCIPLES OF BIOMEDICAL INSTRUMENTATION	BME	OE-EA	3	0	0	3	NIL
2.		BIOSENSORS AND TRANSDUCERS	BME	OE-EA	3	0	0	3	NIL
3.		INTRODUCTION TO BIOFUELS	BTE	OE-EA	3	0	0	3	NIL
4.		FOOD AND NUTRITION TECHNOLOGY	BTE	OE-EA	3	0	0	3	NIL
5.		DISASTER RISK MANAGEMENT	CIVIL	OE-EA	3	0	0	3	NIL
6.		MUNICIPAL SOLID WASTE MANAGEMENT	CIVIL	OE-EA	3	0	0	3	NIL
7.		FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	CSE	OE-EA	3	0	0	3	NIL
8.		INTRODUCTION TO INTERNET OF THINGS	CSE	OE-EA	3	0	0	3	NIL
9.		CYBER SECURITY	CSE	OE-EA	3	0	0	3	NIL
10.		DESIGN OF ELECTRONIC EQUIPMENT	ECE	OE-EA	3	0	0	3	NIL
11.		INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	ECE	OE-EA	3	0	0	3	NIL
12.		3D PRINTING AND ITS APPLICATIONS	MECH	OE-EA	3	0	0	3	NIL
13.		INDUSTRIAL ROBOTICS	MECH	OE-EA	3	0	0	3	NIL
14.		BIOMOLECULES – STRUCTURE AND FUNCTION	PE	OE-EA	3	0	0	3	NIL
15.		PHARMACOGENOMICS	PE	OE-EA	3	0	0	3	NIL

B.E. – MECHATRONICS – SEMESTER I TO VIII									
Project work, Seminar and Internship in Industry or elsewhere Credits - (15)									
SL. NO	**COURSE CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		PROJECT WORK	MECT	PI-P	0	0	16	8	NIL
2.		MINI PROJECT	MECT	PI-M	0	0	6	3	NIL
3.		SEMINAR	MECT	PI-S	0	0	2	1	NIL
4.		INTERNSHIP	MECT	PI-IT	3 Weeks			3	NIL

MANDATORY COURSES (NO CREDITS) (NOT INCLUDED FOR CGPA CALCULATIONS)									
SL. NO	**COURSE CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		YOGA AND MEDITATION	PHED	AC	0	0	2	0	NIL
ANY TWO OF THE FOLLOWING COURSES									
2.		GENDER EQUITY AND LAW	LAW	AC	0	0	2	0	NIL
3.		ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	GEN	AC	0	0	2	0	NIL
4.		INDIAN CONSTITUTION	LAW	AC	0	0	2	0	NIL
5.		NCC/NSS/RRC/YRC/STUDENT CLUBS/UNNAT BHARAT ABHIYAN/ SWACTH BHARAT	GEN	AC	0	0	2	0	NIL
6.		SPORTS AND GAMES	PHED	AC	0	0	2	0	NIL

	TECHNICAL ENGLISH	Category	L	T	P	Credit
		FC - HS	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 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 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 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				**L**	**L**	**M**	**M**	**M**		**S**		**S**	**S**		**S**
CO2							**L**			**S**		**S**	**M**		**S**
CO3				**L**				**L**				**L**	**M**	**M**	
CO4	**L**					**M**		**L**	**M**	**S**	**L**	**S**	**S**	**M**	**S**
CO5	**M**		**L**	**S**								**S**	**M**		**S**

S- Strong; M-Medium; L-Low

SYLLABUS

SELF INTRODUCTION

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)– Technical Abbreviations and Acronyms -Listening Skills- Passive and Active listening, Listening to Native Speakers - Characteristics of a good listener.

STRESS

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, New Norms) - Extempore.

SPEAKING SKILLS

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- Interpersonal Skills.

READING SKILLS

English as language of Opportunity and Employability- 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 – Technical Jargons

TECHNICAL WRITING

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

TEXTBOOK

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. Jennifer G Joseph, Prof. and Head, H&S	jennifer@avit.ac.in
2	Dr.P.Saradha / Associate Professor - English	saradhap@vmkvec.edu.in

	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 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. demonstrate interaction skills and consider how own communication is adjusted in different scenario	Apply
CO3. Use strengthened oral and written skills in the business context	Apply
CO4. Create interest in a topic by exploring thoughts and ideas	Apply
CO5. Have 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**	**S**		
CO2		**M**	**S**	**M**		**M**	**M**		**L**	**S**		**S**	**M**		
CO3	**L**	**M**				**M**		**L**		**S**	**L**	**M**		**M**	
CO4		**L**	**M**	**M**			**L**	**M**	**M**	**S**	**L**	**M**	**M**		**M**
CO5		**L**		**M**		**L**	**L**			**S**		**S**	**M**	**M**	**S**

S- Strong; M-Medium; L-Low

SYLLABUS

Basics of Language and Listening Skills: 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) Jargons- Technical and Business

SPEAKING SKILLS AND READING SKILLS: Extempore**,** Listening to TED Talks and discussion on the topic heard, Speaking activities- pair and group designed by the faculty, Group Discussion-Types of Interviews, Watching Documentary Films and Responding to Questions, Reading Skills-Understanding Ideas and making Inferences–– FAQs –

E - Mail Netiquette - Sample E – mails , Critical Reading-Book Review-Finding Key Information and Shifting Facts from Opinions

CORPORATE COMMUNICATION: What is Corporate Communication? Types of Office communications - Recommendation-Instruction-Check List- Circulars-Inter Office Memo- Minutes of Meeting and Writing Agenda - Discourse Markers - Rearranging Jumbled Sentences

WRITING SKILLS Technical Articles – Written communication Project Proposals-Making Presentations on given Topics -Preparing Power Point Presentations-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. Jennifer G Joseph	Professor & Head	English	jennifer@avit.ac.in
2	Dr. P. Saradha	Associate Professor	English	saradhap@vmkvec.edu.in

	ENGLISH LANGUAGE LAB	Category	L	T	P	Credit
		FC - HS	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 improve the oral skills of the students communicate effectively through different activities
4	To understand and apply the telephone etiquette
5	Case study to understand the practical aspects of communication

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

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
CO2	M								M	S		M	M		M
CO3	M									S		M			M
CO4	M									M			M		M
CO5	M			S						M			M		S

S- Strong; M-Medium; L-Low

SYLLABUS

MODULE I: Ice Breaker, Grouping, Listening- (Hearing and listening)- Active Listening- Passive Listening – Listening to songs, videos 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. Role Play

MODULE IV: Telephone Etiquette, Dining Etiquette, Meeting Etiquette, Corporate Etiquette, Business Etiquette.

MODULE V: Case study of Etiquette in different scenario.

Course Designers:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. Jennifer G Joseph,	Prof. and Head, H&S	English	jennifer@avit.ac.in
2	Dr.P.Saradha	Associate Professor	English	saradhap@vmkvec.edu.in

	TOTAL QUALITY MANAGEMENT	Category	L	T	P	Credit
		FC - HS	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	-	-	M
CO3	S	S	M	S	S	-	-	L	-	L	-	L	L	M	L
CO4	L	M	S	L	M	-	L	-	L	M	L	M	-	-	-
CO5	L	L	M	-	L	M	S	S	M	L	L	M	-	-	M

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION

Concept of Quality and Quality Management - Determinants of quality of product & service - Quality costs – Analysis Techniques for Quality Costs – TQM Principles and Barriers & Implementation –Leadership – Concepts- Role of Top Management- Quality Council – Quality statements: vision, mission, Policy - SMART Goal setting -- Strategic Planning.

TQM PRINCIPLES AND PHILOSOPHIES

Customer satisfaction – Perception of Quality- Customer Complaints - Service Quality- Customer Retention- Employee Involvement – Motivation- Empowerment – Teams - Recognition and Reward- Performance Appraisal - Continuous Process Improvement : Deming's Philosophy - Juran's Trilogy - PDSA Cycle- Taguchi Quality Loss Function - 5S principles and 8D methodology - Kaizen - Basic Concepts.

STATISTICAL PROCESS CONTROL (SPC) & PROCESS CAPABILITY

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

TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT

Benchmarking – Reasons - Process- Quality Function Deployment (QFD) – House of Quality- QFD Process- Benefits- Total Productive Maintenance (TPM) – Concept- Improvement Needs- FMEA – Stages of FMEA - Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

QUALITY SYSTEMS

Introduction to IS/ISO 9004:2000 – quality management systems – Elements- Implementation of Quality System - Documentation- Quality Auditing- 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

34121H82	PROFESSIONAL COMMUNICATION AND PERSONALITY DEVELOPMENT	Category	L	T	P	Credit
		HSS	0	0	2	1

To develop students with good presentation and writing skills (Professionally & technically). Articulate and enunciate words and sentences clearly and effectively. Develop proper listening skills. Understand different writing techniques and styles based on the communication being used.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To develop communication and personality skills.
2	To improve Aptitude skills, train to improve self-learning / researching abilities, presentation skills & technical writing.
3	To improve students employability skills.
4	To develop professional with idealistic, practical and moral values.
5	To produce cover letters, resumes and job application strategies.

COURSE OUTCOMES

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

CO1. Improve communication and personality skills.	Apply
CO2. Demonstrate effective use of teamwork skills and presentation skills to complete given tasks.	Apply
CO3. Speak with clarity and confidence thereby enhancing employability skills of the students.	Apply
CO4. Have balanced value system that can be practiced for enhanced professional life.	Apply
CO5. Improve their vocabulary and use them in appropriate situation	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	**M**	**M**	-	-	-	**M**	**M**	-	**M**	**S**	-	-			
CO2	**M**	-	-	-	-	-	-	-	**S**	**M**	-	-			
CO3	-	-	-	-	-	-	**M**	-	**S**	**S**	-	-			
CO4	-	-	-	-	-	-	-	-	-	-	-	-			
CO5	**S**	-	-	-	-	-	-	-	**M**	**S**	-	**M**			

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT – I: COMMUNICATION AND SELF DEVELOPMENT: Basic Concepts of Communication; Barriers in Communication; How to Overcome Barriers to Communication, Barriers and Filters in Listening Skill, Active and Passive listening, exposure to English language through various activities and maintaining a vocabulary dairy improving confidence in Language usage using activities,

UNIT – II: GRAMMAR & SYNTAX: Subject verb concord, tenses, Homophones, Homonyms, Spotting errors.

UNIT – III. READING AND WRITING SKILLS: Reading Comprehension; and suggesting title for given passage Back office job for organizing a conference / seminar (member of organizing committee and submit a report); Jumbled sentences, respond to real time advertisement and prepare a covering letter with CV.

UNIT IV. SPEAKING SKILLS AND ESSENCE OF SOFT SKILLS: Hard and soft Skills; Feedback Skills; Skills of Effective Speaking; Component of an effective Talk; how to make an effective oral presentation, Time management, Team work skills, Leadership skills, Adaptability and bettering oneself, Persuasion skills.

UNIT V TECHNICAL REPORT, RESEARCH CASE STUDY & REPORTING: Types and Structure of Reports; Collecting Data; Technical Proposals; Visual Aids; General Tips for Writing Reports. Research Case Study and reporting, how to make an effective power point presentation

TEXTBOOK

1. The Functional Aspects of Communication Skills, Prajapati Prasad and Rajendra K.Sharma, S. K Kataria& Sons, New Delhi, Rep''nt 2007

REFERENCES

1. Business Communication, Sinha K. K. S. Chand, New Delhi.
2. Business Communication, Asha Kaul, Prentice Hall of India
3. Business Correspondence and Report Writing A Practical Approach to Business and Technical Communication, Sharma, R.C.and Krishna Mohan, Tata Mc Graw – Hill.

Course Designers:

COURSE DESIGNERS

S.No.	Name of the Faculty	Mail ID
1.	Dr. Jennifer G Joseph, Prof. and Head	jennifer@avit.ac.in
2.	Dr. P.Saradha, Associate Professor	saradhap@vmkvec.edu.in

Course Code	Course Title	Category	L	T	P	C
	UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY	**FC - HS**	**3**	**0**	**0**	**3**

Course Objectives:

1. Development of a holistic perspective based on self- exploration

2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

UNIT I Introduction

Value Education, Definition, Concept and Need for Value Education-Content and Process of -basic guidelines for Value Education -Self exploration - Happiness and Prosperity as parts of Value Education.

UNIT II Understanding Harmony in the Human Being

Harmony in Myself-Understanding human being as a co-existence of the sentient 'I' and the material 'Body'-Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. -Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)-Understanding the characteristics and activities of 'I' and harmony in 'I'-Understanding the harmony of I with the Body-Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

UNIT III Understanding Harmony in the Family and Society

Harmony in Human-Human Relationship -meaning of Justice - Trust and Respect -Difference between intention and competence- respect and differentiation; the other salient values in relationship 4.Understanding the harmony in the society - Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals –Gratitude

UNIT IV Understanding Harmony in the Nature and Existence

Whole existence as Coexistence -.Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature-Holistic perception of harmony at all levels of existence.

UNIT V Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values -.Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order- Competence in professional ethics

Total Hours : 45 Hours

Text Book

1.Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.

COURSE DESIGNERS				
S.NO	**COURSE INSTRUCTOR**	**DESIGNATION**	**NAME OF THE INSTITUTION**	**MAIL ID**
1	Dr.S.P.Sangeetha	Vice Principal(Academics)	AVIT	sangeetha@avit.ac.in
2	Dr.Jennifer G Joseph	HoD-H&S	AVIT	Jennifer@avit.a.cin

	ENGINEERING MATHEMATICS	Category	L	T	P	Credit
		FC- BS	2	1	0	3

PREAMBLE

The driving force in Engineering Mathematics is the rapid growth of technology and the sciences. Matrices had been found to be of great utility in many branches of engineering applications such as theory of electric circuits, aerodynamics, and mechanics and so on. Many physical laws and relation can be expressed mathematically in the form of differential equations. Based on this we provide a course in matrices, calculus and differential equations. Vector calculus is a form of mathematics that is focused on the integration of vector fields. An Engineer should know the Transformations of the Integrals, as Transformation of Line Integral to surface and then to volume integrals.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To recall the advanced matrix knowledge to Engineering problems.
2	To equip themselves familiar with the functions of several variables.
3	To improve their ability in solving geometrical applications of differential calculus problems
4	To examine knowledge in multiple integrals.
5	To improve their ability in Vector calculus.

COURSE OUTCOMES

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

CO1. Apply the concept of orthogonal reduction to diagonalise the given matrix	Apply
CO2. Find the radius of curvature, circle of curvature and centre of curvature for a given curve.	Apply
CO3. Classify the maxima and minima for a given function with several variables, through by finding stationary points	Apply
CO4. Find double integral over general areas and triple integral over general volumes	Apply
CO5. Apply Gauss Divergence theorem for evaluating the surface integral.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	--	--	--	--	L	--	--	--	M	--	--	--
CO2	S	S	M	--	--	--	--	L	--	--	--	M	--	--	--
CO3	S	S	M	--	--	--	--	L	--	--	--	M	--	--	--
CO4	S	S	M	--	--	--	--	L	--	--	--	M	--	--	--
CO5	S	S	M	--	--	--	--	L	--	--	--	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).

DIFFERENTIAL CALCULUS&PARTIAL DERIVATIVES :

Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature.

Partial Derivatives – Total Differentiation – Maxima and Minima -Constrained Maxima and Minima by Lagrangian Multiplier Method,

ORDINARY DIFFERENTIAL EQUATIONS:

Solutions of second and third order linear ordinary differential equation with constant coefficients – Method of variation of parameters -Simultaneous first order linear equations with constant coefficients.

MULTIPLE INTEGRALS:

Introduction of multiple integration by examples of Double and Triple integral-Evaluation of double and Triple Integration(in both Cartesian and polar coordinates)-Change of order of integration

VECTOR CALCULUS:

Scalar and vector point functions, Gradient, divergence, curl, Solenoidal and irrotational vectors, Vector identities (without proof),Normal and Directional derivatives, Solenoidal and irrotational field, Integration of vectors: Definition of Line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems (Statements only)

TEXT BOOKS:

1. Veerarajan T., "Engineering Mathematics", Tata McGraw Hill Education Pvt, New Delhi (2019).
2. Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi (2020).
3. Kreyszig E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt. Ltd., Singapore (2012).

REFERENCES:

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

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. A.K.Bhuvaneswari	Assistant Professor	Mathematics	bhuvaneswari@avit.ac.in
2	Dr.G.Selvam	Associate Professor	Mathematics	selvam@vmkvec.edu.in

	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, the propagation of light through fibers, applications of optical fibers in communication, production and applications of ultrasonics 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 ultrasonics	Understand
CO2. Understand the construction of laser, fiber optic and ultrasonic equipments	Understand
CO3. Demonstrate the working of laser, fiber optic and ultrasonic based components and devices	Apply
CO4. Interpret the potential applications of laser, fiber optics and ultrasonics in various fields	Apply
CO5. Differentiate the working modes of various types of laser, fiber optic and ultrasonic 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		
CO3	S			M			M					M	M		
CO4	S	M		M	M	S	M					M	S		M
CO5	S	M	M									M	M		

S- Strong; M-Medium; L-Low

SYLLABUS

Unit: I **9 hours**

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 **9 hours**

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 **9 hours**

ULTRASONICS: Ultrasonic production: Magnetostriction and piezo electric methods – Determination of velocity of ultrasonic waves (acoustic grating) – Applications of ultrasonics

TEXT BOOKS

1. Engineering Physics, compiled by Department of Physics, Vinayaka Mission's Research Foundation (Deemed to be University), Salem.

2. Palanisamy P. K., Engineering Physics, Scientific Publishers, 2011.

3. Avadhanulu M. N., Kshirsagar P. G., Arun Murthy T. V. S., A Textbook of Engineering Physics, S. Chand Publishing, 2018.

REFERENCE BOOKS

1. Beiser, Arthur, Concepts of Modern Physics, 5th Edition, 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, 2012.

4. Srivastava S. K., Laser Systems and Applications 3rd Edition, New Age International (P) Ltd Publishers, 2019.

5. Ajoy Ghatak, Thyagarajan K., Introduction To Fiber Optics, Cambridge India, 2013.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. C. SENTHIL KUMAR	PROFESSOR	PHYSICS	senthilkumarc@vmkvec.edu.in
2	Dr. R. SETHUPATHI	ASSOCIATE PROFESSSOR	PHYSICS	sethupathi@vmkvec.edu.in

	PHYSICAL SCIENCES PART-B - ENGINEERING CHEMISTRY (Common to all Branches)	Category	L	T	P	Credit
		FC- BS	2	0	0	2

PREAMBLE

The objective of this course is to better understand the basic concepts of chemistry and its applications in diverse engineering domains. It also imparts knowledge on the properties of water and its treatment methods, Electrochemistry, corrosion and batteries, properties of fuel and combustion. This course also provides an idea to select the material for various engineering applications and their characterization.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To Provide the knowledge on water treatment.
2	To explain about the importance of electrochemistry, mechanism of different corrosion and principle and working of batteries.
3	To explain different types of fuel, properties and its important features.

COURSE OUTCOMES

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

CO1.	Estimate the hardness of water Apply and Identify suitable water treatment methods.	Apply
CO2.	Describe terms involved in electrochemistry, the control methods of corrosion and working of energy storage devices.	Analyse
CO3.	Understand the quality of fuels from its properties and the important features of fuels	Analyse

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT – I: WATER TECHNOLOGY **9hrs**

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA. Boiler troubles - Treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning). External treatment – Ion exchange process, zeolite process – Domestic water treatment - desalination of brackish water – Reverse Osmosis and Electrodialysis.

UNIT – II: ELECTROCHEMISTRY, CORROSION AND BATTERIES **9hrs**

Electrochemistry: Electrode potential - Nernst equation – Electrodes (SHE, Calomel and Glass) - Galvanic cell- Electrochemical cell representation - EMF series and its significance. Corrosion – Definition causes and effects, Classification, Types of corrosion- dry corrosion, Wet corrosion, Factors influencing rate of corrosion, Corrosion control methods – Sacrificial anode method and impressed current cathodic method.

Batteries: Terminology- Daniel cell – Dry cell - Lead-acid accumulator- Nickel-Cadmium batteries, Lithium batteries: Li/SOCl2 cell - Li/I2 cell- Lithium ion batteries. Fuel cells: Hydrogen-oxygen fuel cell, Solid oxide fuel cell (SOFC)

UNIT – III FUELS AND COMBUSTION **9hrs**

Fuels: Introduction – classification of fuels – coal – analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – petroleum – manufacture of synthetic petrol (Bergius process). Knocking – octane number – cetane number – natural gas – compressed natural gas (CNG). Liquefied petroleum gases (LPG) – power alcohol and biodiesel. Combustion of fuels: Introduction – calorific value – higher and lower calorific values- theoretical calculation of calorific value – ignition temperature – spontaneous ignition temperature – explosive range – flue gas analysis (ORSAT Method).

TEXTBOOK

1. Engineering Chemistry by Jain and Jain, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, 2017
2. A text book of Engineering Chemistry by S.S. Dara, S.Chand & company Ltd., New Delhi
3. A text book of Engineering Chemistry by Shashi Chawla, Edition 2012 Dhanpatrai & Co., New Delhi.

REFERENCES

1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane, 3rd Edition, McGraw Hill, 1980
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins, Julio de Paula, 8th Edition, Oxford University press, 2007
4. Engineering Chemistry by Dr. A. Ravikrishnan, Sri Krishna Publications, Chennai.

Course Designers:

Name of the Faculty	Mail ID
Dr. A.R. Sasieekumar	sasieekhumar@vmkvec.edu.in
Dr. R. Nagalakshmi	nagalakshmi.chemistry@avit.ac.in

	DIFFERENTIAL EQUATIONS AND TRANSFORMS	Category	L	T	P	Credit
		FC- BS	2	1	0	3

PREAMBLE

A signal is said to be a continuous time signal if it is available at all instants of time. A real time naturally available signal is in the form of time domain. However, the analysis of a signal is far more convenient in the frequency domain. These are three important classes of transformation methods available for continuous time systems. They are Laplace Transform, Fourier series and Fourier Transform. Similarly, Z- transform plays an important role in analysis of linear discrete time signals. Transform techniques are very important tool in the analysis of signals. Also To expose the students to the basics of wavelet theory and to illustrate the use of wavelet processing in engineering fields.

PREREQUISITE

Engineering Mathematics

COURSE OBJECTIVES

1	Learn to use Fourier series to represent periodical physical phenomena in engineering analysis
2	To understand how the Fourier series is extended to aperiodic signals in the form Fourier transform
3	To understand the properties of Z-Transform and associating the knowledge of properties of ROC in response to different operations on discrete signals.
4	To learn Laplace transform and it Inverse methods to solve differential transforms and integral transforms
5	To understand the terminology that are used in the wavelet's literature

COURSE OUTCOMES

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

CO1. Explain fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.	Apply
CO2. Demonstrate Fourier Transform as a tool for solving integral equations	Apply
CO3. Solve difference equations by using Z transform techniques.	Apply
CO4. Understand the concept of Laplace transform and inverse Laplace transform of various functions and its application to solve ordinary differential equations.	Apply
CO5. Understand how to use the modern signal processing tools using signal spaces, bases, operators and series expansions.	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	M	--	--	--	L	--	--	--	M	--	--	--
CO2	S	M	S	M	--	--	--	L	--	--	--	M	--	--	--
CO3	S	M	S	M	--	--	--	L	--	--	--	M	--	--	--
CO4	S	M	S	M	--	--	--	L	--	--	--	M	--	--	--
CO5	S	M	S	M	--	--	--	L	--	--	--	M	--	--	--

S- Strong; M-Medium; L-Low

Syllabus

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

FOURIER TRANSFORMS:
Fourier transform pairs - Fourier Sine and Cosine transforms – Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

Z – TRANSFORMS:
Z-Transform – Elementary Properties – Inverse Z-Transform – Convolution Theorem – Formation of Difference Equations – Solution of first and second order Difference Equations using Z-Transform.

LAPLACE TRANSFORMS:
Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions-Inverse Laplace transform – Convolution theorem – -Solution of linear ODE of second order with constant coefficients.

WAVELET TRANSFROMATION:
Classes of wavelets: Haar, Daubechies, bi-orthogonal. Continuous Wavelet Transform (CWT): CWT and its Properties, Discrete Wavelet Transform- Haar scaling function - Nested spaces - Wavelet function- Designing orthogonal wavelet systems: Daubechies – Coiflet - Symlet wavelet system coefficients- Signal decomposition using DWT.

TEXT BOOKS:

1. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
2. K. P. Soman, K. I. Ramachandran, "Insight into Wavelets: From Theory to Practice", Third Edition, PHI (2004).

REFERENCES:

1. "Engineering mathematics I & II", by Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2017).
2. Dr. A. Singaravelu, "Transforms and Partial differential Equations", 18th Edition, Meenakshi Agency, Chennai (2013).
3. R. M. Rao and Ajit S. Bopardikar, "Wavelet Transform, Introduction to theory and Applications", Addison-Wesley (1998).

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. L. Tamilselvi	Professor	Mathematics	ltamilselvi@avit.ac.in
2	Dr. M. Vijayarakavan	Associate Professor	Mathematics	vijayarakavan@vmkvec.edu.in

	SMART MATERIALS AND NANOTECHNOLOGY	Category	L	T	P	C
	Total Contact Hours: 45	FC- BS	3	0	0	3
	Prerequisite: Physical Sciences					

Preamble:

This syllabus enables the students to learn the applications of smart materials and uses of various smart engineering devices. The syllabus also discusses about the nanomaterials, their unique properties and applications in various fields.

Course Objectives:

1	Gain the knowledge about the concepts of smart systems and various smart materials.
2	Realize about the smart sensor materials which are used for Industrial Applications.
3	Understand about the Industrial application oriented Smart materials' Actuators.
4	To learn the properties and classifications and importance of Nanomaterials
5	Understand the characteristic features of materials at nanoscale and their potential applications

COS	Course Outcomes: On the successful completion of the course, students will	
CO1	Learn the smart-properties of various functional materials	Learn
CO2	understand the applications of different smart materials as sensors	Understand
CO3	understand the applications of different smart materials as actuators	Understand
CO4	Gather knowledge on unique properties of nanomaterials	Learn
CO5	Use of Nanomaterials for industrial applications	Acquire
CO6	Gain knowledge about nanomaterials in health care industry	

Mapping with Programme Outcomes and Programme Specific Outcomes

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	POS2	POS3
CO1	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	S	S	S	S	M	-	-	-	-	-	-	S	-	-	-
CO3	S	M	S	S	-	-	-	-	-	-	-	S	-	-	-
CO4	S	S	S	S	M	-	-	-	-	-	-	S	-	-	-
CO5	S	S	S	S	-	-	-	-	-	-	-	S	-	-	-
CO6	S	M	M	S	M	-	-	-	-	-	-	S	-	-	-

S – strong, M- Medium, L - Low

Syllabus

UNIT: I 9 Hours

Overview of Smart Materials: Introduction to Smart materials –piezoelectric materials – piezoelectricity – magnetostriction materials – magnetostriction effect– shape memory alloys (SMA) – photoelastic materials – photoelasticity.

UNIT: II 9 Hours

Smart material based sensors: Introduction to sensing technology - electric and magnetosrictive sensors - SMA based sensors - Infrared sensors – stress analysis by photoelastic sensors- Industrial Applications of smart sensors: Accelerometer and Biological DNA sensors.

UNIT: III 9 Hours

Smart Materials For Actuators: Introduction to smart actuators - piezoelectric actuators - magnetostrictive actuators - SMA based actuators - polymeric and carbon nanotubes based low power actuators –Industrial Applications: robotic artificial muscles , materials for bone substitutes and tissue replacement implants - smart polymeric materials for skin engineering

UNIT: IV 9 Hours

Materials in Nanoscale: Historical development of nanomaterials - Unit and dimensions - Classifications of nanomaterials - quantum dots, nanowires, ultra-thin films, nanoparticles, multilayered materials. Length Scales involved and effect on properties: mechanical, electronic, optical, magnetic and thermal properties.

UNIT: V 9 Hours

Selected Applications of Nanomaterials: Medical diagnostics – nanomedicine – targeted drug delivery – Biosensors; Information storage – nanocomputer – molecular switch – single electron transistors; design and fabrication of MEMS and NEMS devices.

TEXT BOOKS

1. Palanisamy P.K. Materials Science. SCITECH Publishers, 2015.
2. Fundamental of Smart Materials, Editor: Mohsen Shahinpoor, RSC Publishers 2020
3. Charles P. Poole, Jr. and Frank J Ownes, "Introduction to Nanoscience and Nanotechnology", Wiley-Interscience Inc., Publication, 1st Edition, 2020.
4. Smart Material Systems And Mems Design And Development Methodologies by Vijay K Varadan, WILEY INDIA 2014.

REFERENCE BOOKS

1. Pillai S.O., Solid State Physics, 9th Edition, New Age International (P) Ltd., Publishers, 2020.
2. William D. Callister Jr., David G. Rethwisch., Materials Science and Engineering: An Introduction, 10th Edition, Wiley Publisher, 2018.
3. Nanotechnology, Second eition, M. A. Shah and K. A. Shah, Wiley Publishers 2019.
4. Fundamentals of Nanotechnology, Hornyak, G. Louis, Tibbals, H. F., Dutta, Joydeep, CRC Press, 2009.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. B. DHANALAKSHMI	Asso. Professor	Physics	Dhanalakshmi.phy@avit.ac.in
2	Dr G. SURESH	Asso. Professor	Physics	suresh.physics@avit.ac.in
3	Dr. R. N. VISWANATH	Professor	Physics	rnviswanath@avit.ac.in

	PARTIAL DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	Category	L	T	P	Credit
		FC- BS	2	1	0	3

PREAMBLE

Impart knowledge about the subject of a single variable and multivariable. The focus of the course will be the study of the application of partial differential equations. The course also gives the opportunity to the learner to understand linear algebra and its application to engineering.

PREREQUISITE

Differential Equations and Transforms

COURSE OBJECTIVES

1	Familiarize themselves with the functions of a variety of variables.
2	To familiar with applications of partial differential equations
3	To have the knowledge of vector space & subspaces
4	To have an idea of inner product spaces over the field of complex numbers
5	Understand linear transformation and its properties

COURSE OUTCOMES

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

CO1. Form the partial differential equations and find its solutions	Apply
CO2. Apply the partial differential equations in a vibration of strings; heat-passing a rod and two-dimensional heat conduction problems.	Apply
CO3. Understand the concept of vector space & subspace and to find the dimension of a vector	Apply
CO4. Understand inner product space concepts and apply the concept in various linear system related problems.	Apply
CO5. Compute the linear transformations and find matrices of general linear transformations	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	L	--	--	--	L	--	--	--	M	--	--	--
CO2	S	S	M	L	--	--	--	L	--	--	--	M	--	--	--
CO3	S	S	M	L	--	--	--	L	--	--	--	M	--	--	--
CO4	S	S	M	L	--	--	--	L	--	--	--	M	--	--	--
CO5	S	S	M	L	--	--	--	L	--	--	--	M	--	--	--

S- Strong; M-Medium; L-Low

SYLLABUS

PARTIAL DIFFERENTIAL EQUATIONS:
Formation - Solutions of standard types f(p,q) = 0 , Clairaut's 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

APPLICATION OF PARTIAL DIFFERENTIAL EQUATIONS:
Method of separation of variables – Solutions of one-dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates

VECTOR SPACES:
Vectors in two-dimensional space and n dimensional space**,** subspaces and spanning sets properties of vector space, Linear combination of vectors, Linear independence and dependence of vectors, basis and dimension

INNER PRODUCT SPACES:
Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations -Least square approximation

LINEAR TRANSFORMATION:
Linear transformations, linear operators, Properties of Linear Transformation, Algebra of Linear transformation, Matrix Representation of linear transformation, Linear map Associated with Linear Transformation

TEXT BOOKS:

1. Grewal, B.S., "Higher Engineering Mathematics", 35th Edition, Khanna Publishers, Delhi (2012).
2. Kennath M. Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition, Pearson India Publishing, New Delhi, (2015).

REFERENCES:

1. Dr.A. Singaravelu, "Linear Algebra and Partial Differential Equations", Meenakshi Agencies, Chennai (2019).
2. Kreyszig, E., "Advanced Engineering Mathematics", (8th Edition), John Wiley and Sons, (Asia) Pvt. Ltd., Singapore (2012).
3. Dr.Gunadhar Paria, "Linear Algebra", New Central Book Agency (P) Ltd (2012).

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.V.T.Lakshmi	Associate Professor	Mathematics	lakshmivt@vmkvec.edu.in
2	Ms. S.Sarala	Associate Professor	Mathematics	sarala@avit.ac.in

	NUMERICAL METHODS	Category	L	T	P	Credit
		FC- BS	2	1	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.Differential Equations and Transforms

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

S- Strong; M-Medium; L-Low

SYLLABUS

SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

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 diference methods for solving second order two point linear boundary value problems – Finite diference techniques for the solution of two dimensional Laplace's and Poison's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

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 (2008).

REFERENCES:

1. Joe D. Hoffman , Steven Frankel, "Numerical Methods for Engineers and Scientists", 3rd Edition, Tata Mc-Graw Hill. (New York) (2015).
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	Department	Mail ID
1	Dr. S. Gayathri	Assistant Professor	Mathematics	gayathri@avit.ac.in
2	Dr. M.Vijayarakavan	Associate Professor	Mathematics	vijayarakavan@vmkvec.edu.in

	MATHEMATICAL AND STATISTICAL TOOLS FOR RESEARCH	Category	L	T	P	Credit
		FC- BS	2	1	0	3

PREAMBLE: Optimization techniques helps in solving problems in different environments that need decisions like, replacement , Sequencing and Network problems . Probabilistic and statistical analysis is mostly used in varied applications in Engineering and Science. Statistical method introduces students to cognitive learning in statistics and develops skills on analyzing the data by using different tests

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To be thorough with linear programming problem and formulate a real world problem as a mathematical programming model
2	Mathematical models for analysis of real problems in Operations Research.
3	To acquire skills in handling techniques of PERT, CPM and sequencing model to perform operation among various alternatives.
4	To get the knowledge on concepts of random variables and distributions with respect to how they are applied to statistical data
5	To acquire knowledge of Testing of Hypothesis useful in making decision and test them by means of the measurements made on the sample.

COURSE OUTCOMES

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

CO1,Formulate the Linear programming problem. Conceptualize the feasible region. Solve the LPP with two variables using graphical method and by simplex method	Apply
CO2. Be able to solve simple problems of replacement and sequencing model	Apply
CO3. Able to Solve network problems using CPM, PERT techniques	Apply
CO4. Select an appropriate probability distribution to determine the probability function for solving engineering problem	Apply
CO5. Apply the concepts of large/small sample tests into real life problems	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	L	M	L	--	--	M	--	--	--	M	--	--	--
CO2	S	S	L	M	L	--	--	M	--	--	--	M	--	--	--
CO3	S	S	L	M	L	--	--	M	--	--	--	M	--	--	--
CO4	S	S	M	M	L	--	--	M	--	--	--	M	--	--	--
CO5	S	S	M	M	L	--	--	M	--	--	--	M	--	--	--

S- Strong; M-Medium; L-Low

SYLLABUS

LINEAR MODELS: Mathematical Formulation of Linear programming problems- applications & limitations – Graphical method - Simplex method – Big M method

SEQUENCING AND REPLACEMENT MODELS: Scheduling – processing n jobs through two machines, processing n jobs through three machines, processing n jobs through m machines. Replacement Models: Replacement of Items due to deterioration with and without time value of Money, Group replacement policy.

NETWORK MODELS: Basic terminologies, constructing a project network, network computations in CPM and PERT.

PROBABILITY AND RANDOM VARIABLES: Probability concepts - Random variables - Discrete and continuous random variables - Expectation - Variance - Standard Distributions: Binomial, Poisson, Normal, Uniform and Exponential

TESTING OF HYPOTHESIS: Sampling distributions – Statistical hypothesis – Testing of hypothesis for mean, variance, and proportions for large and Small Samples (Z, t and F test) - Chi-square Tests for Goodness of fit - independence of attribute - Analysis of Variance

TEXT BOOKS:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics", 11th extensively revised edition, S. Chand & Sons (2015).
2. Douglas C. Montgomery and George C.Runger, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley (2013).
3. H.A.Taha, "Operations Research: An Introduction", 7th Edition, Prentice Hall of India (2002).

REFERENCES:

1. Miller, "Probability and Statistics for Engineers", Freund-Hall, Prentice India Ltd. (2009).
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	Department	Mail ID
1	Mrs.V.T.Lakshmi	Associate Professor	Mathematics	lakshmivt@vmkvec.edu.in
2	Ms. S.Sarala	Associate Professor	Mathematics	sarala@avit.ac.in

	NON-DESTRUCTIVE TESTING OF MATERIALS	Category	L	T	P	Credit
		FC- BS	3	0	0	3

PREAMBLE

Nondestructive testing is a wide group of analysis/techniques used in science and industries to evaluate the properties and qualities of a material without causing damage. The nondestructive testing is highly valuable and can save both money and time in product evaluation, troubleshooting, and research.

PREREQUISITE:

COURSE OBJECTIVES

1	To understand the principles of visual inspection
2	To know about the procedure followed in liquid penetrant method
3	To learn the magnetic particle testing
4	To know about in radiographic testing
5	To learn about ultrasonic testing

COURSE OUTCOMES

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

CO1. Choose the NDT methods as per the conditions of the materials under study	Understand
CO2. Identify the defects by visual inspection methods	Apply
CO3. Locate the surface defects using LPT and Magnetic particle inspection	Apply
CO4. Identify the internal defects using X ray radiography and Ultrasonic flaw detector	Apply
CO5. Inspect the defects using various techniques	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			
CO2	S			M	M							M		S	S
CO3	S	M	M	M	M							M		S	S
CO4	S	S	M	M	M							M		M	M
CO5	S	S	S	M	M							M		M	M

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT: I **9 hours**

OVERVIEW OF NDT & VISUAL INSPECTION: Inspection of materials for defects and characterization - Non-Destructive versus Destructive Tests - different NDT methods and selection criteria for inspection - Visual Testing: Principle and conditions - Equipments and accessories: borescope, flexible fiber optic borescope, endoscopes or endoprobes, video imagescope - confocal laser scanning microscopy - optical coherence tomography - laser thermography. Visual inspection applied to construction materials

UNIT: II **9 hours**

LIQUID PENETRANT TESTING: Liquid penetrant testing: Introduction - Principle and equipments - test procedure - cleaning methods - interpretation of test results - characteristics and types of penetrants - developers - safety precautions, advantages and limitations - High temperature penetrant testing - Low temperature penetrant testing - Industrial applications of LPT.

UNIT: III **9 hours**

MAGNETIC PARTICLE TESTING: Principle of magnetic particle testing - different methods to generate magnetic fields - magnetic particle testing equipment - magnetic particle testing procedures method of De-magnetization - advantages and limitations - codes and standard for MPI - magnetic particle test for welding, valves, crank shafts, etc.

UNIT: IV **9 hours**

RADIOGRAPHIC TESTING: X-ray radiography principle, equipment & methodology - Types of industrial radiation sources and application - Radiographic exposure factors and technique - Gama ray and X- ray equipment - Precautions against radiation hazards - applications of industrial radiography

UNIT: V **9 hours**

ULTRASONIC TESTING: Principle: Interaction of ultrasonic waves with matter - instrumentation - ultrasonic probes and types - ultrasonic testing methods and modes - data presentation: A-scan, B-scan and C-scan - advantages and limitations - determination of thickness of samples and defects in welded products.

TEXT BOOKS

1. Jean-Paul Balayssac and Vincent Garnier, "Non-destructive Test and Evaluation of Civil Engineering Structures", ISTE Press Ltd - Elsevier Inc., 2017.
2. Prasad J, Nair C G K, Non-destructive Testing and Evaluation of Materials, Tata McGraw Hill Education Private Limited, 2011(Second Edition)
3. Carles J Hellier, Handbook of Nondestructive Evaluation, McGraw-Hill, 2013

REFERENCE BOOKS:

1. Nathan Ida and Norbert Meyendorf, "Handbook of Advanced Nondestructive Evaluation", Springer Int. Publishing Agency, 2019.
2. Baldev Raj, T.Jayakumar, M.Thavasimuthu, "Practical Non-Destructive Testing", Narosa Publishing House, 2009.
3. Evgency N. Barkanov and Ivan A. Parinov, "Non-destructive Testing and Repair of Pipelines, Springer Int. Publishing Agency, 2018.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
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3	Dr. R. N. Viswanath	Professor	Physics	rnviswanath@avit.ac.in

	ENVIRONMENTAL SCIENCES (Common to All Branches)	Category	L	T	P	Credit
		FC-BS	3	0	0	3

Environmental science is an interdisciplinary field that integrates physical, chemical, biological, and atmospheric sciences. Environmental studies deals with the human relations to the environment and societal problems and conserving the environment for the future. Environmental engineering focuses on the various issues of environment and its management for sustainable development by improving the environmental quality in every aspect.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To inculcate the knowledge of significance of environmental studies and conservation of the natural resources.
2	To acquire knowledge of ecosystem, biodiversity, it's threats and the need for conservation
3	To gain knowledge about environmental pollution, it's sources, effects and control measures
4	To familiarize the legal provisions and the national and international concern for the protection of environment
5	To be aware of the population on human health and environment, role of technology in monitoring human health and environment.

COURSE OUTCOMES

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

CO1. Understand the importance of environment and alternate energy resources	Understand
CO2. Initiate the awareness and recognize the social responsibility in ecosystem and biodiversity conservation	Apply
CO3. To develop technologies to analyse the air, water and soil pollution and solve the problems	Apply
CO4. To evaluate the social issues and apply suitable environmental regulations for a sustainable development	Evaluate
CO5. To identify and analyse the urban problems, population on human health and environment	Analyse

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT –I ENVIRONMENT AND NATURAL RESOURCES

Environment - Definition, scope & importance - Public awareness- Forest resources- Use and over-exploitation, deforestation, case studies- Water resources: Use and over-utilization of surface and ground water, dams-benefits and problems –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, Agriculture- effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, Scope & role of engineers in conservation of natural resources.

UNIT –II ECOSYSTEMS AND BIO – DIVERSITY

Ecosystem - Definition, structure and function - Food chain, food web, ecological pyramids- Introduction, types, characteristics, structure and function of forest and Aquatic ecosystems – pond and sea, Introduction to biodiversity, Levels of biodiversity: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –India as a mega-diversity nation – hot-spots of biodiversity –Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT –III ENVIRONMENTAL POLLUTION

Pollution - Definition, causes, effects and control measures of Air, Water and Land pollution, Solid waste- solid waste Management,–Disaster management: Floods, earthquake, cyclone, landslides and tsunamis - Clean technology options, Low Carbon Life Style.

UNIT-IV SOCIAL ISSUES AND ENVIRONMENT

6 hrs

Sustainable Development- Water conservation – rain water harvesting, watershed management - Resettlement and rehabilitation of people , case studies –Climate change - Global warming - Acid rain - Ozone depletion- Environment Protection Act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act- Pollution Control Board-central and state pollution control boards.

UNIT-V HUMAN POPULATION AND ENVIRONMENT

Population – Population growth & Population Explosion –Family welfare programme - Environment & human health - Human rights – Value education –AIDS/HIV, Role of information technology in

environment and human health.

TEXT BOOK

1. Environmental Science and Engineering by Dr.A. Ravikrishnan, Sri Krishna Publications, Chennai.
2. Erach Bharucha "The Biodiversity of India" Mapin Publishing Pvt Ltd, Ahmedabad, India
3. Benny Joseph “Environmental Science and Engineering”, Tata Mc Graw- Hill, New Delhi

REFERENCES:

1.Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.
2. Anubha Kaushik and C.P Kaushik “Perspectives of Environmental Studies”, New age international publishers.
3. Trivedi R.K. “Handbook of Environmental Laws", Rules, Guidelines,Compliances and Standards Vol I & II, Enviromedia.
4. Environmental Science and Engineering by Dr. J. Meenambal, MJP Publication, Chennai Gilbert M. Masters: Introduction to Environmental Engineering and Science , Pearson EducationPvtLtd., II Edition, ISBN 81-297-0277-0,2004.
5. Miller T.G.Jr. Environmental Science Wads worth Publishing. Co.
6. Townsend C. Harper J. and Michael Begon, Essentials of Ecology, Blackwell Science.

COURSE DESIGNERS

S.No.	Name of the Faculty	Mail ID
1.	Dr. K. Sanghamitra	sanghamitra.chemistry@avit.ac.in
2.	A. Gilbert Sunderraj	gilbertsunderraj@vmkvec.edu.in

	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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S													
CO2	S	S	M	M	S				M			M	M		M
CO3	S														
CO4	S	S	M	M	S							S	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 Mission's Research Foundation (Deemed to be University), Salem.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. C. SENTHIL KUMAR	PROFESSOR	PHYSICS	senthilkumarc@vmkvec.edu.in
2	Dr. R. SETHUPATHI	ASSOCIATE PROFESSSOR	PHYSICS	sethupathi@vmkvec.edu.in

	PHYSICAL SCIENCES PART B - ENGINEERING CHEMISTRY LAB (Common to All Branches)	Category	L	T	P	Credit
		FC- BS	0	0	2	1

Engineering Chemistry Lab experiments explains the basics and essentials of Engineering Chemistry. It also helps the students to understand the applications of Engineering Chemistry. The electrodes, Cell and batteries study gives clear basic application oriented knowledge about electrochemistry. Water technology study gives the idea about hardness and its disadvantages. Now-a-days the practical and handling of equipments are needed for our fast growing life style.

PREREQUISITE

NIL

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

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

CO1. Understand the basic skills for his/her future studies.	Understand
CO2 Analyze the water comprehensively.	Apply
CO3. Apply the practical knowledge in engineering aspects	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	-	L	M	M	S	-	-	-	M	-	-	-
CO2	S	M	M	-	L	M	M	L	-	-	-	M	-	-	-
CO3	S	S	M	-	L	M	M	M	-	-	-	M			

S- Strong; M-Medium; L-Low

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 BOOK:

1. Engineering Chemistry Lab Manual by VMU.

COURSE DESIGNERS

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	FOUNDATIONS OF COMPUTING AND PROGRAMMING(THEORY + PRACTICALS)	Category	L	T	P	Credit
		FC - ES	2	0	2	3

PREAMBLE

This course aims to provide the fundamental concepts of Computer operations like hardware and software installation, and emphasizing principles programming languages. Studying the fundamentals database languages, commands and internet basics.

PRERQUISITE – Nil

COURSE OBJECTIVES

1	To provide basic knowledge of hardware components of computers and classifications.
2	To introduce and demonstrate various Operating System functions and software. Software application packages.
3	To study Principles of programming and applications of programming.
4	To learn about various Database Management Systems languages and commands used.
5	To learn basics of Internet and Web services.

COURSE OUTCOMES

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

CO1. To understand the Basic knowledge on computer hardware and its functions.	Understand
CO2. To get knowledge of Fundamentals of various Operating System functions and soft wares.	Understand
CO3.To Understand the principles of programming and categories of programming languages.	Apply
CO4.To demonstrates Database Management Systems languages and their classifications.	Apply
CO5.To understands and demonstrates the Internet Basics.	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	-
CO2	S	M	M	-	M	-	-	-	-	-	-	M	S	M	M
CO3	S	S	S	-	M	-	-	-	-	-	-	-	S	-	M
CO4	S	S	S	-	S	-	-	-	-	-	-	-	S	M	M
CO5	S	M	M	-	M	-	-	-	-	-	-	S	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to computers:

Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Supercomputers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Microprocessor, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples.

Lab Component- PC Assembly,

Operating System Fundamentals:

Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Booting,

Lab Component-, Basic unix commands

Introduction to Principles of programming

Introduction to Programming , Programming Domain : Scientific Application , Business Applications, Artificial Intelligence, Systems Programming , Web Software
Categories of Programming Languages: Machine Level Languages, Assembly Level Languages , High Level Languages ,Problem solving using Algorithms and Flowcharts

Introduction to Database Management Systems

Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL
Lab Component
Create: Table and column level constraints- Primary key, Foreign key, Null/ Not null, Unique, Default. Check, Alter, Drop, Insert, Update, Delete, Truncate, Select: using WHERE, AND, OR, IN , NOT IN

Internet Basics

Introduction, Features of Internet, Internet application, Services of Internet, Internet Service Providers, and Domain Name System.
Web Basics Introduction to web, web browsers, http/https, URL, HTML,CSS

Lab Component -HTML & CSS, web Browsing, Emails, Searching

TEXT BOOKS:

1. J. Glenn Brookshear,"Computer Science: An Overview", Addision-Wesley, Twelfth Edition, 2014

REFERENCES:

1. "Concepts of programming language" Concepts of Programming Languages Eleventh Edition GLOBAL Edition Robert W. Sebesta.

Knuth D.E., "The Art of computer programming Vol 1: Fundamental Algorithms", 3rd
Edition, Addison Wesley, 1997.

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
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	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 explain the basic laws used in Electrical circuits and various types of measuring instruments.
2	To explain the different components and function of electrical dc and ac machines.
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 theelectrical quantities and basic laws of electrical engineering.	Remember
CO2: Demonstrate Ohm's and Faraday's Law.	Apply
CO3: Describe the basic concepts of measuring instruments.	Understand
CO4: Explain the operation of electrical machineries and its applications.	Understand
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	-	-	M	L	-	-	-	L	M	L	S	M	L
CO2	S	M	M	L	M	-	-	-	S	M	M	L	S	L	-
CO3	S	M	M	M	M	-	-	-	-	L	M	L	S	M	L
CO4	S	M	L	L	M	L	-	-	-	L	M	L	S	L	-
CO5	S	M	L	-	M	S	-	-	-	L	L	L	-	-	-
CO6	S	M	-	-	M	L	S	L	-	L	L	L	M	L	M

S- Strong; M-Medium; L-Low

SYLLABUS
ELECTRICAL CIRCUITS AND MEASUREMENTS

Electrical quantities - Charge, Electric potential, current, power and Energy, Passive components (RLC)- Fundamental laws of electric circuits-steady solution of DC circuits - Introduction to AC circuits- Sinusoidal steady state analysis-Power and Power factor – Single phase and Three phase balanced circuits - Classification of Instruments-Operating Principles of indicating instruments.

ELECTRICAL MACHINES

Faraday's Law, Construction, Principle of operation, Basic Equation and Applications of DC & AC Generators and Motors - Single Phase Transformer, Single phase and Three phase Induction Motor.

ELECTRICAL SAFETY AND INTRODUCTION TO POWER SYSTEM

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.

Types of Generating stations, Transmission types & Distribution system (levels of voltage and power ratings)- Simple layout of generation, transmission and distribution of power.

TEXT BOOKS:

1. Metha.V.K, Rohit Metha, "Basic Electrical Engineering", Fifth Edition, Chand. S&Co, 2012.
2. Kothari.D.P and Nagrath.I. J, "Basic Electrical Engineering", Second Edition, Tata McGraw-Hill, 2009.
3. R.K.Rajput , "Basic Electrical and Electronics Engineering", Second Edition, Laxmi Publication, 2012.

REFERENCE BOOKS:

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

COURSE DESIGNERS

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1	Dr. R. Devarajan	Professor	EEE/VMKVEC	devarajan@vmkvec.edu.in
2	Dr. G. Ramakrishnaprabu	Associate Professor	EEE/VMKVEC	ramakrishnaprabu@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

	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, de-multiplexer, 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 and working Principles of logic gates.
3	To learn the digital logic principles and realize adders, multiplexer, etc.,
4	To understand the application-oriented concepts in the Various 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 rectifier, Clipper, Clamper, regulator 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 for given data input.	Apply
CO5. Expose the working principles of modern technologies in developing application-oriented gadgets like the UHD, OLED, HDR and various communication systems.	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	-	-	-	M	-	-
CO2	S	M	M	M	-	-	M	-	L	-	-	L	-	M	-
CO3	S	M	M	-	-	-	-	-	L	-	-	-	S	-	-
CO4	S	M	M	M	-	-	M	-	L	-	-	L	M	-	-
CO5	S	M	-	-	-	-	-	-	L	L	-	L	S	-	L

S- Strong; M-Medium; L-Low

SYLLABUS

SEMICONDUCTOR DEVICES

Passive and Active Components - Resistors, Inductors, Capacitors- Intrinsic Semiconductor, Extrinsic Semiconductor, Energy band diagram- Conductor, insulator, semiconductor, Characteristics of PN Junction Diode - Zener Diode and its Characteristics - Half wave and Full wave Rectifiers, Voltage Regulation- Simple wave shaping circuits- Clipper, Clamper. Bipolar Junction Transistor, JFET, MOSFET & UJT.

DIGITAL FUNDAMENTALS

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

COMMUNICATION AND ADVANCED GADGETS

Modulation and Demodulation – AM, FM, PM ,PCM,DM– RADAR – Satellite Communication – Mobile Communication, Optical communication, Microwave 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

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1	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
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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

	PYTHON PROGRAMMING (THEORY + PRACTICALS)	CATEGORY	L	T	P	CREDIT
		FC- ES	2	0	2	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	-	-	-	-	-	-	-	M	M	M
CO2	S	M	M	M	M	-	-	-	-	-	-	-	S	M	M
CO3	M	S	S	S	M	-	-	-	-	-	-	-	M	M	M
CO4	S	S	S	S	M	-	-	-	-	-	-	-	S	S	M
CO5	S	M	M	M	M	-	-	-	-	-	-	-	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

1 INTRODUCTION

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

2 DATA STRUCTURES

Strings-Lists-Tuples-Dictionaries-Sets

3 CONTROL STATEMENTS

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

4 FUNCTIONS

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

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.

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

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

PREAMBLE

Objective of this course is to provide an insight and inculcate the essentials of Civil Engineering discipline to the students of all branches of Engineering.

PREREQUISITE-NIL

COURSEOBJECTIVES

1	To understand the basic concepts of surveying and apply in practical problems
2	To study in detail different types of construction materials.
3	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 concepts of Surveying on practical applications.	Apply
CO2. Explain different types of buildings, building components, building materials and building construction.	Remember
CO3.Expalin the essentials of components of a building and application of load on it	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	L	M	-	S	L	-	M	M	L	L	-	L	M	M	M
CO2	S	M	L	-	M	S	-	-	-	-	-	-	M	-	-
CO3	S	M	L	S	M	S	-	-	M	-	-	-	-	S	-

S-Strong;M-Medium; L-Low

SYLLABUS

SURVEYING

Objects–types–classification–principles–measurementsofdistances–angles–levelling–determination of areas– illustrative examples.

CIVIL ENGINEERING MATERIALS

Bricks –stones–sand –cement –concrete mix design and Quantity computation–steel sections.

BUILDING COMPONENTS AND STRUCTURES:

FOUNDATIONS: Types, Safe Bearing capacity of Soil–Requirement of good foundations.
SUPERSTRUCTURE: Brick Masonry–Stone Masonry–Beams –Columns –Lintels–Roofing–Flooring–Plastering–Mechanics – Internal and External Forces –Load Transformation Mechanism in Structural Elements– Stress – Strain – Elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping–Water Supply–Sources and Quality of Water— Rain water harvesting—Introduction to highway and railway.

TEXTBOOKS:

1. Basic Civil and Mechanical Engineering,VMU,(2017).CompanyLtd.,NewDelhi,2009.
2. Basic Civil and Mechanical Engineering, M.Prabakaran, S.P.Sangeetha, Vemuri Lakshminarayana, Maruthi Publishers, 2017.
3. Reinforced Concrete Structures B.C.Punmia,Vol.1&2,-Laxmi Publications,Delhi,2004.

REFERENCES:

1. Ramamrutham S., “Basic Civil En Ltd., 2009.
2. Rangwala S.C and Dalal K.B, Bui ouse, 2022.

COURSE DESIGNERS				
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1	S.Supriya	Assist.Professor	Civil/VMKVEC	jansupriyanair@gmail.com
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	BASICS OF MECHANICAL ENGINEERING	Category	L	T	P	Credit
		FC (ES)	2	0	0	2

Preamble

This course provides a preliminary knowledge of the applications of mechanical engineering in our day to day life.

Prerequisite-NIL

CourseObjective

1	To demonstrate the principles of casting and metal joining processes in manufacturing
2	Understand the importance and uses of IC Engines, working principles of IC Engines.
3	Comprehend the working and use of various power plants

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

CO1.	Illustrate the application of casting and metal joining processes in manufacturing	Apply
CO2.	Demonstrate the operation of automotive engines and important components	Apply
CO3.	Understanding the construction and the working principle of conventional and non-conventional power generation	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	S	L	M	-	-	-	-	-	-	-	-	-	-
CO2	S	M	M	L	L	-	-	-	-	-	-	-	-	-	-
CO3	S	M	M	L	L	-	-	-	-	-	-	-	-	-	-

S-Strong; M-Medium; L-Low

SYLLABUS

BASIC MANUFACTURING PROCESSES

Casting process-Introduction, Principle, Advantages, casting defects Forging process-introduction, forging, rolling, drawing, extrusion Welding process- introduction, principle, types-Gas and arc welding

IC ENGINES

The Importance and uses of Engines-Definition, Classification-I C & E C Engines- two stroke engines - four stroke engines - various parts and functions of I C engines-working of two stroke petrol engine and diesel engine with line sketches - working of four stroke petrol and diesel engines with line sketches - Comparison between two stroke and four stroke engines -S I and C I engines.

POWER PLANT ENGINEERING

Classification of power plants- Working of power plant with line Sketches-Steam power plant-Hydro- electric power plant - Diesel power plant -Nuclear power plant- merits and demerits. Nonconventional energy power plants – solar- wind-tidal- geo thermal, with line sketches- merits & demerits of various non conventional power plants

Text Books

1	Power plant Engineering, by G.R Nagpal
2	Internal combustion Engines by Ganesan
3	Workshop technology vol1, by S K Hajra Choudhury

Reference Books

1	Production technology, by P.C Sharma
2	Thermal Engineering by R.S.Khurumi
3	Power plant Engineering, by R.K Bansal

Course Designers

Sl.No	**Faculty Name**	**Designation**	**Department/Name of the College**	**Emailid**
1	R.MAHESH	AP(G-II)	MECH/AVIT	mahesh@avit.ac.in

	ENGINEERING GRAPHICS AND DESIGN	Category	L	T	P	Credit
		FC- ES	0	0	6	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 draw the orthographic views from the given pictorial view.

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

CO1.	Execute in the form of drawing of the orthographic projections of points, straight lines, plane surfaces and solids.	Apply
CO2.	Demonstrate in the form of drawing of the orthographic projections of sectioned solids and true shape of the sections.	Apply
CO3.	Develop lateral surfaces of the solid section and cut section of solids.	Apply
CO4.	Draw the pictorial projections (isometric and perspective) of simple solids.	Apply
CO5.	Draw 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		

S- Strong; M-Medium; L-Low

Syllabus

PLANE CURVES AND DIMENSIONING

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Dimensioning. Projection of points.

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.

ORTHOGRAPHIC VIEWS AND ISOMETRIC VIEWS – First angle projection – layout views – Representation of Three Dimensional objects -multiple views from pictorial views of objects.

Principles of isometric View – isometric scale – Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones.	
INTRODUCTION TO AUTO CAD Introduction to Auto CAD- Basic introduction and operational instructions of various commands in AutoCAD. Limit System- Tolerance, Limits, Deviation, Actual Deviation, Upper Deviation, Lower Deviation, Allowance. Preparation of manual parts drawing and assembled sectional views from orthographic part drawings,	
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.
4	Bhatt-N.D.-"Machine Drawing"-Published by R.C.Patel- Chartstar Book Stall- Anand-India- 2003
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	Dept / College	Email id
1	Dr. S.Venkatesan	Professor	Mech / VMKVEC	venkatesan@vmkvec.edu.in
2	Dr. N.Rajan	Professor	Mech / VMKVEC	rajan@vmkvec.edu.in

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute	Duriation
1.	Engineering Graphics and Design	Prof. Naresh Varma Datla, Prof. S. R. Kale	IIT Delhi	12 weeks
2.	Engineering Drawing	Robi, P.S.	IIT Guwahati	12 weeks
3.	Engineering Drawing and Computer Graphics	Prof. Rajaram Lakkaraju	IIT Kharagpur	12 weeks

	PROGRAMMING FOR PROBLEM SOLVING	Category	L	T	P	Credit
		FC- ES	3	0	0	3

PREAMBLE

The course is designed to introduce basic problem solving and program design skills that are used to create computer programs. It gives engineering students an introduction to programming and developing analytical skills to use in their subsequent course work and professional development. This course focuses on problem solving, algorithm development, top-down design, modular programming, debugging and testing using the programming constructs like flow-control, looping, iteration and recursion. It presents several techniques using computers to solve problems, including the use of program design strategies and tools, common algorithms used in computer program and elementary programming techniques.

PREREQUISITE–NIL

COURSEOBJECTIVES

1.	To gain basic knowledge about simple algorithms for arithmetic and logical problems.
2.	To learn how to write a program, syntax and logical errors.
3.	To understand how to decompose a problem into functions and synthesize a complete program.

COURSEOUTCOMES

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

CO1: Formulate simple algorithms for arithmetic and logical problems.	Understand
CO2: Test and execute the programs and correct syntax and logical errors	Apply
CO3: Implement conditional branching, iteration and recursion.	Apply
CO4: Decompose a problem into functions and synthesize a complete program.	Analze
CO5: Use arrays, pointers, strings and structures to formulate algorithms and programs	Apply

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMMESPECIFICOUTCOMES

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

S-Strong; M-Medium; L-Low

SYLLABUS

UNIT – I: INTRODUCTION

Computer system: components of a computer system-computing environments-computer languages, creating and running programs, Algorithms, flowcharts- Introduction to C language: basic structure of programs, process of compiling and running program, -tokens, keywords, identifiers, constants, strings, special symbols, variables, data types-I/O statements

UNIT – II: OPERATORS, EXPRESSIONS AND CONTROL STRUCTURES

Operators and expressions: Operators- arithmetic- relational and logical- assignment operators- increment and decrement operators,-bitwise and conditional operators-special operators- operator precedence and associativity- evaluation of expressions-type conversions in expressions- Control structures: Decision statements: if and switch statement- Loop control statements: while, for and do while loops- jump statements- break-continue-goto statements.

UNIT – III: ARRAYS AND FUNCTIONS

Arrays: One dimensional array-declaration and initialization of one dimensional arrays- two dimensional arrays-initialization and accessing- multidimensional arrays- Basic Algorithms: Searching- Basic Sorting Algorithms-Functions: User defined and built-in Functions- Parameter passing in functions-call by value-Passing arrays to functions-call by reference,-Recursion-Example programs, such as Finding Factorial, Fibonacci series

UNIT – IV: STRINGS AND POINTERS

Strings: Arrays of characters- variable length character strings-inputting character strings-character library functions-string handling functions- Pointers: Pointer basics- pointer arithmetic-pointers to pointers-generic pointers-array of Pointers- functions returning pointers,-Dynamic memory allocation

UNIT – V: STRUCTURES AND FILE HANDLING

Structures and unions: Structure definition- initialization- accessing structures,-nested structures,-arrays of structures-structures and functions- unions- typedef- enumerations.-File handling :command line arguments- File modes- basic file operations read,-write and append

TEXTBOOKS

1. Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill

REFERENCES

1. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
2. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.

Course Designers:

S.No.	Name of the Faculty	Designation	Department	MailID
1.	Mrs.R.Shobana	Assistant Professor	CSE	shobana@avit.ac.in
2.	Mr.B.Sundaramurthy	Assistant Professor	CSE	sundaramurthy@vmkvec.edu.in

	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 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	M	L	--
CO2	S	M	S	S	--	--	--	--	M	--	--	M	M	L	--
CO3	L	S	L	--	S	--	--	--	--	L	--	L	M	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. Types of wiring, Joints and 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	Dr. G. Ramakrishnaprabu	Associate Professor	EEE/VMKVEC	ramakrishnaprabu@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

	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. Familiarize with the fundamentals of soldering techniques.	Understand
CO2. Construct experiments for PN and Zener diode characteristics also determine diode forward and reverse resistance	Apply
CO3. Construct clipper and clamper circuit and verify their voltage levels	Apply
CO4. Construct and justify operation simple voltage regulator for given Zener diode	Apply
CO5. Verify the truth tables and characteristics 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	-	-	-	-	-	-	L	-	-	-	M	-	-
CO2	S	M	M	M	-	-	M	-	L	-	-	L	-	M	-
CO3	S	M	M	-	-	-	-	-	L	-	-	-	S	-	-
CO4	S	M	M	M	-	-	M	-	L	-	-	L	M	-	-
CO5	S	M	-	-	-	-	-	-	L	L	-	L	S	-	L

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Practicing of Soldering and Desoldering.
2. Characteristics of PN junction Diode and find the forward and reverse resistance

3.Construct and Study simple clipper and clamper circuits
4. Characteristics of Zener diode and determine the break down voltage and diode resistance
5.Construct and Study simple voltage regulator using zener diode
6. Verification of Logic Gates.
7. Find the characteristics of AND ,NOR,NOT gate
8. Construct and Study simple voltage regulator using zener diode.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
2	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@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

	ENGINEERING SKILLS PRACTICE LAB PARTA- BASIC CIVIL ENGINEERING (Common toAll Branches)	Category	L	T	P	Credit
		FC-ES	0	0	2	1

PREAMBLE

EngineeringSkillsPracticeisahands-ontrainingpracticetoMechanical,CivilandMechatronicsEngineeringstudents.Itdealswithfitting,carpentry,sheetmetal and relatedexercises.Also,it willinducethehabit ofselectingright tools, planningthejobanditsexecution

PREREQUISITE

Nil

COURSEOBJECTIVES

1	Tounderstandthebasicconceptsofbuildingcomponents.
2	Toimpart basic knowledgeaboutPlumping and Carpentry works.

COURSEOUTCOMES

Onthesuccessfulcompletionofthecourse,studentswill beableto

CO1. Preparethedifferenttypesoffitting and plumbing lines.	Apply
CO2.Preparethedifferenttypesofjointsusingwoodenmaterial	Apply

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMMESPECIFICOUTCOMES

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

S-Strong; M-Medium; L-Low

SYLLABUS

Buildings:

1. Studyofplumbingandcarpentrycomponentsofresidentialandindustrial buildings,Safetyaspects.

Plumbing and Carpentry Works:

2. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in householdfittings.
3. Preparationofplumbinglinesketchesforwatersupplyandsewageworks.
4. Hands on Exercise on Demonstrationofplumbingrequirementsofhigh-risebuildings.

CarpentryusingPowerToolsonly:

5. Study of the joints in roofs, doors, windows and furniture.
6. Hands-on-exercise:Woodwork,jointsbysawing,planningandcutting.

TEXTBOOK

1.BasiccivilengineeringLabManual byDepartment ofCivil Engineering, VMRF.

COURSEDESIGNERS

S.No	NameoftheFaculty	Designation	Nameofthe College	MailID
1	M.Senthilkumar	Asst.Professor	Civil/ VMKVEC	senthilkumar@vmkvec.edu.in
2	Dr.D.S.Vijayan	Asst.Professor	Civil/AVIT	vijayan@avit.ac.in

	ENGINEERING SKILLS PRACTICE LAB B. BASIC MECHANICAL ENGINEERING	Category	L	T	P	Credit
			0	0	2	1

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 executive joints using wooden materials.
3	To apply 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.	Perform the different types of fitting using MS plate.	Apply
CO2.	Practice the different types of joints using wooden material	Apply
CO3.	Demonstrate the different types of joints in metal by Arc Welding	Apply
CO4.	Utilize the different types of green sand mould	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO 1	PO2	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	-	L	-	-	-	-	-	M	-	-	-	L	-	-
CO2	S	-	L	-	-	-	-	-	M	-	-	-	L	-	-
CO3	S	-	-	-	-	-	-	-	-	-	-	-	L	-	-
CO4	S	-	L	-	-	-	-	-	M	-	-	-	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	V K Krishnan	Associate Professor	Mech / VMKVEC	vkkrishnan@vmkvec.edu.in
2	S. Duraithilagar	Associate Professor	Mech / VMKVEC	sduraithilagar@vmkvec.edu.in

	Basic Concepts of Mechatronics	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This course is introduce the design process that is characterized by synergistic integration of mechanisms, sensors, actuators and control to perform complex tasks in a hypothetical environment. Mechatronics system design makes possible to understand the basic design process involved in mechatronics, selection of sensors and actuators, the interface issues and communication problems. Design of a mobile robot is introduced in this subject to illustrate the concepts.

PREREQUISTE -NIL

COURSE OBJECTIVES

1	To understand the working of the various Mechatronic components.
2	To understand the knowledge in port components used in system modeling.
3	To gain about Generalized Mechatronics Design Process.
4	To learn the interfacing of pneumatic system with PLC and in turn design a system.
5	To realize the role of piezo electric sensors and actuators in various applications

COURSE OUTCOMES

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

CO1. Apply the knowledge of PLC and different mechatronic components to design a system	Understand
CO2. Analyse the different systems and their mechanisms.	
CO3. Develop the value of team work by performing in small groups and improve the communication skills though report writing/lab records.	Apply
CO4.Explain the design process involved in mechatronics	Understand
CO5. Select the sensor and Actuator for a Mechatronic application	Apply
CO6 Develop a Mechatronic product for the given problem	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	-	-	-	-	-	-	-	L	M	-	-
CO2	S	M	M	L	-	-	-	-	-	-	-	L	S	M	-
CO3	S	M	M	-	-	-	-	-	-	-	-	L	S	M	M
CO4	M	-	L	M	S	-	L	M	-	-	-	L	M	S	
CO5	S	-	L	-	M	-	-	-	S	S	M	L	-	S	M
CO6	S	S	M	M	M	M	-	-	M	-	M	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to Systems And Design

Mechatronic elements – Integrated design issue in mechatronic – mechatronic key element, mechatronics approach – control program control – adaptive control and distributed system – Design process – Type of design – Integrated product design – Mechanism, load condition design and flexibility – structures – man machine interface, industrial design and ergonomics, information transfer, safety.

Control and Drives

Control Parts – Electro hydraulic control devices, electro pneumatic proportional controls – Rotational drives – Pneumatic motors: continuous and limited rotation – Hydraulic motor: continuous and limited rotation – Motion convertors, fixed ratio, invariant n

Real Time Interfacing

interfacing system – Introduction, Elements of a data acquisition and Control system, overview of I/O process, installation of I/O card and software – Installation of the application software – over framing.

Case Studies – I

Case studies on data attainment – Testing of transportation bridge surface materials – Transducer calibration system for Automotive application – strain gauge weighing system – solenoid force – Displacement calibration system – Rotary optical encoder – controlling temperature of a hot/cold reservoir – sensors for condition monitoring – mechatronic control in automated manufacturing

Case Studies – II

Case studies on data attainment and Control – thermal cycle fatigue of a ceramic plate – pH control system. Deicing temperature control system – skip control of a CD player – Auto focus Camera. Case studies on design of mechatronic product – pick and place robot – car park barriers – car engine management – Barcode reader.

Text Books

1. Bolton (2015), "Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering", Pearson Education Limited, ISBN - 9781292076683.

2. Devdas Shetty, Richard A. Kolkm (2010), "Mechatronics System Design", Cengage Learning, ISBN - 9781439061992.

Reference Books

1. Brian Morriss (1994), "Automated Manufacturing Systems – Actuators Controls, Sensors and Robotics", McGraw-Hill Inc., ISBN - 9780028023311.

2. Bradley, D. Dawson, N.C. Burd and A.J. Loader (1993), "Mechatronics: Electronics in products and Processes", CRC Press, ISBN – 9780748757428.

COURSE DESIGNERS				
S.No	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
1	Dr.K.Boopathy	Asso.Prof	EEE/AVIT	boopathy@avit.ac.in
2	Dr.Devarajan	Professor	EEE/VMKVEC	devarajan@vmkvec.edu.in

	ELECTRICAL MACHINERY (THEORY & PRACTICALS)	Category	L	T	P	Credit
		CC	3	0	2	4

PREAMBLE

This course is concerned with the constructions, characteristics and applications of various electrical machines and transformer.

PREREQUISITE

Basic of Electrical & Electronics Engineering

COURSE OBJECTIVES

1	To gain knowledge about the working principle, construction, applications of DC machines
2	To familiarize construction, operation, testing of transformers.
3	To gain knowledge about the construction, operation and applications of Induction machines
4	To gain knowledge about construction, principle of operation and performance of Alternators.
5	To understand the construction, operation of special machines.

COURSE OUTCOMES

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

CO1	Explain the construction, characteristics and applications of DC machines	Understand
CO2	Explain the fundamentals and operation of Transformer	Understand
CO3	Explain the types and operation of induction motor	Understand
CO4	Identify the parts and performance of alternators	Understand
CO5	Explain the construction, and operation of special Machines	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	M	M	-	L	-	-	-	M	M	L	S	M	-
CO2	M	S	-	L	L	-	-	L	L	-	S	-	S	M	-
CO3	M	M	M	S	-	-	-	-	-	L	-	L	S	M	-
CO4	S	S	-	M	M	M	L	L	L	-	S	-	S	M	-

CO5	S	M	M	M	-	-	-	-	-	L	-	L	-	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

D.C GENERATORS AND DC MOTORS

Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators, DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

TRANSFORMERS

Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit, Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation.

THREE PHASE INDUCTION MOTOR

Principle of operation of three-phase induction motors – Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

ALTERNATORS

Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

SPECIAL MOTORS

Principle of operation - Synchros-Synchronous reluctance motor -Stepper Motors - Switched reluctance motor-AC servomotor-AC tachometers- Shaded pole motors-Capacitor motors –Characteristics

PRACTICE

Experiment on Shunt Motor, Series Motor, Transformer, Induction Motor, Generator

TEXT BOOKS

1. "Introduction to Electrical Engineering "– M.S Naidu and S. Kamakshaiah, TMH Publ.1995
2." Basic Electrical Engineering" - T.K. Nagasarkar and M. S. Sukhija, Oxford University Press, 2005
3. " Electrical Machines" Er. R.K. Rajput , Laxmi Publications, 5th Edition 2016

REFERENCES

1. "Theory and Problems of basic electrical engineering" - I.J. Nagarath and D.P Kothari, PHI Publications 2016
2. "Principles of Electrical Engineering "- V.K Mehta, S. Chand Publications.2008

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	e-Mail ID
1	D. Saranya	Assistant Professor (Gr-II)	EEE/AVIT	dsaranya@avit.ac.in
2	R. SATHISH	Assistant Professor	EEE	sathish@vmkvec.edu.in

	SEMICONDUCTOR DEVICES AND CIRCUITS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This is an introduction course to semiconductor devices. The course begins with a discussion on how electron energy bands are formed in semiconductors. It examines the principles and operations of essential semiconductor devices used in today's electronics: diodes, light emitters, bipolar junction transistors and MOSFETs. It includes analysis of small signal model and large signal model of the devices which is the prerequisite for next level courses. This subject helps the students to design, model and develop amplifier circuits, Oscillator circuits, Tuned amplifiers and many other real time application circuits.

PREREQUISITE

Basics of Electrical and Electronics Engineering

COURSE OBJECTIVES

1	To understand the small signal BJT/FET Models.
2	Identify the frequency response of BJT and FET.
3	Apply the basic concept and working of various types of feedback amplifiers and oscillators.
4	To understand the working different types of large signal amplifiers.
5	To learn about various types of tuned amplifiers

COURSE OUTCOMES

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

CO1. Determine various factors for HWR, FWR and construct Clipper, Clamper and voltage regulator circuits	Apply
CO2.Determine the characteristics and parameters of BJT and FET in various configuration	Apply
CO3. Design the voltage divider bias for BJT, FET and justify stability factors.	Apply
CO4. Analyze various parameters of feedback amplifier (voltage series, voltage shunt, current series and current shunt) by using simulation tools.	Analyze
CO5.Analyze the efficiency of large signal amplifiers and bandwidth of tuned amplifier by using simulation tools.	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	M	-	-
CO3	S	S	M	M	-	-	-	-	-	-	-	M	S	L	L
CO4	S	S	M	M	M	-	-	-	-	-	-	M	S	M	L
CO5	S	M	M	M	M	-	-	-	-	-	-	M	S	M	L
S- Strong; M-Medium; L-Low															

SYLLABUS

SEMICONDUCTOR DIODE AND ITS APPLICATIONS

PN Junction Diode –, Zener Diode- Characteristics -equivalent circuits, Diode current Equation, Light-Emitting Diodes, Half-Wave Rectification, Full-Wave Rectification, Bridge Rectifier, Voltage regulator- Line and Load regulation, Clipper, Clamper, Voltage-Multiplier Circuits,

TRANSISTORS & SPECIAL DEVICES

Transistor: Construction, Transistor Operation and characteristics- CE, CB, CC Configuration -Characteristics of JFETs, Transfer Characteristics, Depletion-Type MOSFET, Enhancement-Type MOSFET. Special Devices: SCR, Shockley Diode, Diac, Triac, Unijunction Transistor, Phototransistors, MISFETs, MESFET.

BIASING CIRCUITS & SMALL SIGNAL ANALYSIS

BJT Biasing : Fixed Bias Configurations, Emitter Bias Configuration, Voltage Divider Bias - AC /DC Load line-Operating Point -, Hybrid Equivalent model, stability factor, Small Signal Analysis of CE Amplifier.
FET Biasing : Fixed bias, Self bias and Voltage divider bias, FET amplifiers – small signal model and Configurations using multisim simulation tool.

FEEDBACK AMPLIFIERS

Concept of feedback – effects of negative feedback- Input impedance- output impedance, voltage gain, current gain, Types of feedback amplifier-Voltage and Current Series, Voltage and Current Shunt, Gain Bandwidth Product.

POWER AMPLIFIERS & TUNED AMPLIFIERS

Power Amplifier : Class A, Push –Pull Amplifier-Class B, Class C & D amplifiers, Amplifier Distortion, Amplifier Efficiency. Tuned amplifiers: Single tuned, Double tuned, Synchronous tuned amplifiers –Stability of Tuned Amplifiers using multisim simulation tool.

TEXT BOOKS:

1.Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill,4thEdition, 2015.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11thEdition, 2013

REFERENCE BOOKS:

1. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford University Press, 5th Edition,2008.
2. D.Roychoudhury and shailB.Jain, —Linear Integrated circuits‖, 4th edition, New Age International Pvt.Ltd, 2014.
3. Thomas L. Floyd, "Electronic Devices", 9th edition, Pearson Education, 2011.

COURSE DESIGNERS				
S.No	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
1.	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
2.	Dr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

	FLUID MECHANICS AND STRENGTH OF MATERIALS	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

	ANALOG AND DIGITAL CIRCUITS (Theory and Practicals)	Category	L	T	P	Credit
		CC	3	0	2	4

PREAMBLE

One of the most important reasons for the unprecedented growth of Digital Electronics and systems is the advent of integrated circuits(ICs).Developments in the IC technology have made it possible to fabricate complex digital circuits such as microprocessors, memories and FPGAs etc. This course provides various methods and techniques suitable for a variety of digital system design applications.

PREREQUISITE

Semiconductor Devices And Circuits

COURSE OBJECTIVES

1	To understand the small signal BJT/FET Models
2	To learn about various compound configurations of multivibrators
3	To impart the design knowledge of various combinational logic circuits and sequential circuits
4	To understand the basics of hardware descriptive language
5	To design the various sequential logic circuits

COURSE OUTCOMES

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

CO1. Apply the basic concept and working of various types offeedback amplifiers and oscillators.	Apply
CO2. Design different multivibrators & compound Configurations Circuits.	Apply
CO3. Apply the principles of Boolean algebra to manipulate and minimize logicexpressions	Apply
CO4. Design various combinational logic circuits (adder, subtractor, multiplexer and coders, etc.,)	Analyze
CO5.Design various sequential circuits using flip flops (counters, shift registers, etc.,)	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	M	L	-
CO3	S	M	M	M	M	-	-	-	-	-	-	M	S	M	-
CO4	S	S	M	M	-	-	-	-	-	-	-	M	S	M	-
CO5	S	S	M	S	-	-	-	-	-	-	-	M	S	M	L
S- Strong; M-Medium; L-Low															

SYLLABUS

OSCILLATOR CIRCUITS

Concept of feedback – effects of negative feedback-Barkhausen Criterion – Oscillator Circuits: Oscillator Principles – LC oscillators – Hartley oscillator, Colpitts Oscillator, Clapp Oscillator, RC Phase shift oscillators, Sweep oscillator-Wein Bridge Oscillator-Crystal oscillators - Demonstration With Relevant Experiments

COMPOUND CONFIGURATIONS AND MULTIVIBRATORS

Introduction, Cascade Connection, Cascode Connection, Darlington Connection, Differential Amplifier Circuit, CMRR, Schmitt Trigger. Multivirators- Astable –bistable – Monostable-- Demonstration With Relevant Experiments

BOOLEAN ALGEBRA, LOGIC GATES & GATE –LEVEL MINIMIZATION:

Introduction, Boolean Algebra, basic theorem & properties of Boolean Algebra, Boolean functions, canonical & standard forms, logical operations, logic gates, Integrated circuits, Map method-upto four variable Kmaps, Product of Sums (POS) & Sum of Products (SOP) simplification, don't care conditions, NAND & NOR implementations, Exclusive-OR Function, Hardware Description Language(HDL)- - Demonstration With Relevant Experiments

COMBINATIONAL LOGIC

Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder,
Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Code Converters, Encoders, Decoders, Multiplexers-- Demonstration With Relevant Experiments

SYNCHRONOUS SEQUENTIAL LOGIC, REGISTER & COUNTERS

Sequential circuits, storage elements: latches, flip flops, Analysis of clocked sequential circuits, Moore and Mealy circuits ,state diagram, state reduction & Assignment, design procedure, shift registers, ripple counters, synchronous counters-- Demonstration With Relevant Experiments

Text Books:

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill,4thEdition, 2015.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11thEdition, 2013
3. Morris Mano, "Digital Design (with an introduction to the verilog HDL)", Prentice-Hall of India.
4. John F. Wakerly, "Digital Design Principles & Practices", 4th edition, Prentice-Hall,2005.

Reference Books:

1.David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford University Press, 5th Edition,2008.
2. D.Roy choudhury and shail B.Jain, ―Linear Integrated circuits‖, 4th edition, New Age International Pvt.Ltd, 2014.
3. Thomas L. Floyd, "Electronic De , 2011. Stephen D. Brown, and Zvonko Vranesic, "Fundamentals of Digital Logi cGraw Hill, June, 2007.

4. William Kleitz, “Digital Electronics: A Practical Approach with VHDL”, Ninth Edition, Pearson, 2002.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
2.	Dr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

	SENSORS AND ELECTRONIC MEASUREMENTS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The course is designed with the introduction of electronic instrumentation and with an overview of Electronic measurement principles, the physical principles and electrical characteristics for several common instrument transducers. The electronic signal-conditioning circuits required to convert the electrical changes in the transducers to signal which can be interpreted accurately by a microprocessor or embedded controller, are analyzed and designed.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To understand the measuring methods and instruments of electrical quantities.
2	To understand, design aspects and performance criterion of measuring instruments.
3	To understand the working principle of various transducers.
4	To aware the students about the different types of sensors.
5	To understand about Data aquisitions.

COURSE OUTCOMES

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

CO1. Understand operation of different instruments • • •	Understand
CO2. Distinguish between the analog and digital meters	Understand
CO3. Identify the industrial and laboratory applications of instruments	Apply
CO4. Perform experiments to determine various types of errors in measurements •	Analyze
CO5. Practice for design of testing and measuring set up for electronic 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	M	L	--	M	--	M	--	--	L	--	--	M	--	M	--
CO2	M	L	--	M	--	M	--	--	L	--	--	M	--	M	--
CO3	S	M	L	S	--	S	M	M	M	--	--	M	M	M	M
CO4	S	S	L	S	--	S	M	M	S	--	--	M	S	M	M
CO5	S	S	L	S	--	S	M	M	S	--	--	S	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION:

Basics of Measurements: Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis, Standards of measurement. Bridge Measurement: DC bridges- wheatstone bridge, AC bridges – Kelvin, Hay, Maxwell, Schering and Wien bridges, Wagner ground Connection. Electronic Instruments for Measuring Basic Parameters: Amplified DC meter, AC Voltmeter, True- RMS responding Voltmeter, Electronic multi-meter, Digital voltmeter,

Vector Voltmeter.

DISPLAY AND RECORDING DEVICES

Oscilloscopes: Cathode Ray Tube, Vertical and Horizontal Deflection Systems, Delay lines, Probes and Transducers, Specification of an Oscilloscope. Oscilloscope measurement Techniques, Special Oscilloscopes – Storage Oscilloscope, Sampling Oscilloscope. Signal Generators: Sine wave generator, Frequency – Synthesized Signal Generator, Sweep frequency Generator. Pulse and square wave generators. Function Generators.

SIGNAL PROCESSING:

Signal Analysis: Wave Analyzer, Spectrum Analyzer. Frequency Counters: Simple Frequency Counter; Measurement errors; extending frequency range of counters Transducers: Types, Strain Gages, Displacement Transducers.

PHOTOELECTRIC AND PIEZOELECTRIC SENSORS

Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectrophotometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure and Ultrasound transducer.

DATA ACQUISITION TECHNIQUES:

Digital Data Acquisition System: Interfacing transducers to Electronics Control and Measuring System. Instrumentation Amplifier, Isolation Amplifier. An Introduction to Computer-Controlled Test Systems.IEEE-488 GPIB Bus

TEXT BOOKS:

1. H.S. Kalsi, “Electronic Instrumentation & Measurement”, Tata McGraw HILL, 1995.
2. Modern Electronics Instrumentation & Measurement Techniques, by Albert D.Helstrick and William D.Cooper, Pearson Education. Selected portion from Ch.1, 5-13.
3. Elements of Electronics Instrumentation and Measurement-3rd Edition by Joshph J.Carr.Pearson Education. Selected portion from Ch.1,2,4,7,8,9,13,14,18,23 and 25.

Reference Books : 3. Electronics Instruments and Instrumentation Technology – Anand, PHI 4. Doebelin, E.O., Measurement systems, McGraw Hill, Fourth edition, Singapore, 1990.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.Lakshmi Shree B	Assistant Professor	BME	Lakshmishree.bme@avit.ac.in

	CONTROL SYSTEMS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This course shall introduce the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The course focuses primarily on using Laplace and frequency-domain techniques. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems. At the end of this course, one should possess in-depth knowledge of concepts from classical control theory, understand the concept of transfer function and use it for obtaining system response, analyze dynamic systems for their stability and performance, and design controllers (such as Proportional-Integral-Derivative) based on stability and performance requirements.

PREREQUISITE

Differential Equations and Transforms

COURSE OBJECTIVES

1	Understand the feedback and feed-forward control; apply representations of control systems.
2	To find time response of given control system model, various controllers design and simulation using MATLAB.
3	To understand the frequency domain analysis, use of frequency response methods for open loop and closed loop control systems.
4	To analyze the stability of systems using various methods and to design compensators.
5	To develop and analyze the state space models.

COURSE OUTCOMES

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

CO1	Find Transfer function of systems.	Understand
CO2	Find the time response of given control system model and to design a controller.	Create
CO3	Find the frequency response of control system model using frequency response plots.	Analyze
CO4	Analyze the stability of the control system and design the suitable compensators.	Create
CO5	Apply state space techniques to model control systems.	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	S	L	S	M	-	-	-	-	-	M	M	S	M	-
CO2	S	M	-	M	S	-	-	M	-	-	-	M	S	M	S
CO3	S	M	-	M	S	-	-	-	-	-	-	M	S	M	-
CO4	S	M	-	M	S	-	M	-	-	-	M	M	S	M	S
CO5	S	M	-	M	S	L	L	-	M	-	M	M	S	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO CONTROL SYSTEMS

Basic elements in control systems – classifications of control systems – Mechanical Translational and Mechanical Rotational Systems, Electrical analogy– Transfer function – Block diagram reduction techniques – Signal flow graphs.

TIME RESPONSE ANALYSIS

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Effects of P, PI, PID modes of feedback control. Design and Simulation of time domain analysis using MATLAB.

FREQUENCY DOMAIN ANALYSIS

Frequency response analysis, Frequency domain specifications, Correlation between time and frequency responses, Bode Plot, Polar Plot, Constant M and N circles, Nichols chart, Design and Simulation of frequency domain analysis using MATLAB.

STABILITY ANALYSIS AND COMPENSATOR DESIGN

Concepts of stability, Necessary conditions for Stability, Routh stability criterion, Relative stability analysis, Introduction to Root-Locus Techniques, Guidelines for sketching root locus , Nyquist stability criterion. Cascade Lag compensation, cascade Lead compensation and cascade Lag-Lead compensation

STATE VARIABLE ANALYSIS, AND APPLICATION OF CONTROL SYSTEMS

Introduction to State variable analysis: Introduction, Concept of State, State variables & State model, Equivalence between transfer function and state variable representations, Digital control design using state feedback. Synchros – AC servomotors- DC Servo motors.

TEXT BOOKS

1. K. Ogata, "Modern Control Engineering", 4th Edition, Pearson Education, New Delhi, 2003.
2. I.J. Nagrath & M. Gopal, "Control Systems Engineering", New Age International Publishers, 2003.
3. C.J.Chesmond. "Basic Control System Technology", Viva low priced student edition, 1998.
4. R.C.Dorf and R.H.Bishop, "Modern Control Systems", Addison-Wesley, 1995 (MATLAB Reference).
5. M. Gopal, "Control Systems: Principles and Design", 3rd Edition, McGraw, Hill, 2008
6. Nise N.S , " Control Systems Engineering", 6th Edition , Wiley India , 2016.

REFERENCES

1. Benjamin C Kuo, "Automatic Control system", Prentice Hall of India Private Ltd., New Delhi, 2009.
2. R.C. Dorf and R.H. Bishop, "Modern Control Systems", 12th Edition, Prentice, Hall, 2010.
3. http://www.mathworks.com/access/helpdesk/help/toolbox/control/
4. Control Systems - N. K. Sinha, New Age International (P) Limited Publishers.
5. S.N.Sivanandam, S.N.Deepa, Control System Engineering using Mat Lab, 2nd Edition, Vikas Publishing, 2012.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	e-mail id
1	D.SARANYA	Assistant Professor (Gr-II)	EEE / AVIT	dsaranya@avit.ac.in
2	R. SATHISH	Assistant Professor	EEE/VMKVEC	sathish@vmkvec.edu.in

DESIGN OF SHAFTS AND COUPLINGS
Design of solid and hollow shafts based on strength – rigidity and critical speed – Design of rigid and flexible couplings.
DESIGN OF BOLTED AND WELDED JOINTS
Threaded fasteners – Design of bolted joints – Design of welded Joints for pressure vessels and structures- Theory of Bolted joints
DESIGN OF SPRINGS
Design of helical, leaf and torsional springs under constant loads and varying loads.
DESIGN OF BEARINGS AND FLYWHEELS
Design of bearings – sliding contact and rolling contact types – Design of journal bearings calculation ofbearing dimensions- Design of flywheels involving stresses in rim and arm.
Text Books
1. Design of Machine Elements-V.B.Bhandari 2. Mechanical Engineering Design: Joseph E Shigley and Charles R. Mischke
Reference Books
1. Machine Design: Robert L.Norton,Pearson Education,2001 2. Design of Machine Elements-M.F.SPotts,T.E.Shoup,pearsonEdn,2006. 3. Fundamentals of Machine component Design–Robert C.Juvinall,Wiley India Pvt.Ltd,3rdEdn,2007. 4. Design Data – PSG College of Technology, DPV Printers, Coimbatore, 2012. 5. P.C.Sharma&D.K.Aggarwal, A Text Book of Machine Design, S.K.Kataria& Sons, New Delhi,12th edition, 2012 .

Alternative NPTEL/SWAYAM Course – Nil

S.No	NPTEL /SWAYAM Course Name	Instructor	Host Institution	Duration
	-	-	-	-

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	R.Venkatesh	Assistant Professor	MECH/VMKVEC	venkatesh@vmkvec.edu.in
2	J. Senthil	Associate Professor	MECH/AVIT	jsenthil@avit.ac.in

	ENGINEERING METROLOGY AND MEASUREMENTS (Theory and Practicals)	Category	L	T	P	Credit
		CC	3	0	2	4

Preamble

The aim of the subject is to provide basic knowledge in instrumentation and measurements. Familiarization with basic concepts and different instrumentation and measurement strategies being usedin practice.

Prerequisite

NIL

Course Objectives

1	To apply the fundamentals of basic engineering measurement system.
2	To understand the various instruments used for linear, angular measurement, form measurement and surface finish
3	To apply the knowledge of different measuring instruments like linear, angular measurement, form measurement and surface finish
4	To understand the principle, concepts, applications and advancements of temperature, pressure and flow measurements
5	To use information to classifications, working and processes of optical measuring instruments, also to acquire the data and store in computer

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

CO1.	Explain the sensitivity of the instruments by evaluating the error in measurements	Understand
CO2.	Discuss the working principle and usage of various instruments used for linear, angular measurement, form measurement and surface finish	Understand
CO3.	Demonstrate the various setups used for measuring linear, angular measurement, form measurement and surface finish	Apply
CO4.	Determine the appropriate instruments for temperature, pressure and flow measurements	Apply
CO5.	Explain the application oriented knowledge in the use of optical measuring instruments	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	M	L	-	-	-	-	-	-	-	-	L	-	-
CO2	S	S	M	L	-	-	-	-	-	-	-	-	L	-	-
CO3	S	L	M	L	-	-	-	-	-	-	-	-	L	-	-
CO4	S	S	M	L	-	-	-	-	-	-	-	-	L	-	-
CO5	S	M	S	L	-	-	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

BASIC PRINCIPLES & LINEAR / ANGULAR MEASUREMENT

Basic principles of measurement - Generalized measuring system - Characteristics of measuring instruments, Static and Dynamic characteristics - Precision, Accuracy, Sensitivity, Repeatability, Reproducibility, Linearity, Errors –sources of error, classification and elimination of error- Calibration. Linear and angular Measurements: Vernier – Micrometer - Slip gauges and classification - Optical flats - Limit gauges - Comparators: Mechanical - Pneumatic and Electrical types – applications. -Sine bar - optical bevel protractor - Autocollimator- Angle Decker – Taper measurements.

DISPLACEMENT, SPEED & ACCELERATION / VIBRATIONMEASUREMENT

	MICROCONTROLLERS AND EMBEDDED SYSTEMS	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 inVLSI technology, microcontrollers evolvewhichfunctionsimilartomicroprocessorsbutthey havemostoftheperipherals built on-chip. This course makes the students to be familiar with the architecture and programming ofMicrocontrollers.ThiscoursealsointroducesthearchitectureandhardwarefeaturesofPIC16F877andARM7(LPC2148)microcontrollers.

PREREQUISITE–Nil

COURSEOBJECTIVES

1	Tolearntheconceptsofmicroprocessorsandknowledgeofinterfacingdevices.
2	TostudytheArchitectureof8051microcontroller
3	Todevelopskillinsimpleprogramwritingofmicrocontroller
4	Tostudytheinterfacing andapplicationsofmicrocontroller
5	Tostudythe concepts of Embedded Systems.

COURSEOUTCOMES

Onthesuccessful completionofthecourse, studentswill beable to

CO1.Explaintheconceptofmicroprocessorandinterfacingdevices.	Understand
CO2.Explainthearchitectureandfunctionof8051microcontroller	Apply
CO3.Designandimplementprogramson8051Microcontroller	Analyze
CO4.Designandimplementapplicationsusing8051Microcontroller	Analyze
CO5. Explainthearchitectureandfunctionof Embedded Systems	Apply

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMMESPECIFICOUTCOMES

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
CO2	S	S	S	-	M	-	-	-	-	-	-	M	S	M	M
CO3	S	M	M	-	M	M	-	-	-	-	-	M	S	S	M
CO4	S	S	M	-	M	M	-	-	-	-	-	M	S	S	M
CO5	S	M	S	M	M	M	-	-	-	-	-	M	S	M	M

S-Strong;M-Medium;L-Low

SYLLABUS

INTEL8086MICROPROCESSOR&I/OINTERFACING

Introduction to 8086 - Architecture of 8086 - Register organization – Signal Description of 8086 - Addressing modes –Data Transfer Instruction – Arithmetic Instruction - Branching Instruction -Program Transfer Instruction – simpleprograms-ProgrammablePeripheralInterface8255–ProgrammableCommunicationInterface8251USART– ProgrammableInterruptController8259A–DirectMemoryAccessController8257- ProgrammableIntervalTimer8253Keyboard/DisplayController8279.

INTEL8051MICROCONTROLLER

Introduction to 8bit microcontroller–architecture of 8051-Signal descriptions of 8051-Role of PC and DPTR-Flagsand PSW-CPU registers- Internal RAM & ROM-Special Function Register-Counter & Timers-Serial Communication.

ASSEMBLYLANGUAGEPROGRAMOFINTEL 8051

Interrupt-Addressing Mode-Data Transfer Instruction-Arithmetic Instruction-Logical Instruction- Jump Loop& Call Instruction-I/O Port Programming.

INTERFACINGANDAPPLICATIONOFINTEL 8051

LCD Interfacing-A/D and D/A Interfacing-Sensor Interfacing-Relays and Opt isolators-Stepper Motor Interfacing-DCMotor Interfacing.

INTRODUCTION TO EMBEDDED SYSTEMS

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA — Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging

Text Books:

1. MuhammadAliMazidiandJanicaGilliMazidi,The8051microcontrollerandembeddedsystems,PearsonEducation ,5th Indian reprint, 2003.
2. Frank D.Petruzella. “ProgrammableLogicControllers”,McGraw–HillBook,Company,1989
3. Raj Kamal, “Embedded Systems-Architecture, Programming and Design”, TataMcGraw-Hill,2011.

Reference Books:

1. B.P.Singh,MicroprocessorsandMicrocontrollers,GalcotiaPublications(P)Ltd,Firstedition,NewDelhi,1997.
2. EmbeddedControllerHandbook, IntelCorporation,USA.
3. MicrocontrollerHandBook, INTEL,1984.
4. AjayV.Deshmukh,“Microcontrollers-Theoryandapplications”,TataMcGraw-Hill,publisher,2005.

COURSEDESIGNERS				
S.No.	**Name of theFaculty**	**Designation**	**Department**	**MailID**
1	Dr.R.Ramani	AssistantProfessor	ECE	ramani@vmkvec.edu.in
2	Mr.G.Sureshkumar	AssistantProfessor	ECE	sureshkumar@vmkvec.edu.in
3	Dr.L.K.Hema	Professor	ECE	hemalk@avit.ac.in

	COMPUTER INTEGRATED MANUFACTURING (Theory and Practicals)	Category	L	T	P	Credit
		CC	3	0	2	4

Preamble

The students completing this course are expected to understand the nature and role of computers in manufacturing. The course includes computer aided design, fundamentals of CNC machines, programming of CNC machines, group technology, computer aided process planning techniques, shop floor control and flexible manufacturing systems. It exposes the students to various current trends followed in the industries

Prerequisite

NIL

Course Objectives

1	Demonstrate basics of CAD/CAM/CIM concepts.
2	To apply geometric modelling techniques and various graphics standards in CAD.
3	Illustrate with tooling and fixtures in CNC programming and machining.
4	Demonstrate part programs and group technology techniques.
5	Discuss latest advances in the manufacturing perspectives.

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

CO1	Understand basic concept of CAD/CAM/CIM	Understand
CO2	Utilize CAD standards for geometrical modelling. Demonstrate Solid modelling techniques.	Apply
CO3	Interpret and demonstrate complex programs for CNC machining centers	Apply
CO4	Apply group technology concept in manufacturing product. Make use of FEA concept for analysis.	Apply
CO5	Explain FMS and CIM wheel for manufacturing industry, discuss the latest advances in the manufacturing perspectives.	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	-	-	-	-	-	-	-	L	M	-	-
CO2	S	M	M	M	-	-	-	-	-	-	-	L	M	-	-
CO3	S	M	M	M	-	-	-	-	-	-	-	L	M	-	-
CO4	S	M	M	M	-	-	-	-	-	-	-	L	M	-	-
CO5	S	M	M	M	-	-	-	-	-	-	-	L	M	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Definition and scope of CAD/CAM- Computers in industrial manufacturing, design process- Computer Aided Design (CAD)-Computer Aided Manufacturing (CAM)-Computer Integrated Manufacturing (CIM) - Introduction to Computer graphics -Raster scan graphics-Co-ordinate systems.

GRAPHICS AND COMPUTING STANDARDS

Data base for graphic modeling-transformation geometry-3D transformations –Clipping-hidden line removal-Colour-shading-Standardization in graphics- Open GL Data Exchange standards – IGES, STEP - Graphic Kernal system (GKS). Geometric construction methods-Constraint based modeling- Wireframe, Surface and Solid – Parametric representation of curves, solids & surfaces.

CNC MACHINE TOOLS

Introduction to NC, CNC, DNC - Manual part Programming – Computer Assisted Part Programming – Examples using NC codes- Adaptive Control – Canned cycles and subroutines – CAD/ CAM approach to NC part programming – APT language, machining from 3D models.

GROUP TECHNOLOGY & FEA CONCEPTS

Group technology-coding-Production flow analysis-computer part- programming-CAPP implementation techniques. Nodes -Meshing – Pre and Post processing – Modal analysis – Stress analysis – Steady state and Transient analysis.

AUTOMATED MANUFACTURING SYSTEMS

Flexible Manufacturing systems (FMS) – the FMS concepts – transfer systems – head changing FMS – Introduction to Rapid prototyping, Knowledge Based Engineering, Virtual Reality, Augmented Reality –automated guided vehicle-Robots-automated storage and retrieval systems - computer aided quality control-CMM-Non contact inspection methods.

LIST OF EXPERIMENTS

1. 2D Geometry –Splines
2. Surface Modelling –NURBS
3. Solid Modelling-CSG, Brep.
4. Preparing solid models for analysis-Neutral files
5. Real time component analysis-STRESS, STRAIN Analysis.
6. Model analysis of different structures.
7. Tolerance analysis of any mechanical component.
8. CNC Milling program involving linear motion and circular interpolation
9. CNC Milling program involving contour motion and canned cycles
10. CNC Milling program involving Pocket milling.
11. CNC Turning program involving turning and facing
12. CNC Turning program involving Step turning, Taper turning and Grooving
13. CNC Turning program involving Fixed/Canned cycles& Thread cutting cycles
14. Diagnosis and trouble shooting in CNC machine
15. Route sheet generation using CAM software.
16. Generation of CNC programming and machining using Master Cam/Edge Cam.

Text Books

1. Mikell.P.Groover “Automation, Production Systems and Computer Integrated
2. Radhakrishnan P, Subramanyan.S. andRaju V., “CAD/CAM/CIM”, New Age International (P) Ltd., New Delhi.
3. P.N.Rao, CAD/CAM: Principles and Applications-3rd Edition, Tata McGraw Hill, India, 2010.

Reference Books

1. Yoremkoren, “Computer Integrated Manufacturing System”, McGraw-Hill.
2. Ranky, Paul G., “Computer Integrated Manufacturing”, Prentice Hall International
3. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe “Computer Integrated Design and Manufacturing”, McGraw-Hill Inc.
4. Roger Hanman “Computer Integrated Manufacturing”, Addison – Wesley
5. Viswanathan.N, Narahari.Y “Performance Modeling& Automated Manufacturing systems” Prentice hall of indiapvt. Ltd.

Alternative NPTEL/SWAYAM Course

S.No	NPTEL /SWAYAM Course Name	Instructor	Host Institution	Duration
1	Computer Integrated Manufacturing	Prof. J. Ramkumar, Prof. Amandeep Singh	IIT Kanpur	12 weeks

Course Designers				
S.No	**Faculty Name**	**Designation**	**Department/Name of the College**	**Email id**
1	Dr.L.Prabhu	Associate Professor	MECH/ AVIT	prabhu@avit.ac.in
2	S.Prakash	Assistant Professor-II	MECH/ AVIT	prakash@avit.ac.in
3	M.Saravanan	Associate Professor	MECH/VMKVEC	saravanan@vmkvec.edu.in

	ROBOTICS AND AUTOMATION	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Robotics is the applied science of motion control for multi-axis manipulators and is a large subset of the field of "Mechatronics" (Mechanical, Electronic and Software engineering for product or systems development, particularly for motion control applications). Robotics, sensors, actuators and controller technologies are continuously improving and evolving synergistically. In the 20th century, engineers have mastered almost all forms of motion control and have proven that robots and machines can perform almost any job that is considered too heavy, too tiring, too boring or too dangerous and harmful for human beings. This course supports the students to design and develop multi-DOF manipulator and wheeled mobile robot.

PREREQUISITE -

COURSE OBJECTIVES

1	To Understand the actuators used in robotic manipulators and indicate their advantages and limitations.
2	To apply the forward kinematic model of multi-degree of freedom to develop a robot arm and wheeled robot
3	To apply a static force and dynamic model of two degrees of freedom to develop robot arm
4	To apply a step-by-step procedure for the generation a cubic polynomial trajectory for a joint with specified kinematic constraints
5	To apply and develop a program for point-to-point applications

COURSE OUTCOMES

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

CO1. Describe the working of the subsystems of robotic manipulator and wheeled mobile robot	Understand
CO2. Develop the forward kinematic model of multi-degree of freedom (DOF) manipulator and inverse kinematic model of two and three degrees of freedom planar robot arm and wheeled robot	Apply
CO3. Develop the static force and dynamic model of two degrees of freedom planar robot arm	Apply
CO4. Generate a trajectory in joint space using polynomial and trigonometric functions with given kinematic constraints of multi-degree of freedom (DOF) manipulator	Apply
CO5. Develop a offline robot program for point-to-point applications such as pick and place, palletizing, sorting and inspection of work-parts	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	-	-	-	-	-	-	-	-	-	L	-	S	M	
CO2	S	L	M	-	-	-	-	-	-	-	M	-	S	M	
CO3	S	L	M	-	-	-	-	-	-	-	M	-	S	M	
CO4	S	L	M	-	-	-	-	-	-	-	M	-	S	M	

CO5	S	L	M	-	-	-	-	-	-	-	M	-	S	M	

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to Robotics. Mechanical structure: Robot Configuration - Robot Anatomy, Sub-systems/ Elements of Industrial Robot - Performance characteristics of industrial Robots. Mobile robot locomotion: Introduction, key issues for locomotion, wheeled locomotion-wheel design, geometry, stability and controllability. Applications - Progressive advancement in Robots – Point to point and continuous motion applications - Mobile manipulators and its applications.

Kinematic model - Forward Kinematics for two DOF manipulator – Algebraic method, Mechanical structure and notations, Coordinate frames, Description of objects in space, Transformation of vectors, Fundamental rotation matrices (principal axes and fixed angle rotation) Description of links and joints, Denavit- Hartenberg (DH) notation, Forward Kinematics for multi-Degrees of Freedom (DOF) manipulator. Inverse kinematics of 2R, 3R manipulator - Manipulator workspace. Mobile Robot kinematics: kinematic model and constraints, Mobile robot workspace-motion control.

Static model: Differential relationship - Velocity analysis – Jacobian matrix – Determination of forces and equivalent torques for joints of two link planar robot arm. Dynamic model: Euler –Lagrangian formulation - Forward and inverse dynamic model for two DOF planar manipulator. Applications of Fuzzy Logic and Neural network in Robot Control, Neural controllers, Implementation of Fuzzy controllers

Trajectory planning: Definitions and planning tasks, Joint space techniques – Motion profiles – Cubic polynomial, Linear Segmented Parabolic Blends and cycloidal motion - Cartesian space techniques. Navigation: Graph search and potential field path planning - navigation architecture - offline and online planning.

AI And Other Research Trends In Robotics- Application of Machine learning - AI, Expert systems; Tele-robotics and Virtual Reality, Micro & Nanorobots, Unmanned vehicles, Cognitive robotics, Evolutionary robotics, Humanoids.

TEXTBOOKS

1. S.K.Saha, “Introduction to Robotics”, Second Edition, McGraw Hill Education (India) Private Limited, 2014.
2. Roland Siegwart and Illah R.Nourbakhsh, “Introduction to Autonomous Mobile Robots”, Prentice Hall of India (P) Ltd., 2005.

REFERENCE BOOKS

1. B. Siciliano, L. Sciavicco, L. Villani, G. Oriolo, “Robotics: Modelling, Planning and Control”, First Edition, Springer-Verlag London,2009
2. K.S. Fu, R.C Gonzalez and C.S. Lee, “Robotics- Control, Sensing, Vision and Intelligence”, Tata McGraw-Hill Editions, 2008.
3. John J.Craig, “Introduction to Robotics, Mechanics and Control”, Third Edition, Pearson Education, 2005.
4. Mark W.Spong, M.Vidyasagar, “Robot Dynamics and Control”, Wiley India, 2009.
5. George A. Bekey, “Autonomous Robots – From Biological Inspiration to Implementation and Control”, MIT Press, 2005.
6. Howie Choset, Kevin M. Lynch, Seth Hutchinson, George A. Kantor, Wolfram Burgard, Lydia E. Kavraki and

Sebastian Thrun, “Principles of Robot Motion – Theory, Algorithms and Implementation”, MIT Press, 2005.
7. Mikell P. Groover, Mitchell Weiss, Roger N.Nagel and Nicholas G. Odrey, “Industrial Robotics – Technology, Programming and Applications” Tata McGraw-Hill, 2008.
8. Yoram Koren, “Robotics for Engineers”, McGraw-Hill Book Co., 1992.
9. P.A. Janakiraman, “Robotics and Image Processing”, Tata McGraw-Hill, 1995.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1.	Dr.T.Muthumanickam	**Professor**	**ECE**	muthumanickam@vmkvec.edu.in
2.	Dr.L.K.Hema	Professor	ECE	hemalk@avit.ac.in

	POWER ELECTRONICSAND DRIVES (THEORY & PRACTICALS)	Category	L	T	P
		CC	3	0	2

PREAMBLE

Power electronics involves the study of electronic circuits intended to control the flow ofelectrical energy. It de processing and control of 'raw' electrical power from anelectrical source such as an AC mains supply, a bat photovoltaic array, or a windturbine into a form and quality suitable for a particular electrical load. It is an enablin with a very wide range of applications.Electric Drives, both ac and dc types, come in many shapes and arestandardized versions for general-purpose applications. Others are intended for specifictasks. In any case, moto selected to satisfy the dynamic requirements of themachines on which they are applied without exceeding temperature.To acquire the practical knowledge in power electronic devices and converters.

PREREQUISITE: SemiconductorDevices and Circuits

COURSEOBJECTIVES

1	Togetanoverviewofdifferenttypesofpowersemiconductordevices andtheirswitchingcharacteristics.
2	Tounderstandtheoperation,characteristics andperformanceparameters ofcontrolledrectifiers.
3	Tostudytheoperation,switchingtechniquesandbasics topologiesofDC-DCswitchingregulators.
4	TostudytheoperationofACvoltagecontroller and tolearn thedifferentmodulationtechniquesinverters.
5	Toemploythe solidstatespeedcontroltechniquesforDCdrivesforefficientcontrol.
6	Toemploysolidstatespeedcontroltechniquesfor ACdrivesforproficientandlosslesscontrol.
7	To Analyze the performance of semiconductor devices and converters through experiments.

COURSEOUTCOMES

Onthesuccessful completionofthecourse,studentswillbe ableto

CO1:Define semiconductorphysicstothepropertiesofrealpowersemiconductordevicesanddifferentiatefromlowpowerdevices.	Re
CO2: Implement rectifiers and inverters forthe given application	
CO3: Implement DC-DC converters andAC-AC converter for the givenapplication	
CO4: Interpret theconceptsofanelectricaldrivesystemandchoosea suitablemotordrive fordifferentapplications&Explain the basics and advantages ofelectric drives.	Ur
CO5: Appraise the conventional speed control methods of AC motors withstartingandbrakingmethods.	Ana
CO6:ValidatetheproficientcontrolofACandDCdrivesbyutilizethepowerelectronicsconcepts.	Eva
C07: Analyze the performance of semiconductor devices and converters by conducting suitable experiments.	A

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMME SPECIFICOUTCOMES

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

CO6	S	S	S	S	S	M	M	-	M	M	S	M	L	S
C07	S	M	L	L	M	-	-	-	S	-	M	-	-	S
S-Strong;M-Medium;L-Low-														

SYLLABUS

POWERSEMI-CONDUCTOR DEVICES
Overviewofswitchingdevices - Principles of operation, Characteristics, Protection and Gate dri ofPowerDiode,PowerTransistor,MOSFET,IGBT,SCR andTRIAC - Design of filters.

RECTIFIERS& CHOPPERS
Singlephaseandthreephase rectifiers - Dualconverters.BasicPrinciplesofChoppers-Stepdownandstepupchopper– Timeratiocontrolandcurrentlimitcontrol–Buck,Boost,Buck-Boostconverters.

INVERTERS &AC-ACCONVERTERS
Singlephaseandthreephase[120º&180º mode] Voltage Sourceinverters–Current SourceInverters - Regeneration i - PWMtechniques–SinglephaseandthreephaseACvoltagecontrollers –singlephaseandthreephasecycloconv Cycloconverter Control Scheme.

ELECTRICALDRIVES
General electric drive system - Classification and TypesofElectricalDrives –Factorsinfluencingtheselection drives– Torque-speed characteristics of motors- heating andcoolingcurves–classesofduty–Selection of motor p simpleproblems.

SOLIDSTATEDRIVES
Advantagesofsolidstatedrives–Speed control methods of DCmotorsusingrectifiersandchoppers– Speed controlofinductionmotorbyStator Voltage control, Voltage / Frequency control -Slippowerrecoverysystems.

PRACTICE

CharacteristicsofSCR, MOSFET andIGBT. ConverterfedDC MotorDrive.InverterfedInductionMotorDri

TEXTBOOKS:
1. RashidM.H.,"PowerElectronicsCircuits,Devices andApplications",PrenticeHallIndia,3rdEdition,NewDelhi,200
2. G.K.Dubey“FundamentalElectricalDrives”secondedition2002,NarosaPublications,Second edition,2002.

REFERENCES:
1. Cyril.W.Lander,"PowerElectronics",McGraw HillInternational,ThirdEdition,1993.
2. P.S.Bimbra"PowerElectronics",KhannaPublishers,thirdEdition2003.
3. PhilipT.Krein, "ElementsofPowerElectronics"OxfordUniversityPress,2004Edition.
4. N.K.De.,P.K.Sen“ElectricDrives”,PrenticeHall,Firstedition1999.
5. Pillai,S.K.,“A FirstcourseonElectricalDrives”,WileyEasternLtd.,New Delhi, 1982

COURSEDESIGNERS

S.No.	Nameof theFaculty	Designation	Department	MailID
1	Dr. R. Sankarganesh	AssociateProfessor	EEE/VMKVEC	sankarganesh@vmkv
2	Mr.N.P.Gopinath	Assistant Professor(Gr-II)	EEE/AVIT	Gopinathnp@avit.ac.i

17MTCC01	PROGRAMMABLE LOGIC CONTROLLERS (THEORY & PRACTICALS)	Category	L	T	P	Credit
		CC	3	0	2	4

PREAMBLE

Programmable Logic Controllers is the applied science of automatic control for multi-axis manipulators and is a large subset of the field of "Mechatronics" (Mechanical, Electronic and Software engineering for product or systems development, particularly for motion control applications) Mode of operation and programming of a Programmable Logic Controller (PLC), Characteristics of a PLC (synchronous, asynchronous), Analysis of the process schematic Statement of the interlocking functions and the safety requirements Creating of a control system function chart. Selection of the necessary hardware units, Programming, Simulation, Start-up procedure, testing.

PREREQUISITE -

COURSE OBJECTIVES

1	To Understand the PLC used in automatic control systems I / O and indicate their advantages and limitations.
2	To apply the control programming the devices and modes of operation.
3	To apply a Electromagnetic Control Relays, Manually Operated Switches.
4	To design Timer and counter circuit.
5	To apply and develop a programmable control device for point-to-point applications

COURSE OUTCOMES

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

CO1. Describe the working of the Programmable Logic Controllers operations	Understand
CO2. Apply the programming in ladder diagram design	Apply
CO3. Develop the design in timer and counter circuits.	Apply
CO4. Generate a Data Transfer Operations and Data Compare Instructions	Analyze
CO5. Develop a PLC program for point-to-point applications such as pick and place, Palletizing, sorting and inspection of work-parts.	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	-	-	-	-	-	-	-	-	-	S	-	-
CO2	S	L	M	-	L	-	-	-	-	-	-	-	S	-	-
CO3	S	L	M	-	-	M	-	-	-	-	-	M	S	M	-
CO4	S	S	L	-	M	-	-	-	-	-	-	M	S	M	-
CO5	S	S	S	M	S	M	S	L	S	S	M	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO PLC:

Introduction, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. The I/O Section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O Specifications, The Central Processing Unit (CPU), Memory Design, Memory Types, Programming Terminal Devices.

PLC PROGRAMMING LANGUAGES :

Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of Operation. Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-In Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description.

TIMERS AND COUNTERS :

Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers. Counter Instructions, Up-Counter, Down-Counter, Cascading Counters, Incremental Encoder-Counter Applications, Combining Counter and Timer Functions.

PLC INSTRUCTIONS :

Data Manipulation, Data Transfer Operations, Data Compare Instructions, Data Manipulation Programs, Numerical Data I/O Interfaces, Closed-Loop Control. Math Instructions, Addition Instruction, Subtraction Instruction, Multiplication Instruction, Division Instruction, Other Word-Level Math Instructions, File Arithmetic Operations.

PLC AUTOMATION :

Types of Processes, Structure of Control Systems, On/Off Control, PID Control, Motion Control, Data Communications, Supervisory Control and Data Acquisition (SCADA).

PLC PRACTICE :

Hydrometer rotation with Timer & speed control**,** ON / OFF Control using PID , Simulation of basic PLC programs using PLC simulator.

TEXTBOOKS

1. Frank D.Petruzella,"Programmable Logic Controllers", McGraw-Hill Companies, Third edition,March2004

2. Charles H. Roth, Jr "Fundamentals of Logic Design ", Fourth Edition, Jaico Publishing house, 1999.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Email ID
1	Dr. L.Chitra	Professor	EEE/AVIT	chitra@avit.ac.in
2	Dr.R.Devarajan	Professor	EEE/VMKVEC	devarajan@vmkvec.edu.in

	FLUID MECHANICS AND STRENGTH OF MATERIALS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

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

	SENSORS AND ELECTRONIC MEASUREMENTS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

Preamble

This course provides comprehensive idea about working operation of various types of sensors used to measure various physical quantities. measurement techniques to assess the quality of processes, components, systems..

Prerequisite

Nil

Instructional Objective

1	Uses technical knowledge, design methodology, and appropriate design tools and related resources.
2	Distinguishes between different design steps and carries out steps; Analyzes/evaluates progress of design.
3	Student will learn the different kind of measurements ie: Displacement, speed, temperature.
4	To learn the measurement of capacitance & inductance.
5	Student will learn the signal conditional circuits ie: Analog to Digital converter.

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

CO1.	Select appropriate transducer to measure given parameters.	Apply
CO2.	Construct a proper AC/ DC bridges for measurement of R, L & C.	Apply
CO3.	Analyze the characteristics of strain gauges.	Analyse

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	PS O1	PS O2	PS O3
CO1	S	M	M	-	M	-	-	-	M	-	-	M	S	S	M
CO2	S	S	M	M	M	-	-	-	M	-	-	M	S	S	-
CO3	S	M	M	-	M	-	-	-	M	-	-	M	S	S	M

S- Strong; M-Medium; L-Low

Syllabus

List of Experiments

1. Speed measurement using Photoelectric tachometer
2. Digital transducer – shaft angle encoder
3. Strain gauge characteristics.
4. Torque measurement
5. Displacement measurement using potentiometric transducer.
6. Measurement of Temperature using RTD.
7. Measurement of temperature using Thermocouple.
8. Measurement of Capacitance using Schering bridge.
9. Measurement of Resistance using Wein bridge.
10. Measurement of Inductance using Anderson bridge.

Reference Books

1	Laboratory reference manual

Course Designers

S.No	**Faculty Name**	**Designation**	Department	**Email id**
1	Mr.G.Murali	Assistant Professor	ECE	muralig@vmkvec.edu.in
2	Mr. P. Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

	CONTROL SYSTEMS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

Control Systems simulation Lab consists of multiple workstations, each equipped with an oscilloscope, digital multi-meter, PID trainers, control system trainers and stand alone inverted-pendulum, ball and beam control, magnetic-levitation trainers. This lab also covers the industrial implementation of advanced control systems via different computer tools such as MATLAB and Simulink.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2	To assess the system performance using time domain analysis and methods for improving it
3	To assess the system performance using frequency domain analysis and techniques for improving the performance
4	To design various controllers and compensators to improve system performance

COURSE OUTCOMES

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

CO1	How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application	Understand
CO2	Apply various time domain and frequency domain techniques to assess the system performance	Apply
CO3	Apply various control strategies to different applications(example: Power systems, electrical drives etc)	Analyze
CO4	Test system controllability and observability using state space representation and applications of state space representation to various systems	Analyze and 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	L	M	S	-	-	-	M	L	-	L	S	M	S
CO2	S	S	L	M	S	-	-	L	M	L	M	-	S	M	-
CO3	S	S	S	M	S	-	L	-	M	L	-	M	S	M	S
CO4	S	S	-	M	S	L	-	-	M	L	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

LIST OF EXPERIMENTS

1. Transfer function of self and separately excited DC Generator.
2. Transfer function of Armature and Field controlled DC Motor.
3. Transfer function of AC Servomotor.

4. Frequency response of Lag, Lead & Lag – Lead networks.
5. Characteristics of Synchronous transmitter and Receiver.
6. Transfer function of Ward – Leonard method of speed control of DC motor.
7. Study of P, PI and PID Controllers (First Order).
8. Simulate DC Position Control system and obtain its step response
9. Analog and simulation of type – 0 and type – 1 systems
10. Stability analysis of Linear Systems
11. Simulation of first order systems using MATLAB/ SCILAB
12. Simulation of second order systems using MATLAB/ SCILAB

COURSE DESIGNERS

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1.	R. SATHISH	Assistant Professor	EEE/VMKVEC	sathish@vmkvec.edu.in
2.	D.SARANYA	Assistant Professor GR-II	EEE / AVIT	dsaranya@avit.ac.in

	MICROCONTROLLERS AND EMBEDDED SYSTEMS LAB	Category	L	T	P	Credit
		CC	**0**	**0**	**4**	**2**

PREAMBLE

To provide the skill to design linear integrated circuits using op-amp and other special purpose circuits. Assembly language programming for microcontroller and interfacing peripheral devices with microcontroller is vital due to the persisting real time application scenarios. Hence exposure to interface ADCs, DACs with microprocessor and acquiring knowledge about the real time applications like stepper motor control, key board etc., is essential.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	To write the assembly language program for 8051 Microcontroller.
2	To write the programs for communication between microcontroller and peripheral devices
3	To write the programs using ARM Processors
4	To study one type of Real Time Operating Systems (RTOS)

COURSE OUTCOMES

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

CO1. Develop assembly language program for basic Arithmetic and Logical Operations	Analyze
CO2.Develop assembly language program for basic applications like arithmetic operations, interrupt and UART, etc	Analyze
CO3. Apply the practical knowledge of Microcontroller in designing various Circuit	Analyze
CO4. Develop and execute program using ARM architecture.	Analyze
CO5. Understand the concept of Real Time Operating Systems (RTOS)	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	-	-	-	-	M	-	L	-	M	-	M	-	-
CO2	M	L	-	-	-	-	M	-	L	-	M	-	M	-	-
CO3	M	L	-	-	-	-	M	-	M	-	M	-	M	-	-
CO4	M	L	-	-	-	-	M	-	M	-	M	-	M	-	-
CO5	M	L	-	-	-	-	M	-	M	-	M	-	M	-	-
S- Strong; M-Medium; L-Low															

SYLLABUS

LISTOFEXPERIMENTS:

MICROCONTROLLERSLAB

1. 8086&8051Assembly language program for Arithmetic Operations.
2. 8051Assembly language program for Logical, Interrupt & UART Operations.
3. Interfacing DAC to Microcontroller and generate Square, Triangular and Saw–tooth waveforms.
4. Interfacing ADC to Microcontroller.
5. Interfacing Stepper Motorto8051 and operate it in Clock wise and Anti-Clock wise directions.

EMBEDDED SYSTEMS LAB

1. Study of ARM Architecture.
2. Interfacing ADC and DAC.
3. Interfacing Real Time clock and Serial Port.
4. Interfacing Keyboard and LCD.
5. Study of one type of Real Time Operating Systems (RTOS)

REFERENCES

Laboratory Reference Manual.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
2	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
3	Ms.R.MohanaPriya	Assistant Professor(Gr-II)	ECE	mohanapriya@avit.ac.in

	ROBOTICS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

Robotics is the prominent component of manufacturing automation which will affect human labor at all levels, from unskilled workers to professional engineers and managers of production. Future robots may applications outside of the factory in banks, restaurants, and even homes.

PRERQUISITE

COURSE OBJECTIVES

1	To introduce different types of robotics and demonstrate them to identify different parts and components
2	To write programming for simple operations like pick and place, rotoxim etc.
3	To practice with the simulation from simple to six axis robot.

COURSE OUTCOMES

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

CO1.Implement the programming and control of robots	Apply
CO2.Predict the Path and trajectory planning for given 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	S	M	M	M	L	-	-	-	M	-	L	L	S	M	M
CO2	S	S	S	M	M	M	-	-	M	-	M	M	S	M	M

S- Strong; M-Medium; L-Low

List of Experiments

1) Study of different types of robots based on configuration and application.
2) Study of different type of links and joints used in robots
3) Study of components of robots with drive system and end effectors.
4) Simulation of Forward and Inverse Kinematics using Robo Analyzer.
5) Simulation of Workspace Analysis of a 6 axis robot.
6) Forward and inverse kinematics using QBot 2
7) Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
8) Estimation of accuracy, repeatability and resolution.

COURSE DESIGNERS

S.No	Name of The Faculty	Designation	Department	Email.ID
1	Dr. L. K. Hema	Professor & Head	ECE	hemalk@avit.ac.in
2	Dr.P.M.Murali	Associate Professor	ECE	muralipm@vmkvec.edu.in

	ELECTRIC VEHICLES	Category	L	T	P	Credit
		EC- PS	3	0	0	3

PREAMBLE

This course introduces the fundamental concepts, principles, analysis and design of hybrid, electric vehicles.

PREREQUISITE: Basic Electrical & Electronics Engineering.

COURSE OBJECTIVES

1	To understand the basic concepts and dynamics of electric vehicles.
2	To familiarize and design of battery backup.
3	To analyze the characteristics of different types of DC & AC Motors.
4	To understand different types of power transmission configuration, clutch and braking.
5	To study about hybrid electric vehicles.

COURSE OUTCOMES

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

CO1: Describe the basic concepts of electric vehicles.	Understand
CO2: Design the propulsion system for electric vehicles.	Evaluate
CO3: Explain the construction, characteristics and application of batteries.	Analyze
CO4: Elucidate performance characteristics of DC&AC electrical machines.	Analyze
CO5: Design the drive train model for electric vehicles.	Evaluate
CO6: Describe about the various types and configuration of hybrid electric 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	-	L	L	-	-	-	-	-	-	-
CO2	S	M	S	L	M	-	L	M	-	-	-	-	-	-	-
CO3	S	-	-	-	M	-	-	-	-	-	-	-	-	-	-
CO4	S	-	-	-	M	-	-	-	-	-	-	-	-	-	-
CO5	S	M	S	L	M	-	L	M	-	M	M	-	-	-	-
CO6	S	-	-	-	M	-	L	L	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

ELECTRIC VEHICLES

Introduction, Components, vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

BATTERY

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.

DC & AC ELECTRICAL MACHINES

Motor and Engine rating, Requirements, DC machines, Three phase A/c machines, Induction machines, permanent magnet machines, switched reluctance machines.

ELECTRIC VEHICLE DRIVE TRAIN

Transmission configuration, Components – gears, differential, clutch, brakes regenerative braking, motor sizing. Types – series, parallel and series, parallel configuration – Design – Drive train, sizing of components.

HYBRID ELECTRIC VEHICLES

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.

TEXT BOOKS:

1. Iqbal Hussain, *"Electric & Hybrid Vehicles – Design Fundamentals"*, Second Edition, CRC Press,
2. James Larminie, "*Electric Vehicle Technology Explained*", John Wiley & Sons, 2003.

REFERENCE BOOKS:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, *"Modern Electric, Hybrid Electric, and Fuel Cell Vehicles-Fundamentals*", CRC Press, 2010.
2. Sandeep Dhameja, *"Electric Vehicle Battery Systems",* Newnes, 2000 .http://nptel.ac.in/courses/108103009

COURSE DESIGNERS

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1	Dr. R. Devarajan	Professor	EEE	devarajan@vmkvec.edu.in
2	Mr. V.Rattankumar	Assistant Professor	EEE	rattankumar@avit.ac.in

	INTRODUCTION TO MEMS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The objective of this course is to make students to gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques. This enables them to design, analysis, fabrication and testing the MEMS based components. And to introduce the students for various opportunities in the emerging field of MEMS.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Understand the fundamental concept of MEMS and study the essential material properties.
2	To know the various fabrication and machining process of MEMS.
3	Build an understanding of microscale physics for use in designing MEMS applications.
4	To study various sensing and transduction technique.

COURSE OUTCOMES

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

CO1.Know the basics of MEMS fabrication technologies andPiezo resistance Effect, Piezoelectricity, Piezoresistive Sensor	Understand
CO2. Understandthe Mechanics of Beam and Diaphragm Structures	Understand
CO3. Use mechanics principles and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.	Apply
CO4. Know the concept of Electrostatic Actuation	Analyze
CO5. Understand the applications of MEMS in RF	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	-	-	-	-	-	-	-	-	-	-	S	-	-
CO2	S	M	M	-	-	-	-	-	-	-	-	-	-	-	-
CO3	S	M	M	-	-	-	-	-	-	-	-	-	-	-	-
CO4	S	S	M	-	-	-	-	-	-	-	-	-	-	-	-
CO5	S	S	S	M	M	-	-	-	M	-	-	M	-	L	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO MEMS

MEMS fabrication technologies, Materials and substrates for MEMS, Process for Micromachining: Bulk Micromachining, Surface Micromachining, Characteristics, Sensors/Transducers, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.

MECHANICS OF BEAM AND DIAPHRAGM STRUCTURES

Hooke's Law, Stress and Strain of Beam Structures :Stress, Strain in a Bent Beam, Bending moment and the moment of Inertia, Displacement of Beam Structures Under Weight, Bending of Cantilever Beam Under Weight

AIR DAMPING

Drag Effect of a Fluid: Viscosity of a Fluid, Viscous Flow of a Fluid, Drag Force Damping, The Effects of Air Damping on Micro-Dynamics. Squeeze-film Air Damping: Reynold's Equations for Squeeze-film Air Damping, Damping of Perforated Thick Plates. Slide-film Air Damping: Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.

ELECTROSTATIC ACTUATION

Electrostatic Force, Normal Force, Tangential Force, Fringe Effects, Electrostatic Driving of Mechanical Actuators: Parallel-plate Actuator, Capacitive sensors. Step and Alternative Voltage Driving: Step Voltage Driving, Negative Spring Effect and Vibration Frequency.

APPLICATIONS OF MEMS IN RF

MEMS Resonator Design Considerations, One-Port Micromechanical Resonator Modeling Vertical Displacement Two-Port Micro resonator Modeling, Micromechanical Resonator Limitations.

Text Books

1. G. K. Ananthasuresh, K. J. Viinoy, S. Gopalakrishnan, K. N. Bhat and V .K. Atre, "Micro and smart systems". Wiley India,2010.
2. S. M. Sze, "Semiconductor Sensors", John Wiley & Sons Inc., Wiley Interscience Pub.
3. M. J. Usher, "Sensors and Transducers", Mc Millian Hampshire.

Reference Books

1. Nadim Maluf," An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton,2000.
3. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002. Liu,"MEMS", Pearson education, 2007.

COURSE DESIGNERS

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1	Mrs.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in
2	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

	NANO ELECTRONICS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

This course is offered for students to gain the knowledge in Nanoelectronics and various Nanotechnologies

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To learn the Fundamentals of Nano electronics.
2	To gain knowledge of the silicon MOSFET and Quantum Transport Devices.
3	To Know basic concepts of various Nanotechnology and applications of Nano Materials
4	To learn the fabrication of Carbon Nanotubes.
5	To study about the Molecular Electronics in Nanotechnology

COURSE OUTCOMES

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

CO1.Understand the basics of Nano electronics and quantum mechanics behind nanoelectronics	Understand
CO2.Explain the concepts of Silicon MOSFETS, quantum transport devices and tunneling effects.	Understand
CO3.Discuss the types of nanotechnology, molecular technology and the preparation of nano materials.	Understand
CO4.Illustrate the synthesis, interconnections and applications of carbon nano tubes.	Apply
CO5.Design and simulate the circuits using molecular electronic devicesand discuss their applications in MEMS and robots	Apply

MAPPINGTH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO 10*	*PO11*	*PO12*	*PSO1*	*PSO2*	*PSO3*
CO1	*S*	*M*	*L*	-	-	-	-	-	-	-	-	*L*	*S*	*M*	-
CO2	*S*	*M*	*M*	-	-	-	-	-	-	-	-	*L*	*M*	*L*	-
CO3	*S*	*M*	*M*	-	-	-	-	-		-	-	*L*	*S*		-
CO4	*S*	*S*	*M*	-	*M*	-	-	-	*L*	-	-	*L*	*S*	*M*	-
CO5	*S*	*M*	*M*	-	*M*	-	-	-	*M*	-	-	*M*	*S*	*M*	*L*

S- Strong; M-Medium; L-Low

SYLLABUS

Fundamentals Of Nanoelectronics

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation: - power dissipation limit – dissipation in reversible computation – the ultimate computer.

Silicon Mosfets& Quantum Transport Devices

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling, Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications: - Single electron devices – applications of single electron devices to logic circuits.

Introduction To Nanotechnology

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope– atomic force microscope – scanning tunnelling microscope – nanomanipulator – nano tweezers – atom manipulation – nano dots – self-assembly – dip pen nanolithography. Nanomaterials: preparation– plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials;

Carbon Nanotubes

Carbon Nanotube: Fullerenes - types of nano tubes – formation of nano tubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of all carbon nanotube nanoelectronics.

Molecular Electronics

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

Text Books:

1. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, "Nanotechnology: Basic Science and Emerging Technologies", Chapman & Hall / CRC, 2002
2. Rainer Waser (Ed.), "Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices", Wiley-VCH, 20032. T. Pradeep, NANO:"The Essentials–Understanding Nanoscience and Nanotechnology", TMH, 2007

References:

1. T.Pradeep, "NANO:The Essentials–Understanding Nanoscience and Nanotechnology", TMH, 2007.
2. W. Ranier, "Nano Electronics and Information Technology", Wiley, (2003).
3. K.E. Drexler, "Nano systems", Wiley, (1992).
4. M.C. Petty, "Introduction to Molecular Electronics"1995.
5. Vladimir V. Mitin, Vieatcheslov A. Kochelap, Micheal A. Stroscio, Introduction to Nanoelectronics, Cambridge University Press, London, 2008

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	*Dr.R.Ramani*	*Assistant Professor*	*ECE*	*ramani@vmkvec.edu.in*
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	Power Converters Analysis and Design	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

To Give an Introduction to The Recent Developments in The Power Electronics Converters. This Course Introduces the Advanced Power Converters Such as Isolated Dc-Dc Converter, Reactive Elements. It Also Deals with The Synchronous Rectifiers and Cascaded Boost Converters.

PRERQUISITE

NIL

COURSE OBJECTIVES

1	Acquire a basic understanding of various power converter modules used to build a power electronics system and acquire the ability to select and design suitable circuit.
2	To impart knowledge on the design of different components for Power converter Systems.
3	To learn the switching losses of various triggering techniques
4	To understand the designing concept of various types of chopper and rectifier
5	To impart knowledge on the design of closed-loop compensators for DC-DC Converter

COURSE OUTCOMES

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

1. Select Power Semiconductor Switches for Power Electronic converters and calculate Losses in the Switch.	Remember
2. Apply the need and working of an Isolated DC-DC Converter for real-time application.	Apply
3. Implement the Design Reactive components for Power Electronic Converters.	Analysis
4. Develop a Model the DC-DC Converter Using state Space Technique.	Implement
5. Modelling of Design compensator for DC-DC Converters.	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	M	-
CO2	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO3	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO4	S	M	M	L	L	-	-	-	-	-	-	L	S	M	-
CO5	S	S	M	M	M	-	-	-	-	-	-	L	S	M	M

S- Strong; M-Medium; L-Low

Syllabus

TRIGGERING LOSS CALCULATION

Survey of devices: Diode, Thyristor, BJT, IGBT, MOSFET and TRIAC-Realization of Semiconductor switch for one quadrant operation, Current bidirectional operation, Voltage bidirectional operation,
four quadrant operation- Thermal Design of Power Switching Devices-Estimation of loss in switch: Conduction Loss Switching Loss –Blocking Loss- Transistor Switching with Clamped Inductive Load.

ISOLATED CHOPPER CONVERTER

Need for Isolated Converters-Operation and Derivation of Voltage equation: Forward Converter-Fly back converter Push pull converter-Half Bridge and Full Bridge Converter.

DESIGN OF REACTIVE ELEMENTS IN POWER ELECTRONIC SYSTEMS:
Introduction-Design of Inductor: Material Constraint-Design Relationships-Design Steps-Design of Transformer: Design Equations-Design Steps-Different Types of Capacitors for Power Electronics Applications-Related problems on design of Inductor and Transformer and Evaluation of loss in capacitor

DC-DC CONVERTER DYNAMICS
Small Signal Analysis of Converter-State Space Averaging Technique-Steps involved in state space averagingDerivation of Transfer function of Ideal buck, boost converter using state space averaging- Converter Non Idealities.

COMPENSATOR DESIGN AND CURRENT MODE CONTROL
Closed loop requirements-Compensator structure-Design of compensator-Introduction of Current Mode Control Block diagram of Current Mode Control-Advantages of Current Mode control

TEXT BOOKS:

1. Ned Mohan,Undeland and Robbin, "Power Electronics: converters, Application and design" John Wiley and sons.Inc,New York,2002.
2. Rashid M.H., " Power Electronics Circuits, Devices and Applications ", Prentice Hall India, New Delhi, 2010.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.K.Boopathy	Associate Professor	EEE/AVIT	boopathyk@avit.ac.in
2	Dr. R. Devarajan	Professor	EEE/ VMKVEC	devarajan@vmkvec.edu.in
4				

17CSEC09	ETHICAL HACKING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE
To analyze the basic concepts of security and hacking process

PREREQUISITE
NIL

COURSE OBJECTIVES

1	To understand the basic concepts in ethical hacking
2	To identify vulnerabilities using ethical hacking techniques
3	To understand security in web applications
4	To understand various types of vulnerabilities in wireless networks
5	To discuss about security tools and its applications

COURSE OUTCOMES

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

CO1: To Understand basics in ethical hacking	Understand
CO2: To apply hacking techniques in real time problems	Apply
CO3: To apply Security Features in web applications	Apply
CO4: To understand and apply security features in wireless networks	Understand and 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			
CO1	M	M									L	L			
CO2	M	M		L								L			
CO3	M	M	L	L		M									
CO4	M	S	L			L				L		M			
CO5	M	L				M					M	L			

S- Strong; M-Medium; L-Low

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.

HACKINGTECHNIQUES

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.

WIRELESSNETWORKHACKING
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	**The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy** Book by Patrick Engebretson
2	**Hacking: Be a Hacker with Ethics** Book by Harsh Bothra
Reference Books	
1	**The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws** Book by DafyddStuttard and Marcus Pinto
2	**Hacking: Computer Hacking Beginners Guide How to Hack ...** Book by Alan T. Norman

Course Designers				
S.No	**Faculty Name**	**Designation**	**Dept / College**	**Email id**
1	S.Leelavathy	Assistant Professor	CSE/ AVIT	leelavathy@avit.ac.in
2	Dr.R.Bharanidharan	Assistant Professor	CSE/VMKVEC	bharanidharan@vmkvec.edu.in

	CLOUD COMPUTING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

To study and understand the concepts in cloud computing and apply them practically.

PREREQUISITE NIL

COURSE OBJECTIVES

1.	To understand cloud computing concepts.
2.	To study various cloud services.
3.	To apply cloud computing in collaboration with other services.
4.	To Apply cloud computing services.
5.	To apply cloud computing online.

COURSE OUTCOMES

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

CO1: Able to Understand basics in Cloud Computing	Understand
CO2: Able to apply cloud computing concepts in real time	Apply
CO3: Able to develop cloud computing projects	Apply
CO4: Able to apply cloud services	Apply
CO5: Able to collaborate cloud services with other 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	M	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO2	M	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO3	M	M	S	M	-	-	-	-	-	-	-	-	M	M	M
CO4	S	M	M	M	-	-	-	-	-	-	-	-	M	M	S
CO5	S	M	M	M	-	-	-	-	-	-	-	-	M	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION
Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage –Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.
DEVELOPING CLOUD SERVICES
Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.
CLOUD COMPUTING FOR EVERYONE
Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.
USING CLOUD SERVICES
Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files.
COLLABORATING ONLINE
Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services –Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware –Collaborating via Blogs and Wikis.
TEXT BOOKS
1. Rajkumar Buyya, James Broberg, Andzej M.Goscinski, "Cloud Computing –Principles and Paradigms",John Wiley & Sons, 2010. 2. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.
REFERENCES
1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring. Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July 2008.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1.	Dr.R.Jaichandran	Professor	CSE	rjaichandran@avit.ac.in
2.	T.Geetha	Assistant professor	CSE	geetha_kcs@yahoo.com

	SENSORS & TRANSDUCERS FOR HEALTHCARE	Category	L	T	P	Credit
		EC-PS	**3**	**0**	**0**	**3**

PREAMBLE

Sensors & transducers for healthcare course presents an overview of sensors and transducers of different types that have been proven in medical and home environments as being helpful in Quality of Life enhancement. Also emphasizes the need Home care.

PREREQUISITE:

NIL

COURSE OBJECTIVES

1	To Understand the basic concepts of sensors, sensor principles and its classification.
2	To use the basic concepts of transducers, electrodes and its classification.
3	To Study the cardiac, respiratory and muscular physiological systems and several other instruments for healthcare.
4	To outline the various biological components using biosensors.
5	To emphasize the need for home medicare system and provide the advance medical technology in home medicare.

COURSE OUTCOMES

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

CO1. Quantify the specification and characteristics of sensors	Understand
CO2. Describe the working principles of transducers.	Understand
CO3. Develop the knowledge for implementing different types of physiological parameter measurement using appropriate sensors.	Apply
CO4. Analyze the biological components using biosensors in various applications.	Analyze
CO5.Analyze the skills required for home Medicare for the elderly, the children and digital technical advancements with home Medicare.	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	L	S	S	-	-	-	-	-	-	-	S	M	-
CO2	M	L	-	M	-	M	-	-	L	-	-	M	-	M	-
CO3	S	S	M	M	L	M	-	M	M	M	-	S	M	M	S
CO4	S	S	L	S	-	S	M	M	S	-	-	S	S	M	M
CO5	S	S	M	M	L	M	-	M	M	M	-	S	M	M	S
S- Strong; M-Medium; L-Low															

SYLLABUS

SENSOR FUNDAMENTALS AND SENSOR PRINCIPLES

Sensor Classification, Performance and Types, Electric charge, field and potentials, capacitor and dielectric constant, magnetism, Induction, resistance, Seebeck, peltier and thermal effects, Heat transfer, light and ultrasonic.

TRANSDUCERS AND ITS CLASSIFICATION

General measurement system, Transducers and its classification, Resistance transducers, capacitive transducer, Inductive transducer, Temperature transducers, piezoelectric transducers, Piezo resistive transducers, photoelectric transducers.

BIOMEDICAL SENSORS AND PHYSICAL SENSORS IN BIOMEDICINE

Introduction to Biomedical Sensors-Classification-Temperature measurement: core temperature,-surface temperature-invasive. Blood flow measurement: skin blood- hot film anemometer- Doppler sonography- electromagnetic sensor - blood pressure measurement: noninvasive- hemodynamic invasive, Spirometry- sensors for pressure pulses and movement- ocular pressure sensor- acoustic sensors in hearing aid, tactile sensors for artificial limbs, sensors in ophthalmoscopy.

BIOSENSORS AND ITS APPLICATION

Biological elements, Immobilization of biological components, Chemical Biosensor, electrochemical sensor, chemical fibro sensors, blood glucose sensors, non-invasive blood gas monitoring, UREASE biosensor.

MEDICAL INSTRUMENTS AT HOME AND DIGITAL HOME CARE

Spectrophotometer, colorimeter, flame photometer, auto-analyzer, Medical devices at home and its implementation, Infant monitors, Medical alert services, Activity monitors, Home medicare management by videophone, Continuous home care through wireless bio-signal monitoring system Smart Wearables in Healthcare.

Text Books:

1. Jacob Fraden,"Hand book of modern sensors: Physics design and applications", Springer, 2003, 3rdedition, AIP press
2. J. G. Webster, J. G. Webster ,"Medical Instrumentation; Application and Design", John Wiley & Sons, Inc., New York,4th Edition, 2015.
3. Robyn Rice, "Home care nursing practice: Concepts and Application", Elsevier, 4th Edition, 2006.
4. Brain R Eggins, "Biosensors: An Introduction", John Wiley Publication, 1997.

Reference Books:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 3 rd edition , 2014.
2. H.S. Kalsi, "Electronic Instrumentation & Measurement", Tata McGraw HILL, 1995.

COURSE DESIGNERS				
S.No	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
1	R.Mohana Priya,	Assistant Professor(Gr-II),	ECE	mohanapriya@avit.ac.in
2.	Dr.P.M.Murali	Assistant Professor	ECE	muralipm@vmkvec.edu.in

	VIRTUAL INSTRUMENTATION	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

A virtual instrument consists of an industry-standard computer or workstation equipped with powerful application software, cost-effective hardware such as plug-in boards, and driver software, which together perform the functions of traditional instruments.

PREREQUISITE

COURSE OBJECTIVES

1	Review background information required for studying virtual instrumentation.
2	Study the basic building blocks of DAQ in virtual instrumentation.
3	Study the various techniques of interfacing of external instruments of PC.
4	Study the various graphical programming environments in virtual instrumentation
5	Study a few applications in virtual instrumentation

COURSE OUTCOMES

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

CO1: Review the study of signal time domain and AC/DC converters.	Remember
CO2: The concepts of operation of virtual instrumentation and classification.	Understand
CO3:Classify and design of interfacing of external instruments	Evaluator
CO4: Apply the concepts of graphical programming.	Apply
CO5: Analyze the tools and simple applications in systems for Fourier transform Power spectrum correlation windowing and filtering tools.	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	M	L	M	S				M		
CO2	S	S	M		S	M	L	M	S		M			S	
CO3	S					M	L	M	S	L			M		L
CO4	S		S	L	S	M	L	M	S					L	

CO5				L	S		L		S		M		L		

S- Strong; M-Medium; L-Low

REVIEW OF DIGITAL INSTRUMENTATION

Representation of analog signals in the digital domain - Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

FUNDAMENTALS OF VIRTUAL INSTRUMENTATION

Concept of virtual instrumentation - PC based data acquisition - Typical on board DAQ card - Resolution and sampling frequency - Multiplexing of analog inputs - Single-ended and differential inputs - Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card - Use of timer-counter and analog outputs on the universal DAQ card.

CLUSTER OF INSTRUMENTS IN VI SYSTEM

Interfacing of external instruments to a PC - RS232, RS 422, RS 485and USB standards - IEEE 488 standard - ISO-OSI model for serial bus - Introduction to bus protocols of MOD bus and CAN bus.

GRAPHICAL PROGRAMMING ENVIRONMENT IN VI

Concepts of graphical programming - Lab-view software - Concept of VIs and sub VI - Display types - Digital - Analog - Chart Oscilloscopic types - Loops - Case and sequence structures - Types of data - Arrays - Formulae nodes -Local and global variables String and file I/O.

ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI

Fourier transform - Power spectrum - Correlation - Windowing and filtering tools - Simple temperature indicator - ON/OFF controller - P-I-D controller - CRO emulation - Simulation of a simple second order system - Generation of HTML page.

TOTAL HOURS: 45

TEXT BOOKS

1. S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.
2. Peter W. Gofton, 'Understanding Serial Communications', Sybex International. 3. Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.

REFERENCE BOOKS

1. Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.
2. Gary W. Johnson, Richard Jennings, 'Lab-view Graphical Programming', McGraw Hill Professional Publishing, 2001.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. K.Boopathy	Professor	EEE	boobathyk@avit.ac.in

	HYDRAULICS AND PNEUMATIC SYSTEMS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

Today, Industries are increasingly demanding process automation in all sectors. Automation results into better quality, increased production and reduced costs. The controlling parameters like motion, Speed, Position and torque are paramount in raising productivity and quality and reducing energy and equipment costs in all industries. Electric drives share most of industrial machine control applications. The variable speed drives which controls speed of a.c/d.c motors are indispensable controlling elements in automation systems. Such drives contain various high performance motors, power electronic converters and digital control systems. With wide options which are open to engineers for selecting proper drive system, one can look forward for a highly efficient and reliable drive for every application in industry.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand about basics of fluid power systems fundamentals.
2	To acquire knowledge about components used in hydraulic and pneumatic systems.
3	To familiarize about the various types of valves and actuators.
4	To design hydraulic circuits for different applications.
5	To design pneumatic circuits for different applications.

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

CO1. Understand the different drive systems and identify which is suitable for specific application.	Understand
CO2. Understand the working of different components in fluid power system.	Understand
CO3. Understand about the utilization of cylinders, accumulators, valves and various control components.	Understand
CO4. Design a feasible hydraulic circuit for a given application.	Apply
CO5. Design a feasible pneumatic circuit for a given application.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	S	M	M	L	M	-	-	-	-	-	-	-	L	-	-
CO2	S	M	M	L	M	-	-	-	-	-	-	-	L	-	-
CO3	S	M	M	L	M	-	-	-	-	-	-	-	L	-	-
CO4	S	S	S	M	L	M	-	-	-	-	-	-	L	-	-
CO5	S	S	S	M	L	M	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

FLUID POWER SYSTEMS AND FUNDAMENTALS

Introduction to fluid power, Advantages and Applications of fluid power system. Basic Laws in Fluid power system, Types of fluid power systems, Properties of fluids – General types of fluids – Fluid power symbols. Basic Laws in Fluid power system. Low cost automation.

HYDRAULIC SYSTEM & PNEUMATIC SYSTEMS COMPONENTS

Pump classification – Gear pump, Vane Pump, Piston pump, construction and working of pumps– Variable displacement pumps. Pneumatic Components: Compressors-types. Filter, Regulator, Lubricator Unit, Muffler

VALVES AND ACTUATORS

Construction of Control Components: Director control valve – 3/2 way valve ,4/2 way valve, Shuttle valve, check valve – pressure control valve –pressure reducing valve, sequence valve-Flow control valve.. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like Telescopic, Cushioning mechanism, Construction of single acting and double acting cylinder.

DESIGN OF HYDRAULIC CIRCUITS

Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, intensifier – Intensifier circuit. Circuits: Reciprocating- Regenerative - Quick return – Sequencing – Synchronizing - Safety circuits -Press – Planer.

DESIGN OF PNEUMATIC CIRCUITS

Fluid Power Circuit Design: Speed control circuits, synchronizing circuit, Sequential circuit design for two and three cylinder using cascade method. Pneumo-hydraulic circuit. Electro pneumatic circuit, Fluid power circuits- failure and troubleshooting.

Text Books:

1. Anthony Esposito - “Fluid Power with Applications”- Pearson Education - 2013
2. Srinivasan - “Hydraulic and Pneumatic Controls”- TMH - 2011.
3. Andrew Parr - “Hydraulics and Pneumatics "- Jaico Publishing House

Reference Books:

1. Thomson, “Introduction to Fluid power”- Prentice Hall - 2004.
2. Majumdar S.R. - “Oil Hydraulics – Principles and maintenance”- Tata McGraw-Hill.
3. Majumdar S.R. - “Pneumatic systems – Principles and maintenance”- Tata McGraw Hill.

Course Designers

S.No	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	Dr.S.Natarajan	Asso.Prof	MECH/ VMKVEC	natarajanshree@gmail.com

DESIGN FOR MANUFACTURING AND ASSEMBLY	Category	L	T	P	Credit
	EC-PS	3	0	0	3

PREAMBLE: To introduce the concepts of automation in Various Industrial applications

PREREQUISITE - NIL

COURSE OBJECTIVES

To understand robotics based industrial automation

To Identify the various automated assembly systems

To develop automated material handling and storage system

To identify the various automated inspection and testing methods.

To build the automated manufacturing systems.

COURSE OUTCOMES

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

Understand the quality aspects of design for manufacture and assembly.	Understand
Apply Boothroyd method of DFM for product design and assembly.	Apply
Apply the concept of DFM for casting, welding, forming and assembly.	Apply
Identify the design factors and processes as per customer specifications.	Apply
Apply the DFM method for a given product.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO 1	PSO2	PSO3
M	-	-	S	-	-	-	-	-	-	-	M	-	-
S	M	-	M	-	-	-	-	-	-	-	L	-	L
S	M	L	M	-	-	-	-	-	-	-	M	-	M
M	M	L	L	M	-	-	-	-	-	-	M	-	M
M	L	L	L	-	-	-	-	-	-	-	M	-	L

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to DFM, DFMA: (9 Hrs.)

How Does DFMA Work?, Reasons for Not Implementing DFMA, What Are the Advantages of Applying DFMA During Product Design?, Typical DFMA Case Studies, Overall Impact of DFMA on Industry.

High speed Automatic Assembly & Robot Assembly: (9 Hrs.)
Design of Parts for High-Speed Feeding and Orienting, Additional Feeding Difficulties, High-Speed Automatic Insertion, General Rules for Product Design for Automation, Design of Parts for Feeding and Orienting, Product Design for Robot Assembly.
Design for Machining and Injection Molding: (9 Hrs.)
Machining Using Single-Point & Multi point cutting tools, Choice of Work Material, Shape of Work Material, Machining Basic Component Shapes, Cost Estimating for Machined Components, Injection Molding Materials, The Molding Cycle, Injection Molding Systems, Molding Machine Size, Molding Cycle Time, Estimation of the Optimum Number of Cavities, Design Guidelines.
Design for Sheet Metal working & Die Casting: (9 Hrs.)
Dedicated Dies and Press-working, Press Selection, Turret Press working, Press Brake Operations, Design Rules, The Die Casting Cycle, Auxiliary Equipment for Automation, Determination of the Optimum Number of Cavities, Determination of Appropriate Machine Size, Die Casting Cycle Time Estimation, Die Cost Estimation, Design Principles.
Design for Assembly Automation: (9 Hrs.)
Fundamentals of automated assembly systems, System configurations, parts delivery system at workstations, various escapement and placement devices used in automated *as*sembly systems, Quantitative analysis of Assembly systems, Multi station assembly systems, single station assembly lines.
TEXT BOOKS:
Geoffrey Boothroyd, Assembly Automation and Product Design, Marcel Dekker Inc., NY, 3rd Edition,2010.
Geoffrey Boothroyd, Hand Book of Product Design, Marcel Dekker Inc., NY, 1992.
REFERENCES:
. GeofferyBoothroyd, Peter Dewhurst and Winston Knight,A, “Product Design for Manufacture and Assembly”, CRC Press, 2011.
.KarlUlrich,T, Steven Eppinger, D, “Product Design and Development”, McGrawHill, 2015.
COURSE DESIGNERS

Name of the Faculty	Designation	Department / Name of the College	Mail ID
R.PRAVEEN	Assistant Professor G-II	Mechanical, AVIT	Praveen@avit.ac.in

	INDUSTRIAL SAFETY	Category	L	T	P	Credit
		EC-PS	3	0	0	3

Preamble
To familiarize with safety issues in design, handling and industrial environment

Prerequisite
NIL

Course Objective

1	To study about safety management and understand all the safety aspects thoroughly.
2	To be aware of the various safety procedures and precaution to be followed during the operation of different types of machines.
3	To be thoroughly equipped with sufficient knowledge of handling the different types of equipments and materials used for industrial safety.
4	To be having sufficient knowledge and sharing of expertise for emergency situations arising due to accidents and monitoring of health aspects.
5	To be aware of the various laws regarding health issues and safety of personals.

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

CO1.	Identify materials for industrial applications based on microstructure and mechanical property relationship.	Understand
CO2.	Select suitable strengthening mechanism and its effects for a crystalline material.	Understand
CO3.	Identify heat treatment methods and surface treatments to improve mechanical properties of materials for applications in engineering industries.	Apply
CO4.	To makes an analysis of the formation and effects of corrosion on various materials.	Analyze
CO5.	Perform testing and mechanical properties evaluation of materials for real-time applications. Select advanced materials and various fabrication techniques	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	L	L	L	L								M		
CO2	M	L	L	L	L								M		
CO3	S	S	S	S	S								S		
CO4	S	M	M	M	M								M		
CO5	S	S	S	S	S								M		

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT I - SAFETY MANAGEMENT

Evaluation of modern safety concepts - Safety management functions – safety organization, safety department – safety committee, safety audit - performance measurements and motivation - employee participation in safety - safety and productivity.

UNIT II: OPERATIONAL SAFETY

Hot metal Operation - Boiler, pressure vessels - heat treatment shop - gas furnace operation – electroplating-hot bending pipes -Safety in welding and cutting. Cold-metal Operation – Safety in Machine shop - Cold bending and chamfering of pipes - metal cutting –shot blasting, grinding, painting - power press and other machines

UNIT III: SAFETY MEASURES

Layout design and material handling - Use of electricity - Management of toxic gases and chemicals - Industrial fires and prevention - Road safety - highway and urban safety – Safety of sewage disposal and cleaning - Control of environmental pollution - Managing emergencies in Industries - planning, security and risk assessments, on- site and off site. Control of major industrial hazards.

UNIT IV: ACCIDENT PREVENTION

Human side of safety - personal protective equipment - Causes and cost of accidents. Accident prevention programs -Specific hazard control strategies - HAZOP - Training and development of employees - First Aid- Fire fighting devices - Accident reporting, Investigation.

UNIT V SAFETY, HEALTH, WELFARE & LAWS

Safety and health standards - Industrial hygiene - occupational diseases prevention – Welfare facilities - History of legislations related to Safety-pressure vessel act-Indian Boiler act - The environmental protection act - Electricity act - Explosive act.

Text Books

1	Krishnan N.V. “Safety Management in Industry” Jaico Publishing House
2	John Ridley

Reference Books

1	Accident Prevention Manual for Industrial Operations”,N.S.C.Chicago, 1982

Course Designers

S.No	Faculty Name	Designation	Department/ Name of the College	Email id
1	S.DURAITHILAGAR	ASSO.PROF	MECH/VMKVEC	duraithilagar@vmkvec.edu.in
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	PRODUCT DEVELOPMENT	Category	L	T	P	Credit
		EC-PS	3	0	0	3

Preamble
The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product.

Prerequisite
NIL

Course Objective

1	Understanding the aspects of product planning and development
2	To understand the customer needs
3	Concept generation and industrial needs
4	Concept selection and method of selection
5	Intellectual property

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

CO1.	Understand the basic concept of product planning and development	Understand
CO2.	Understand the customer requirements and specification of the product	Apply
CO3.	Apply the concept of design and manufacturing to develop new product	Apply
CO4.	Apply the appropriate concept required for new product development	Apply
CO5.	Analyze the product elements, scope, operating procedure and outline for patenting procedure	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	M						L		
CO2	S	M	L	L	M	M							L		
CO3	S	L	M										L		
CO4	S	M	S	M	M	M							L		
CO5	S	M	S	S									L		

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION AND PRODUCT PLANNING AND PROJECT SELECTION
Significance of product design, product design and development process, sequential engineering design method, the challenges of product development, Identifying opportunities evaluate and prioritize projects, allocation of resources
IDENTIFYING CUSTOMER NEEDS AND PRODUCT SPECIFICATIONS
Interpret raw data in terms of customers need, organize needs in hierarchy and establish the relative importance of needs., Establish target specifications, setting final specifications
CONCEPT GENERATION AND INDUSTRIAL DESIGN
Activities of concept generation, clarifying problem, search both internally and externally, explore the output, Assessing need for industrial design, industrial design process, management, assessing quality of industrial design
CONCEPT SELECTION
Overview, concept screening and concept scoring, Concept and Idea generation - methods of selection. - Activities of concept generation, clarifying problem, search both internally and externally
INTELLECTUAL PROPERTY
Elements and outline, patenting procedures, claim procedure, Design for Environment: Impact, regulations from government, ISO system and IPR.

Text Books	
1	Ulrich K. T, Eppinger S.D and Anita Goyal , "Product Design and Development", Tata McGraw Hill, 2009.
Reference Books	
1	Otto K, and Wood K, "Product Design", Pearson Education, 2001.

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	P.KUMARAN	ASST. PROF –GR-II	Mech / AVIT	Kumaranp@avit.ac.in
2	R.PRAVEEN	ASST. PROF –GR-II	Mech / AVIT	praveen@avit.ac.in

	DESIGN FOR QUALITY	Category	L	T	P	C
		EC-PS	3	0	0	3

PREAMBLE

This course reviews the statistical techniques, designing various experiments and special experiments and optimization techniques

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To know about Design principles and analysis of statistical techniques
2	To Understand single factor & multi factorial experiments
3	To know about factorial designs
4	To know about the Selection of orthogonal arrays
5	Principles of robust design

COURSE OUTCOMES

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

CO1. The various statistical techniques	Understand
CO2. design single factor & multi factorial experiments	Apply
CO3. special designs in factorial experiments	Apply
CO4. To design orthogonal experiments	Analyze
CO5. To design robust design and how to optimize those data	**Analyze**

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2	PSO3
CO1	**S**	**S**	**S**	**M**	**M**	**M**							**L**		
CO2	**S**	**S**	**S**	**M**	**M**	**M**							**L**		
CO3	**S**	**S**	**S**	**M**	**M**	**M**							**L**		
CO4	**S**	**S**	**S**	**M**	**M**	**M**							**L**		
CO5	**S**	**S**	**S**	**M**	**M**	**M**							**L**		

S- Strong M-Medium L- Low

Syllabus

INTRODUCTION
Perception of quality, Taguchi's definition of quality – quality loss function, Planning of experiments, design principles, terminology, normal probability plot, Analysis of variance, Linear regression models.
FACTORIAL EXPERIMENTS
Design and analysis of single factor and multi-factor experiments, tests on means, EMS rules
SPECIAL DESIGNS
2 K Factorial designs, Fractional factorial designs, Nested designs, Blocking and Confounding.
ORTHOGONAL EXPERIMENTS
Selection of orthogonal arrays (OA's), OA designs, conduct of OA experiments, data collection and analysis of simple experiments, Modification of orthogonal arrays
ROBUST DESIGN
Variability due to noise factors, Product and process design, Principles of robust design, objective functions in robust design - S/N ratios , Inner and outer OA experiments, optimization using S/N ratios, fraction defective analysis, case studies
Text Books:
1. Krishnaiah, K. and Shahabudeen, P. Applied Design of Experiments and Taguchi Methods, PHI learning private Ltd., 2012 2. Douglas C Montgomery, " Design and Analysis of Experiments" , John Wiley & Sons Ltd.
Reference:
1. Larry B. Barrentine, "An introduction to Design of Experiments A simplified approach", New Age International Publishers, 2010 2. Nicolo Belavendram, "Quality by design" Taguchi techniques for Industrial experimentation, Prentice Hall.
Course Designer

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**

	MODERN MANUFACTURING METHODS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

Preamble

This course aims to teach the physics, modelling, and mathematical inferences of variousadvanced manufacturing processes used in industries for making products. Thestudents will get complete knowledge of the unconventional processes in termsof aspects stated above.

Prerequisite - NIL

Course Objective

1	To discuss the basic concepts various unconventional machining processes
2	To Demonstrate the Mechanical energy baseduncconventional machining processes.
3	To Demonstrate the Electrical energy based unconventional machining processes.
4	To Demonstrate the Chemical & Electro-Chemical energy baseduncconventional machining processes.
5	To Demonstrate the Thermal energy based unconventional machining processes.

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

CO1.	Discuss the basic concepts various unconventional machining processes	Understand
CO2.	Demonstrate the Mechanical energy based unconventional machining processes.	Apply
CO3.	Demonstrate the Electrical energy based unconventional machining processes.	Apply
CO4.	Demonstrate the Chemical & Electro-Chemical energy based unconventional machining processes.	Apply
CO5.	Demonstrate the Thermal energy based unconventional machining processes.	Apply

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

S- Strong; M-Medium; L-Low

SYLLABUS
INTRODUCTION
Unconventional machining Process – Need – classification – Brief overview–merits –demerits–Applications
MECHANICAL ENERGY BASED PROCESSES
Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. Working Principles & Applications – equipment used – process parameters – MRR - Variation in techniques used.
ELECTRICAL ENERGY BASED PROCESSES
Electric Discharge Machining - working principle and applications – equipments - process parameters - surface finish and MRR- Power and control circuits–Wire cut EDM – working principle and Applications.
CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES
Chemical machining and Electro-Chemical Machining- Electro Chemical Grinding and Electro chemical Honing-working principle and applications-Process Parameters -Surface finish and MRR -Etchants–Maskants
THERMAL ENERGY BASED PROCESSES
Laser Beam Machining and drilling, Plasma Arc Machining and Electron Beam Machining Working principles & Applications – Equipment –Types - Beam control techniques. Micromachining and Nanofabrication Techniques

Text Books	
1	Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd.
2	P.K.Mishra , " Non Conventional Machining "- - The Institution of Engineers (India) Text Books: Series.
Reference Books	
1	Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., NewYork
2	Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi.
3	Paul De Garmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., New Delhi, 8th Edition.

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				

	BUSINESS INTELLIGENCE AND ITS APPLICATIONS	Category	L	T	P	Credit
		EC- IE	3	0	0	3

PREAMBLE

Business Intelligence (BI) refers to the tools, technologies, applications and practices used to collect, integrate, analyze, and present an organization's raw data in order to create insightful and actionable business information in Data mining.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To Introduce students to various business intelligence concepts
2	To learn the concepts of data integration used to develop intelligent systems for decision support
3	To introduce visualization tool for prepare the enterprise reporting
4	To learn analytical components and technologies used to create dashboards and scorecards, data/text/Web mining methods
4	To gain new insights into organizational operations in implementation of systems for Business Intelligence (BI)

COURSE OUTCOMES

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

CO1. Learn about the concepts of OLTP and OLAP for BI infrastructure development	Understand
CO2. Gained an understanding of how business professionals can use analytics techniques to formulate and solve relevant problems and how they use analytics to support decision making	Analyze
CO3. Apply Clustering, Association and Classification techniques for Data Integration	Apply
CO4. Assess BI tools to solve problems, issues, and trends using predictive analysis	Apply
CO5. Develop systems to measure, monitor and predict the enterprise variables and performance indicators for business decision-making 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	-	-	-	-	-	-	M	**S**	M	M
CO2	S	M	L	-	M	-	-	-	-	-	-	M	**S**	M	M
CO3	S	M	L	-	M	-	-	-	-	-	-	M	**S**	M	M
CO4	S	M	L	-	M	-	-	-	-	-	-	M	**S**	M	M
CO5	S	M	L	-	M	-	-	-	-	-	-	M	**S**	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO BUSINESS INTELLLIGENCE

Introduction to OLTP AND OLAP – BI Definition and BI Concepts – Business Applications of BI - BI Framework- Role of Data Warehousing in BI –BI Infrastructure Components- BI Process – Developing Data Warehouse – Management Framework – Business driven approach –BI Technology — BI Roles & Responsibilities.

BASICS OF DATA INTEGRATION

Concepts of Data Integration need and advantages of using Data Integration – Introduction to common data integration approaches – Introduction to ETL using SSIS – Introduction to Data Quality – Data Profiling Concepts and Applications.

INTRODUCTION TO MULTIDIMENSIONAL DATA MODELING

Introduction to Data and Dimensional Modeling – Multi Dimensional Data Model – ER modeling Vs Multi Dimensional Model – Concepts of Dimensions - facts - cubes- attributes- hierarchies- star and snowflake schema – Introduction to Business Metrics and KPIs – Creating Cubes using SSAS.

BASICS OF ENTERPRISE REPORTING

Introduction to Enterprise Reporting - Concepts of dashboards - balanced scorecards – Introduction to SSRS Architecture– Enterprise Reporting using SSRS reporting service

BI ROAD AHEAD

BI and Mobility – BI and cloud computing – BI for ERP systems - Benefits of BI in ERP-NorthWind_Traders Data-Data Analyses through Excel-Kettle Tool – Conversion of data using Kettle Tool.

TEXT BOOKS

1.RN Prasad, Seema Acharya, ”Fundamentals Of Business Analytics” Wiley India,2011

REFERENCES

1.Soumendra Mohanty, “Data Warehousing Design, Development and Best Practices”, Tata McGraw-Hill, New Delhi, 2007.

2.David Loshin, “Business Intelligence”, Morgan Kaufmann Publishsers, San Francisco, Fifth edition, 2007.

3.Larissa Terpeluk Moss and Shaku Atre, “Business Intelligence Roadmap”, Pearson Education, 2007

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. K. Sasikala	Associate Professor	CSE	sasikalak@vmkvec.edu.in
2.	Mrs. S. Leelavathy	Assistant Professor(G-II)	CSE	leelavathy@avit.edu.in

	LEARNING IT ESSENTIALS BY DOING	Category	L	T	P	Credit
		EC- IE	3	0	0	3

PREAMBLE

The proposed elective course exposes the non-CS/IT students to IT Essentials. The core modules of this Elective includes programming , Database and web Technology amongst other related topics. This course refers to the basic tools and technologies for the right type of website development and enable student to create simple web applications

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To learn about the essentials of Information Technology
2	To get an idea about the scripting languages.
3	To get an idea about the internet protocols

COURSE OUTCOMES

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

CO1 Understand the networking concept internet protocols, network routing	Understand
CO2. Understand the fundamentals of web applications and its modeling	Understand
CO3. Understand and learn the scripting languages with design of web applications	Understand
CO4. Analyze the process of mobile communication and network technologies	Analyze
CO5. Build simple interactive applications, database applications and multimedia 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	M	M	M	-	-	-	-	-	-	-	M	**S**	M	M
CO2	S	M	M	M	-	-	-	-	-	-	-	M	**S**	-	M
CO3	S	M	M	M	-	-	-	-	-	-	-	M	**S**	M	M
CO4	M	M	M	M	M	-	-	-	-	-	-	M	**S**	M	-
CO5	M	M	M	M	S	-	-	-	-	-	-	M	**-**	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Fundamentals of Computer architecture

introduction-organization of a small computer -Central Processing Unit - Execution cycle – Instruction categories – measure of CPU performance Memory – Input/output devices - BUS-addressing modes. System Software – Assemblers – Loaders and linkers – Compilers and interpreters

Operating system

Introduction – memory management schemes Process management Scheduling – threads.
Problem solving with algorithms- Programming styles – Coding Standards and Best practices - Introduction to C -Programming Testing and Debugging. Code reviews -System Development Methodologies – Software development Models -User interface Design – introduction – The process – Elements of UI design & reports.

RDBMS

Data processing – the database technology – data models-ER modeling concept –notations – Extended ER features -Logical database design - normalization -SQL – DDL statements – DML statements – DCL statements
Writing Simple queries – SQL Tuning techniques – Embedded SQL - OLTP

Objected oriented concepts

Object oriented programming -UML Class Diagrams– relationship – Inheritance – Abstract classes – polymorphism-Object Oriented Design methodology - Common Base class -Alice Tool – Application of OOC using Alice tool.

Client server computing

Internetworking – Computer Networks – Working with TCP/IP – IP address – Sub netting – DNS – VPN – proxy servers World Wide Web – Components of web application - browsers and Web Servers
URL – HTML – HTTP protocol – Web Applications - Application servers – Web Security.

REFERENCES

1. Andrew S. Tanenbaum, Structured Computer Organization, PHI, 3rd ed., 1991
2. Silberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley, 1995
3. Dromey R.G., How to solve it by Computers, PHI, 1994
4. Kernighan, Ritchie, ANSI C language PHI,1992
5. Wilbert O. Galitz, Essential Guide to User Interface Design, John Wiley, 1997
6. Alex Berson, Client server Architecture, Mc Grew Hill International, 1994
7. Rojer Pressman, Software Engineering-A Practitioners approach, McGraw Hill, 5th ed., 2001
8. Alfred V Aho, John E Hopcroft, Jeffrey D Ullman, Design and Analysis of Computer Algorithms, Addison Wesley Publishing Co., 1998
9. Henry F Korth, Abraham Silberschatz, Database System Concept, 2nd ed. McGraw-Hill International editions, 1991
10. Brad J Cox, Andrew J.Novobilski, Object – Oriented Programming – An evolutionary approach, Addison – Wesley, 1991

Course Designers:

S.No.	Name of the Faculty	Designation	Department	Mail ID
1.	Dr.K.Sasikala	Associate Professor	CSE	sasikalak@vmkvec.edu.in
2.	Mr. K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in

	MATH MODELLING & CONTROL SYSTEMS (THEORY AND PRACTICALS)	Category	L	T	P	C
		EC-IE	2	0	2	3

Preamble

This course introduces Mathematical modeling implementation in control system .

PREREQUISITE : Nil

COURSE OBJECTIVES

1	To present a clear exposition of the classical methods of control system modelling, and basic principles of frequency and time domain design techniques
2	To teach the practical control system design with realistic system specifications
3	Understand the concept of stability using various stability criteria

COURSE OUTCOMES

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

CO 1	Develop mathematical models of engineering systems	Understand
CO 2	Able to design control strategies for engineering systems	Understand
CO 3	Develop plant models for evaluating control strategies	Understand
CO 4	Develop MIL and HIL testing frameworks and analyse results	Analyze
C0 5	Gain proficiency in use tools like MATLAB/ Simulink	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	-	S	M	M
CO2	M	L	M	M	-	-	-	-	-	-	-	-	M	-	-
CO3	S	M	S	L	-	-	-	S	M	-	-	-	S	M	-
CO4	M	M	L	S	-	-	-	M	-	-	M	M	S	M	-
CO5	S	S	M	M	-	-	-	-	-	-	-	M	S	S	-

SYLLABUS

INTRODUCTION TO MATH MODELLING
Need for Math Modelling – Transfer Functions - Steps to Build Transfer Functions. Modelling: Electrical & Electronic systems, Electromechanical systems, Hydraulic systems, Thermal systems - Control Systems in simple terms - Natural behaviour of a system - Controlled behaviour of a system
BUILDING A SIMPLE CONTROL SYSTEM
Input and Response of a system - Identifying control inputs - Types of controllers - Types of Systems based on number of I/O - Types of Systems based on I/O relationship - Time-Variant & In-Variant systems LTI Systems Behaviour - Practical example for controlling system behaviour
SIGNALS & BUILDING A SIMPLE CONTROL SYSTEM
Introduction to Signals - Signal Processing - Signal Noise- Conditioners - First order system and its response - Second order system and its response - Solution to the differential equations - Introduction to frequency domain – Convolution - Impulse response
FREQUENCY ANALYSIS & FEEDBACK SYSTEM
Bode plot - Laplace transform - Initial value theorem - Final value theorem - Zeros and poles - Closed Loop Control System – Air-Fuel Control – SI Engines, Closed Loop Control System – Air – Fuel Control – CI Engines - Data Driven vs Mathematical Models, Data Extraction Methods – Testing vs Simulation
STABILITY ANALYSIS & CONTROLLER DESIGN
Routh stability criterion - Nyquist plot – Linearization - Pole placement - Root locus Observability - Robust control – LQR - Observer design and State-estimator - Cascade control
HIL TESTING
HIL Testing fundamentals, applications and use cases - Developing HIL testing frame-work for control strategy evaluation - Automating HIL Test Scripts – Pass / Fail Scenarios
TEXTBOOK
1. U Kiencke, L Nielsen, “Automotive Control Systems for Engine, Driveline, and Vehicle”, Springer 2. John B Heywood, “Internal Combustion Engine Fundamentals”, McGraw-Hill, Inc
REFERENCES
1. Graham C Goodwin “Control System Design” 2. John R Fanchi “Math Refresher for Scientists and Engineers” 3. William, B. Ribbens, Understanding Automotive electronics, ButterWorth Heinemann 1998. 4. Robert N. Brandy, Automotive computers and Digital Instrumentation, Prentice Hall Eaglewood Cliffs, New Jersey, 1988
COURSE DESIGNERS 

Sl No	Name of the Faculty	Designation	Department	Mail ID
1	S.Prakash	AP(Gr-IIP	EEE	sprakash@avit.ac.in
2	Mr. P. Loganathan	AP	EEE/ VMKVEC	loganathan@vmkvec.edu.in

	Electric & Hybrid Electric Vehicles (THEORY AND PRACTICALS)	Category	L	T	P	Credit
		EC- IE	2	0	2	3

PREAMBLE

This course presents the fundamental ideas, principles, analysis and design of hybrid and electric vehicles. deeper into the various aspects of hybrid and electric drive train such as their configuration with Matlab program.

PREREQUISITE: *Nil*

COURSE OBJECTIVES

1	To Discuss different energy storage technologies used for hybrid electric vehicles and their control
2	To learn the design and select EV & HEV components based on design requirements.
3	To understand the model-based development using MATLAB Simulink
4	To learn designing and mathematical modelling of EHV and drives.
5	To learn Carry out model-based calibration based on emissions requirements.
6	To know about various Electrical propulsion system

COURSE OUTCOMES

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

CO1 -Develop the electric propulsion unit and its control for application of electric vehicles.	Apply
CO2 - Analyze different power converter topology used for electric vehicle application.	Implement
CO3 – Use the energy on board effectively	Remember
CO4 - Create the simulate and observe the behavior of EV	Apply
CO5 - Understand various components that make up a EV / HEV vehicle.	Apply
CO6- Interpret working of different configurations of electric vehicles and its components, hybrid vehicle configuration, performance analysis and Energy Management strategies in HEVs.	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	PSO1	PSO 2	PSO3
CO1	L	M	L	M	M	-	L	M	S	L	-	-	S		-
CO2	-	L	M	L	-	S	-	M	M	-	S	-	-	M	-
CO3	M	S	-	S	-	L	L	L	-	M	-	-	-	L	-
CO4	L	L	M	S	-	L		M	M	L	L	S	M	M	M
CO5	M	M	L	M	S	-	L	M	-	M		L	M	-	M
CO6	L	L	M	-	L		L	S	M	-	L		L	L	L

S- Strong; M-Medium; L-Low

SYLLABUS

1. *Introduction to Hybrid & Electric vehicles*

2. *Principles of Electric Machines*
3. *Power electronics and Motor control*
4. *Energy storage system and Fuel cell vehicles*
5. *Transmissions and Alternate storage systems*
6. *Energy Management and Model based development*
7. *Integration of Subsystems*

References

1. *Electric and Hybrid Vehicles: Design Fundamentals, Husain Iqbal.*
2. *Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, Chris Mi and M. Abul Masrur.*
3. *Electric and Hybrid Vehicles, by Tom Denton*
4. *Electric Vehicle Technology Explained, 2ed (WSE), James Larminie*
5. *Introduction to Hybrid Vehicle System Modeling and Control, Wei Liu.*
6. *Hybrid, Electric, and Fuel-Cell Vehicles, Jack Erjavec.*

	INNOVATION, PRODUCT DEVELOPMENT AND COMMERCIALIZATION	Category	L	T	P	Credit
		OE-IE	3	0	0	3

PREAMBLE

commercialization of innovation and new products in fast-paced, high-tech markets and matching technological innovation to market opportunities.

PREREQUISITE - NIL

COURSE OBJECTIVES

1	To make students understand multiple-perspective approach in organization to capture knowledge and creativity to develop successful products and services for Volatile, Uncertain, Complex and Ambiguous (VUCA) world.
2	Inculcate a disruptive thought process to generate ideas for concurrent and futuristic problems of society in general and markets in particular which focus on commercialization
3	Improved understanding of organizational best practices to transform exciting technology into successful products and services
4	Critically assess and evaluate innovation policies and practices in organizations especially from a cultural and leadership point of view
5	Explain why innovation isessential to organizational strategy – especially in a global environment

COURSE OUTCOMES

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

CO1: Understand the role of innovation in gaining and maintaining competitive advantage	Understand
CO2: Integrate the innovation basis and its role in decision making especially under uncertainty	Apply
CO3: Analyze business challenges involving innovation management	Apply
CO4: Having problem solving ability – solving social issues and business problems	Apply
CO5: Comprehend the different sources of innovation	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	M	-	-	-	-	M	S	S	-	M	-	-
CO2	S	S	S	M	M	M	-	-	-	-	-	-
CO3	S	S	S	M	M	M	-	-	-	-	-	-
CO4	S	S	S	M	M	M	-	-	-	-	-	-
CO5	S	S	S	M	M	M	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Pre-launch, during launch and Post launch preparations;

SYLLABUS:

Introduction to Innovation Management - Innovation – What it is? Why it Matters? - Innovation as a Core Business Process – system thinking for innovation – Framework for System Thinking - system thinking tools

Creating New Products and Services - Product and Service Innovation – Exploiting Open Innovation and Collaboration –The Concept of Design Thinking and Its Role within NPD and Innovation – framework for design thinking

Capturing Innovation Outcome - New Venture – Benefits of Innovation, and Learning from Innovation – Building Innovative Organization and Developing Innovation Strategy - Globalization for Innovations, Innovating for Emerging Economies and Role of National Governments in Innovation

New Product Brand Development and Pricing Strategies - Importance of Brand decisions and Brand identity development; Pricing of a new product, Pre-test Marketing

The Product offer Selecting Market opportunity and Designing new market offers-Concept Generation and Evaluation, Developing and Testing Physical offers - Pre-launch, during launch and Post launch preparations;

Text Book:

1. Joe Tidd, John Bessant (2013), Managing Innovation: Integrating Technological, Market and Organizational Change, 5th edition, Wiley.

Reference Books:

1. Schilling, M (2013), Strategic management of technological innovation, 4th edition, McGraw Hill Irwin.
2. Allan Afuah (2003), Innovation Management: Strategies, Implementation and Profits, 2nd edition, Oxford University Press.
3. Michael G. Luchs, Scott Swan, Abbie Griffin (2015), Design Thinking: New Product Development Essentials from the PDMA, Wiley-Blackwell.
4. John Boardman, Brian Sauser (2013), Systemic Thinking: Building Maps for Worlds of Systems, 1st edition, Wiley.
5. Rich Jolly (2015), Systems Thinking for Business: Capitalize on Structures Hidden in Plain Sight, Systems Solutions Press

COURSE DESIGNERS:

S.No	Name of the faculty	Designation	Department	E-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

	NEW VENTURE PLANNING AND MANAGEMENT	Category	L	T	P	Credit
		OE- IE	3	0	0	3

PREAMBLE

Contemporary methods and best practices for the entrepreneur to plan, launch, and operate a new venture and creation of a business plan

PREREQUISITE - Not Required

COURSE OBJECTIVES

1	An opportunity for self-analysis, and how this relates to success in an entrepreneurial environment.
2	Information and understanding necessary to launch and grow an entrepreneurial venture.
3	A realistic preview of owning and operating an entrepreneurial venture.
4	An entrepreneur must understand the diversity, emotional involvement, and workload necessary to succeed.
5	The opportunity to develop a business plan.

COURSE OUTCOMES

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

CO1: Explain the concept of new venture planning, objectives and functions and its components.	Understand
CO2: Analyze the business plan issues and remuneration practices in startups business.	Apply
CO3: Explore an entrepreneurial idea to the point where you can intelligently and decide whether to "go for it" or not.	Apply
CO4: Compare and contrast the different forms entrepreneurial environment in terms of their key differences and similarities.	Apply
CO5: Explore the business plan and business model canvas for your idea.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	M	-	-	-	-	M	S	S	-	M	-	-
CO2	S	S	S	M	M	M	-	-	-	-	-	-
CO3	S	S	S	M	M	M	-	-	-	-	-	-
CO4	S	S	S	M	M	M	-	-	-	-	-	-
CO5	S	S	S	M	M	M	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

SYLLABUS:

STARTING NEW VENTURE: Opportunity identification - Search for new ideas - Sources of innovative

ideas - Techniques for generating ideas - Entrepreneurial imagination &creativity - The role of creative thinking - Developing your creativity - Impediments to creativity.

METHODS TO INITIATE VENTURES: Pathways to new venture - Creating new ventures - Acquiring an existing venture - Advantages of acquiring an established venture - Examination of key issues – Franchising - How a franchise works and franchise law - Evaluating franchising opportunity.

THE SEARCH FOR ENTREPRENEURIAL CAPITAL: The venture capital market - Criteria for evaluating new venture proposals - Evaluating venture capitalists - stage of venture capital financing - Alternate sources of financing for Indian entrepreneurs - Bank funding - State financial corporations - Business incubators and facilitators - Informal risk capital - Angel investors.

THE MARKETING ASPECTS OF NEW VENTURE: Developing a marketing plan - Customer analysis - Sales analysis - Competition analysis - Market research - Sales forecasting - Sales Evaluation - Pricing decisions.

BUSINESS PLAN PREPARATION FOR NEW VENTURE: Business plan concept - Pitfalls to avoid in business plan - Developing a well conceived business plan - Elements of a business plan - Harvest strategy - Form of business organization - Legal acts governing businesses in India .

Text Book:

1. The Successful Business Plan, Secrets & Strategies, Rhonda Abrams, Published by The Planning Shop Titan, Ron Chernow, Random House
2. Osterwalder, A. and Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Hoboken, NJ: John Wiley & Sons

Reference Books:

1. Blackwell, E. (2011). How to Prepare a Business Plan: Create Your Strategy; Forecast Your Finances; Produce That Persuasive Plan. Kogan Page Publishers.
2. Levi, D. (2014). Group Dynamics for Teams. Sage Publications, Inc. Thousand Oaks.
3. Rajeev Roy, 'Entrepreneurship' 2nd Edition, Oxford University Press, 2011.
4. Business Model Generation by Osterwalder and Pigneur.

COURSE DESIGNERS:

S.No	Name of the faculty	Designation	Department	E-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

	SOCIAL ENTREPRENEURSHIP	Category	L	T	P	Credit
		OE- IE	3	0	0	3

PREAMBLE

Social entrepreneurship involves the creativity, imagination and innovation often associated with entrepreneurship.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To provide students with a working knowledge of the concepts, opportunities and challenges of social entrepreneurship..
2	To demonstrate the role of social entrepreneurship in creating innovative responses to critical social needs (e.g., hunger, poverty, inner city education, global warming, etc)..
3	To engage in a collaborative learning process to develop a better understanding of the context and domain of social entrepreneurship..
4	To help prepare you personally and professionally for meaningful employment by reflecting on the issues of social entrepreneurship.
5	Engage with a diverse group of social entrepreneurs

COURSE OUTCOMES

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

CO1: Explain the concept social entrepreneurship and distinguish its elements from across a continuum of organizational structures from traditional nonprofits to social enterprises to traditional for profits	Understand
CO2: Analyze the operations of a human service organization using social entrepreneurial orientation and industry assessment and diagnostic tools.	Apply
CO3: Apply the Social Business Model Canvas and lean startup methods for planning, developing, testing, launching and evaluating social change ventures.	Apply
CO4: Compare funding options for social change ventures.	Apply
CO5: The outcomes of social entrepreneurship are focused on addressing persistent social problems particularly to those who are marginalized or poor.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012
CO1	M	-	-	-	-	M	S	S	-	M	-	-
CO2	S	S	S	M	M	M	-	-	-	-	-	-
CO3	S	S	S	M	M	M	-	-	-	-	-	-
CO4	S	S	S	M	M	M	-	-	-	-	-	-

CO5	S	S	S	M	M	M	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

SYLLABUS:

Social entrepreneurship – dimensions of social entrepreneurship – social change theories – equilibrium and complexity – theory of social emergence

Social entrepreneurs – mindset, characteristics and competencies – developing a social venture sustainability model – feasibility study – planning – marketing challenges for social ventures

Microfinance– MFI (Micro Finance Institutions) in India – regulatory framework of MFI – Banks and MFIs – sustainability of MFI – Self Help Groups– successful MFI models

Angel Investors & Venture Capitalists – difference – valuation of firm – negotiating the funding agreement – pitching idea to the investor

Corporate entrepreneurship – behavioral aspects – identifying, evaluating and selecting the opportunity – venture– location – organization – control – developing business plan – funding the venture – implementing corporate venturing in organization.

Text Book:

1. Constant Beugré, Social Entrepreneurship: Managing the Creation of Social Value, Routledge, 2016.

2. Björn Bjerke, Mathias Karlsson, Social Entrepreneurship: To Act as If and Make a Difference, Edward Elgar Publishing, 2013.

Reference Books:

1. Wei-Skillern, J., Austin, J., Leonard, H., & Stevenson, H. (2007). Entrepreneurship in the Social Sector (ESS). Sage Publications.
2. Janus, K. K. (2017). Social startup success. New York, NY: Lifelong Books.
3. Dancin, T. M., Dancin, P. A., & Tracey, P. (2011). Social entrepreneurship: A critique and future directions.
4. Alex Nicholls, Social Entrepreneurship: New Models of Sustainable Social Change, OUP Oxford, 2008.
5. David Bornstein, Susan Davis, Social Entrepreneurship: What Everyone Needs to Know, Oxford University Press, 2010.

COURSE DESIGNERS:

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17MBHS01	ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	Category	L	T	P	Credit
		OE- IE	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: Nil

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.	Evaluates

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	L	-
CO3	S	S	S	M	M	M	-	-	-	-	-	M	L	-	M
CO4	S	S	S	M	M	M	-	-	-	-	-	M	-	M	L
CO5	S	S	-	M	M	M	-	-	-	-	-	M	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS:

Elements of a successful Start up: Startup Process – Create Management Team and Board of Directors – Evaluate market and Target Customers – Define your product or service – preparation of business plan -

specific problems and challenge in startup.

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 – Equity Ownership – 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.

Startup Capital Requirements and Legal Environment:

Identifying Startup capital Resource requirements - estimating Startup cash requirements - Develop financial assumptions- Constructing a Process Map - Positioning the venture in the value chain - Launch strategy to reduce risks- Startup financing metrics - The Legal Environment- Approval for New Ventures- Taxes or duties payable for new ventures..

Text Book:

1. James A. Swanson & Michael L. Baird, "Engineering your start-up: A Guide for the High-Tech Entrepreneur" 2nd ed, Professional Publications.inc
2. Donald F Kuratko, " Entrepreneurship – 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:

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	INTELLECTUALPROPERTY RIGHTS	Category	L	T	P	Credit
		OE-IE	3	0	0	3

PREAMBLE: The course is designed to introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.

PREREQUISITE: Nil

COURSE OBJECTIVES:

1. To introduce fundamental aspects of Intellectual property Rights
2. To disseminate knowledge on patents and copyrights
3. To disseminate knowledge on trademarks, Design and Geographical Indication (GI),
4. To disseminate knowledge onPlant Variet, Layout Design Protection and create awareness about current trends in IPR
5. To disseminate knowledge onLegislation of IPRs and Alternate Dispute Resolution

COURSE OUTCOMES:

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

CO1: Understand the important of intellectual property rights	Understand
CO2: Apply for the patents	Apply
CO3: Understand and apply for the copyrights	Understand
CO4: Understand the important of trademarks	Apply
CO5: Appreciate the importance of IPR and its related issues	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	L	-	-	-	-	L	S	L	-	L	-	L	L	M	-
CO2	L	S	S	M	M	L	-	-	-	-	-	L	M	L	-
CO3	L	S	L	M	M	L	-	-	-	-	-	L	M	L	-
CO4	L	S	S	S	M	L	-	-	-	-	-	L	L	L	-
CO5	L	S	S	M	-	L	-	-	-	-	-	L	M	L	-

S- Strong; M-Medium; L-Low

SYLLABUS:

Unit 1 - Overview of Intellectual Property

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in

abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.

Unit 2 - Patents & Copyright

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Copyright - Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

Unit 3 – Trademarks, Design and Geographical Indication (GI)

Trademarks: Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

Design: Meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

Geographical Indication (GI): Meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection

Unit 4 - Plant Varieties, Layout Design and Indian National Intelectual Property Policy

Plant Variety Protection: Plant variety protection: meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection.

Layout Design Protection: Layout Design protection: meaning – Procedure for registration, effect of registration and term of protection.

Indian National Intelectual Property Policy: India`s New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenario with case studies

UNIT – V: Legislation of IPRs and Alternate Dispute Resolution

Legislation of IPRs: The Patent Act of India, Patent Amendment Act (2005), Design Act, Trademark Act,

Geographical Indication Act, Bayh- Dole Act - Patent Ownership and Transfer, Patent Infringement, International Patent Law

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 Books:

1. Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.
2. Neeraj, P., &Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

Reference Book:

1. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	P. S. Balaganapathy	Associate Professor	Management	dydirectormanagementstudies@avit.ac.in
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	PRINCIPLES OF BIOMEDICAL INSTRUMENTATION	Category	L	T	P	
		OE-EA	3	0	0	

PREAMBLE

Toenablethestudentstodevelopknowledgeofprinciples,designandapplicationsof theBiomedical Instruments.

PREREQUISITE–NIL

COURSEOBJECTIVES

1	Toknowaboutbioelectricsignals,electrodesanditstypes.
2	ToknowthevariousBiopotentialrecording methods.
3	Tostudyaboutpatientmonitoringconceptandvarious Physiologicalmeasurementsmethods.
4	Tostudytheprincipleofoperationbloodflowmeter,bloodcellscounter.
5	Tostudyaboutbiochemicalmeasurementsanddetailstheconceptofbiotelemetryandpatientsafety.

COURSEOUTCOMES

Onthesuccessfulcompletionofthecourse,studentswillbeableto

CO1. Explainthedifferent Biosignalor biopotential.	Understand
CO2. Discusstheworkingprinciplesofdiagnosticandtherapeuticequipments.	Understand
CO3. ExaminethevariousinstrumentslikeasECG,EMG,EEG,X-ray machine.	Apply
CO4. Illustratemedicalinstrumentsbasedonprinciplesandapplicationusedin hospital.	Analyze
CO5. Analyzeandcalibratefundamentalbiomedicalinstrumentationusedin hospital.	Analyze

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMMESPECIFIC OUTCOMES

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

S-Strong;M-Medium;L-Low

SYLLABUS

BIOELECTRICSIGNALSANDELECTRODES

Basicmedicalinstrumentationsystem,OriginofBioelectricPotential,Recordingelectrodes–ElectrodeTissueinterface, Electrolyte – skin interface, Polarization, Skin contact impedance, motion artifacts. Electrodes – Silver – silver electrodes, electrodes for ECG, electrodes for EEG, electrodes for EMG, Electrical conductivity of electrode jel creams, Microelectrodes.

BIOAMPLIFIERANDBIOMEDICAL RECORDERS

Bioamplifier, Need for Bioamplifier, Differential amplifier, Instrumentation amplifier, Chopper amplifier, I Amplifier, ECG, EEG, EMG, PCG, EOG, ERG lead system and recording methods, typical waveform.

PATIENTMONITORINGSYSTEMANDNONELECTRICALPARAMETERS MEASUREMENTS

System concepts of patient monitoring system, Bedside patient monitoring system, central monitors, Blood

measurement,Measurementoftemperature,Respirationratemeasurement,cardiacoutputmeasurement,Measuremento rate, Plethysmography technique.

BLOODFLOWMETERS, BLOODCELL COUNTERS

Electromagnetic blood flow meter, ultrasonic blood flow meter, Laser Doppler blood flow meter, Types of bloc Methods of cell counting, coulter counters, automatic recognition and differential counting.

BIO-CHEMICALMEASUREMENTSANDBIOTELEMETRYANDPATIENTSAFETY

Ph, Pc02, p02, Phco3 and electrophoresis, colorimeter, spectrophotometer, flame photometer, auto-a Biotelemetry-wireless telemetry, single channel telemetry, multichannel telemetry, multi patient telemetry.

TEXT BOOKS:

1. KhandpurR.S,**"Hand-bookofBiomedicalInstrumentation"**,TataMcGrawHill,2nd Edition,2003.
2. LeslieCromwell,FredWeibellJ,ErichPfeiffer.A,**"BiomedicalInstrumentationandMeasurements"**, Prentic India, 2nd Edition, 1997.

REFERENCES:

1. JohnG.Webster,**"MedicalInstrumentationapplicationanddesign"**,JohnWiley,3rd Edition, 1997.

Carr,JosephJ,Brown,John.M,**"IntroductiontoBiomedicalequipmenttechnology"**,JohnWileyandsons, New York Edition, 1997.

COURSEDESIGNERS

S.No.	Nameofthe Faculty	Designation	Department	Mail ID
1	Dr.N.Babu	Professor	BME	babu@vmkvec.edu.in
2	Mr.V.Prabhakaran	AssistantProfessor(Gr-II)	BME	prabhakaran.bme@avit.a
3	Mrs.S.Vaishnodevi	AssistantProfessor	BME	vaishnodevi@vmkvec.ed
4	Ms.LakshmiShree	AssistantProfessor	BME	lakshmishree.bme@avit.a

		Category	L	T	P	Credit

	BIOSENSORSANDTRANSDUCERS	OE-EA	3	0	0	3

PREAMBLE

The course is designed to make the student acquire conceptual knowledge of the transducers and biological components used for the detection of an analyte. The relation between sensor concepts and biological concepts is highlighted. The principles of biosensors that are currently deployed in the clinical side are introduced.

PREREQUISITE–Nil

COURSEOBJECTIVES

1	Tousethebasicconceptsoftransducers,electrodes andits classification.
2	Todiscussthevarious typesof electrodes.
3	Todeterminetherecordingofbiological components.
4	Toemploytheknowledgeinelectrochemicalandopticalbiosensors.
5	Tooutlinethevariousbiologicalcomponentsusing biosensors.

COURSEOUTCOMES

Onthesuccessfulcompletionofthecourse,studentswillbeableto

CO1. Describetheworkingprinciples of transducers.	Understand
CO2. Explainthevarious typesof electrodes.	Understand
CO3. UtilizevariousFETsensorsforrecordingofbiologicalcomponents.	Apply
CO4. Distinguishvariousbiosensorslikeelectrochemicalandopticalbiosensors.	Analyze
CO5. Analyzethebiologicalcomponentsusingbiosensorsinvarious applications.	Analyze

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMMESPECIFIC OUTCOMES

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

S-Strong;M-Medium;L-Low

SYLLABUS

INTRODUCTION: General measurement system, Transducers and its classification, Resistance transducers, capacitive transducer, Inductive transducer.

TRANSDUCERS:
Temperaturetransducers,piezoelectrictransducers,Piezoresistivetransducers,photoelectrictransducers.

BIOPOTENTIAL ELECTRODES:
Half cell potential, Types of Electrodes –Micro electrodes, Depth and needle electrodes, Surface electrodes, Chemicalelectrodes, Catheter type electrodes, stimulation electrodes, electrode paste, electrode material.

BIOSENSORS:
Biologicalelements,Immobilizationofbiologicalcomponents,ChemicalBiosensor-ISFET,IMFET,electrochemical sensor,

chemical fibro sensors.

APPLICATIONSOFBIOSENSORS:
Bananatrode,bloodglucosesensors,noninvasivebloodgasmonitoring,UREASEbiosensor,Fermentationprocess control, Environmental monitoring, Medical applications.

TEXT BOOKS:

1. H.S.Kalsi,**"ElectronicInstrumentation&Measurement"**,TataMcGrawHILL,1995.
2. BrainREggins,**"Biosensors:AnIntroduction",**JohnWileyPublication,1997.
3. Shakthichatterjee,**"BiomedicalInstrumentation"**,CengageLearning,2013.
4. JohnGWebster, **"MedicalInstrumentation:Applicationanddesign"**,JohnWileyPublications,2001.

REFERENCES:

1. K.Sawhney,**"AcourseinElectronicMeasurementsandInstruments"**,DhapatRai&sons,1991.
2. JohnPBentley,**"PrinciplesofMeasurementSystems"**,3rdEdition,PearsonEducationAsia,(2000Indianreprint).

GeddesandBaker,**"PrinciplesofAppliedBiomedicalInstrumentation"**,3rdEdition,JohnWileyPublications, 2008.

COURSEDESIGNERS

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3	Mr.V.Prabhakaran	AssistantProfessor(Gr-II)	BME	Prabhakaran.bme@avit.
4	Mrs.S.Vaishnodevi	AssistantProfessor	BME	vaishnodevi@vmkvec.e

		Category	L	T	P	Credit
	INTRODUCTION TO BIOFUELS	**OE-EA**	**3**	**0**	**0**	**3**

PREAMBLE

This course will provide an overview of existing energy utilization, production and infrastructure. We will also cover the consequences of our energy choices on the environment. The topics covered will include the chemistry of biofuels, the biology of important feedstocks, the biochemical, genetic and molecular approaches being developed to advance the next generation of biofuels and the economical and global impacts of biofuel production.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the different types and differences between existing energy resources.
2	To understand the improcurement, utilization and their impacts on society and environment
3	To gain knowledge about the existing different biofuels and the methods of production from different sources
4	To introduce the techonologies involved in the production, characterization of biofuels
5	To impacrt the knowledge and applications of biofuel in various sectors and their beneficial aspects to the society.

COURSE OUTCOMES

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

CO1. Understand the existing and emerging biomass to energy technologies	Remember
CO2. Understand the concept of 1st generation, 2nd generation and advance biofuels	Understand
CO3. Appraise the techno-economic analyses of biofuel conversion technologies	Understand
CO4. To articulate the concept of a biorefinery system and be able to develop major unit operations of an integrated biorefinery	Apply
CO5. Illustrate the environmental implications	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	-	M	-	S	L	-	-	-	-	S	-	L
CO2	-	S	S	-	M	-	L	-	-	-	-	-	-	S	L
CO3	S	M	-	M	-	M	-	L	L	-	-	-	S	-	L
CO4	-	S	M	-	M	L	L	-	-	-	-	-	-	S	M
CO5	-	-	-	-	-	-	-	S	M	-	-	-	-	-	L

S- Strong; M-Medium; L-Low

SYLLABUS

OVERVIEW OF BIOFUELS

Generation of biofuels – Development of biological conversion technologies – Integration of biofuels into biorefineries – Energy security and supply – Environmental sustainability of biofuels – Economic sustainability of biofuels.

BIODIESEL

Biodiesel – Microorganisms and raw materials used for microbial Oil production – Treatment of the feedstocks prior to production of the Biodiesel – Current technologies of biodiesel production – Purification of biodiesel; Industrial production of biodiesel – Biodiesel production from single cell oil.

BIOETHANOL

Bioethanol – Properties – Feedstocks – Process technology – Pilot plant for ethanol production from lignocellulosic feedstock – Environmental aspects of ethanol as a biofuel.

BIOMETHANE AND BIOHYDROGEN

Biomethanol – Principles, materials and feedstocks – Process technologies and techniques – Advantages and limitations – Biological hydrogen production methods – Fermentative hydrogen production – Hydrogen economy – Advantages and limitations.

OTHER BIOFUELS

Biobutanol production – Principles, materials and feedstocks – Process technologies – Biopropanol – Bioglycerol – Production of bio-oils via catalytic pyrolysis – Life-Cycle environmental impacts of biofuels and Co-products.

TEXT BOOKS:

1. Luque, R., Campelo, J.and Clark, J. Handbook of biofuels production, Woodhead Publishing Limited 2011 2. Gupta, V, K. and Tuohy, M, G. Biofuel Technologies, Springer, 2013 3. Moheimani, N. R., Boer, M, P, M, K, Parisa A. and Bahri, Biofuel and Biorefinery Technologies, Volume 2, Springer, 2015

REFERENCES:

1.Eckert, C, A. and Trinh, C, T. Biotechnology for Biofuel Production and Optimization, Elsevier, 2016 2. Bernardes, M, A, D, S. Biofuel production – recent developments and prospects, InTech,2011

COURSE DESIGNERS

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	FOOD AND NUTRITION TECHNOLOGY	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

The course aims to enable the students to understand the physicochemical, nutritional, microbiological and sensory aspects, To familiarize the students about the processing and preservation techniques. To emphasize the importance of food safety, food quality, food plant sanitation, food laws and regulations, food engineering and packaging in food industry.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	Understand the tradition food processing techniques and the basics concept of food biochemistry
2	Demonstrate the product development technique, quality and contaminant check
3	To articulate their technical knowledge for industrial purpose
4	Describe national food laws and standards
5	Laws and qualities of standard for food products

COURSE OUTCOMES

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

CO1: Recall the processing techniques practiced in olden days and the biological process	Remember
CO2. Illustrate the methods for animal product development, quality control and also screen the contaminant	Understand
CO3.Transfer the techniques in scaling up for industrial needs	Apply
CO4. Interpret and Troubleshoot instruments to maintain accuracy	Apply
CO5. Develop standards for food 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	L	M	S	M	L	-	-	-	-	-	-	-	M	L	-
CO4	M	S	S	M	L	-	-	-	-	-	-	-	S	S	-
CO5	-	S	S	M	M	-	-	-	-	-	-	M	L	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO FOOD BIOTECHNOLOGY

Introduction, History and scope of food Biotechnology, development and prospects of biotechnology in animal products, ancient and traditional food processing techniques; Biochemical and metabolic pathways of biological systems used in food production.

METHODS IN FOOD BIOTECHNOLOGY: Role of biotechnology in productivity of livestock, Modern biotechnological methods and processes in animal product development, chemical and physical factors required for growing microbial cultures in nutritive substrate; Meat species identification, Quality control, Screening products for contaminants

BIOTECHNOLOGY METHODS IN FOOD PROCESSING:

Use of biotechnology in the production of food additives, use of biotechnological tools for the processing and preservation and foods of animal origin, use of biotechnology improved enzymes in food processing industry, Basic principles of the industrial use of bio-reactions for production of biomass-upstream and downstream processing application of microorganisms as starter cultures in meat industry, microbial production of food ingredients; Biosensors and novel tools and their application in food science.

HURDLE TECHNOLOGY:

Principles and applications, Hurdle effect in fermented foods, shelf stable products, intermediate moisture foods, application of hurdle technology

FOOD SAFETY & SECURITY:

Consumer concerns about risks and values, biotechnology & food safety, Ethical issues concerning GM foods; testing for GMOs; current guidelines for the production, release and movement of GMOs; Future and applications of food biotechnology in India.

TEXT BOOKS:

1. Potter, Norman. M. Food Science, 5th Ed. Springer US

2. Manay, S.; Shadakshara Swamy, M., (2004). Foods: Facts and Principles, 4 th Ed. New Age Publishers.

3. B. Srilakshmi., (2002) Food Science, New Age Publishers.

REFERENCES:

1. Meyer, (2004). Food Chemistry. New Age

2. Deman JM. (1990) Principles of Food Chemistry. 2 nd Ed. Van Nostrand Reinhold, NY

3. Ramaswamy H and Marcott M. Food Processing Principles and Applications. CRC Press

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.A.Nirmala	Assistant Professor GII	Biotechnology	nirmalabt@avit.ac,in
2	Mrs.C.Nirmala	Associate professor	Biotechnology	nirmala@vmkvec.edu.in

	DISASTERRISK MANAGEMENT	Category	L	T	P	Credit
		OE – EA	3	0	0	3

PREAMBLE

PREREQUISITE

NIL

COURSEOBJECTIVES

1	Tostudyabout theDisasterManagementCycles
2	ToStudyabouttheDisasterCommunityandplanning
3	ToUnderstandtheChallengesposedbyDisasterstothecommunity
4	Tostudyaboutcopingconceptsforbothnaturaland manmadedisasters
5	Tostudyaboutstrengtheningtechniquesforstructuralandnonstructuralmeasures

COURSE OUTCOMES

Onthesuccessfulcompletionofthe course,studentswillbeable to

CO1. UnderstandingDisasters,man-madeHazardsandVulnerabilities	UnderstandandApply
CO2. Understandingdisaster managementmechanism	Apply
CO3 Togainknowledgeabout organizationsinvolvedindisastercommunity	Apply
CO4. Tobuildskillstorespondtodisasters	Apply
CO5. Understandingcapacitybuildingconcepts andplanningofdisastermanagements	UnderstandandApply

MAPPING WITHPROGRAMMEOUTCOMES ANDPROGRAMMESPECIFICOUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	L	L	L	L	L	L	M	L	L	M	L	M	M	L	L	M
CO2	M	M	L	L	M	L	S	L	L	M	M	S	S	L	L	S
CO3	S	M	L	L	M	L	M	L	L	M	S	S	M	L	L	S
CO4	M	M	L	L	M	L	M	L	L	S	S	S	S	L	L	M
CO5	S	S	L	L	S	L	S	L	L	S	M	M	S	L	L	S

S-Strong;M-Medium;L-Low

SYLLABUS

UNITIINTRODUCTION

Overview of Disaster Management – Distinguishing between an emergency and a Disaster situation.Disaster Management Cycle – Disaster management Act and Policy in India; Organisational structurefordisastermanagementinIndia;Preparationofstateanddistrictdisastermanagementplans-PhaseI: Mitigation, and strategies; hazard Identification and vulnerability analysis. Disaster Mitigation andInfrastructure,impactofdisastersondevelopmentprogrammes,vulnerabilitiescausedbydevelopment, developingadraftcountry-leveldisasteranddevelopmentpolicyPhaseII:Preparedness, Disaster Risk Reduction(DRR), Emergency Operation Plan (EOP) Phases III and IV:Response and recovery, Response aims, Response Activities, Modern and traditional responses todisasters,DisasterRecovery,andPlan

UNITII DISASTERPLANNING

DisasterPlanning-DisasterResponsePersonnelandduties,CommunityMitigationGoals,Pre-DisasterMitigationPlan,PersonnelTraining,VolunteerAssistance,School-basedProgrammes,HazardousMaterials,Waysofstoringandsafelyhandlinghazardousmaterials,CopingwithExposure

.

UNITIIIDISASTERCOMMUNITY

Disaster Community-Community-based Initiatives in Disaster management, need for Community-Based Approach, categories of involved organizations: Government, Nongovernment organizations(NGOs), Regional AndInternational Organizations, Panchayaths, Community Workers, NationalAnd Local Disaster Managers, Policy Makers, Grass-Roots Workers, Methods Of Dissemination OfInformation, Community-Based Action Plan, Advantages/Disadvantages Of The Community BasedApproach

UNITIV COPINGWITHDISASTER

Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - IndustrialSafetyPlan;Safetynormsand survivalkits-Massmediaand disastermanagement

UNITV CAPACITYBUILDING

Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity forReducing Risk - Counter-Disaster Resources and their utility in Disaster Management - LegislativeSupportatthestate andnationallevels

TEXTBOOKS:

1. ManualonDisaster Management, NationalDisasterManagement,AgencyGovtofIndia.
2. Ayaz,."DisasterManagement:ThroughtheNewMillennium",AnmolPublications.(2009)
3. Dave,P.K.."Emergency MedicalServicesandDisasterManagement:AHolisticApproach",NewDelhi:JaypeeBrothersMedicalPublishers(P)Ltd.,2009
4. Disaster ManagementbyMrinaliniPandeyWiley2014.
5. Goel,S. L.,"DisasterManagement",NewDelhi:Deep&DeepPublicationPvt. Ltd.,2008

REFERENCEBOOKS:

1. Narayan,B."DisasterManagement",NewDelhi:A.P.H.PublishingCorporation,2009
2. Kumar,N.. "DisasterManagement".NewDelhi:AlfaPublications.,2009
3. Ghosh,G.K.,"DisasterManagement",New Delhi:A.P.HPublishingCorporation.

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1	MrsJ.Srija	AssistantProfessor-I	AVIT	srija.civil@avit.ac.in

		Category	L	T	P	Credit
	MUNICIPAL SOLID WASTE MANAGEMENT	**OE-EA**	**3**	**0**	**0**	**3**

Preamble

Structure is an arrangement and organization of interrelated elements in a material object or system, or the object or system so organized. Material structures include man-made objects such as buildings and machines and natural objects such as biological organisms, minerals and chemicals.

Prerequisite

Nil

Course Objectives

1.	The on-site/off-site processing of the same and the disposal methods.
2.	The student is expected to know about the various effects and disposal options for the municipal solid waste.
3.	The collection and supply of water
4.	The offsite processing involved in site

Course Outcomes

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

CO1. To know about the types of waste & Sources	Analyze
CO2 . To Study the on site Storage & Processing	Apply
CO3. To study about the collection & transfer the waste	Apply
CO4. To Study the process of off site processing	Apply
CO5. To know about the solid waste disposal	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**
CO2	**S**	**M**	**L**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**M**	**S**
CO3	**S**	**M**	**M**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**M**	**S**
CO4	**S**	**M**	**M**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**M**	**S**
CO5	**S**	**M**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**L**		**-**	**S**

S- Strong; M-Medium; L-Low

Syllabus

SOURCES AND TYPES OF MUNICIPAL SOLID WASTES

Sources and types of solid wastes-major legislation-monitoring responsibilities-Effects of disposal of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization– public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

ON-SITE STORAGE & PROCESSING

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

COLLECTION AND TRANSFER

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, Anaerobic digestion, RDF and Incineration and co-generation of energy using waste, Pyrolysis of solid Waste operation & maintenance; options under Indian conditions.

OFF-SITE PROCESSING

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions-cradle to grave management concept, Prevailing laws of hazardous waste management- Risk assessment.

DISPOSAL

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment.

Text Books

1. George Tchobanoglous et.al., “Integrated Solid Waste Management”, McGraw-HillPublishers, 2002.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, “Waste Management”,Springer, 1994.
3. Charles A. Wentz; "Hazardous Waste Management", McGraw-Hill Publication, Latest publication, (1992).

Reference Books

1. R.E.Landreth and P.A.Rebers, “Municipal Solid Wastes – problems and Solutions”, Lewis Publishers, 1997, Bhide A.D. and Sundaresan, B.B., “Solid Waste Management in Developing Countries”,INSDOC, 1993.

2. Handbook of Solid Waste Management by Frank Kreith, George Tchobanoglous, McGraw Hill Publication, (2002), Bagchi, A., Design, Construction, and Monitoring of Landfills, (2nd Ed). Wiley Interscience, ISBN: 0-471-30681-9, Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development.

3. Government of India, New Delhi, (2000).

4. NPTEL – Municipal Soild Waste Management by Prof. Ajay Kalamdhad – IIT Guwahati.

		Category	L	T	P	Credit
	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	**OE-EA**	**3**	**0**	**0**	**3**

PREAMBLE

This syllabus is intended for the Engineering students and enable them to lean about Artificial Intelligence. This syllabus contains intelligent agent, Knowledge Representation and Game playing. Thus, this syllabus focuses on to know about AI and its concepts.

PREREQUISITE :NIL

COURSE OBJECTIVES

1.	To introduce the basic principles, techniques, and applications of Artificial Intelligence.
2.	To have knowledge of generic problem-solving methods in Artificial Intelligence.
3.	To design software agents to solve a problem.
4.	Apply the knowledge of algorithms to solve arithmetic problems.
5.	Assemble an efficient code for engineering problems.

COURSE OUTCOMES

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

CO1:. Identify the different agent and its types to solve the problems	Understand
CO2: know about the problem solving technique in Artificial Intelligence.	Apply
CO3: Construct the normal form and represent the knowledge.	Apply
CO4: to know about extension of condition probability and how to apply in the real time environment.	Apply
CO5: To lean about Information Retrieval and Speech Recognition	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	M	M	M	M	M	-	-	-	-	-	-	M	S	M	-
CO2	M	M	L	M	L	-	-	-	-	-	M	M	S	M	M
CO3	M		S	M	M	-	-	-	-	-	-	M	S	-	M
CO4	S	M	M	M	M	-	-	-	-	-	-	M	S	M	M
CO5	S	M	M	M	M	-	-	-	-	-	-	M	S	M	-

S- Strong; M-Medium; L-Low

INTRODUCTION
What is AI? – AI Problems – What is an AI technique – Defining the problem as a state space search – Production system - Production system – Characteristics – Problem Characteristics?
HEURISTIC SEARCH TECHNIQUES
Generate and test – Hill Climbing – Best first Search – Problem Reduction – Constraints satisfaction – Means end analysis.
KNOWLEDGE REPRESENTATION
Propositional Logic-First Order Predicate Logic-Prolog Programming-Unification-Forward Chaining- Backward Chaining-Ontological Engineering-Categories and Objects-Events-Mental Events and Mental Objects.
REPRESENTING KNOWLEDGE USING RULES
Procedural versus – Declarative Knowledge – logic Programming – Forward versus Backward Reasoning – Matching
GAME PLAYING
The Minimax search procedure – Adding Alpha Beta cut offs – Addition Refinements – Waiting for Quiescence – Secondary Searches – Using Book moves.
TEXT BOOKS
1. S. Russell and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2015 Bratko, I., Prolog Programming For Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th Edition, 2011..
REFERENCES
1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: A Logical Approach", Oxford University Press, 2004. 2. G. Luger, "Artificial Intelligence: Structures and Strategies For Complex Problem Solving", Fourth Edition, Pearson Education, 2002. 3. J. Nilsson, "Artificial Intelligence: A New Synthesis", Elsevier Publishers, 1998.

COURSE DESIGNERS

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1	Dr.M.Nitya	Professor	CSE	nithya@vmkvec.edu.in
2	Dr.M.Jayachandran	Professor	CSE	jayachandran@avit.ac.in

		Category	L	T	P	Credit
	INTRODUCTION TO INTERNET OF THINGS	**OE-EA**	**3**	**0**	**0**	**3**

PREAMBLE

Introduction to IoT for statistical data manipulation and analysis. It was inspired by and is most compatible with the statistical language.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To learn Introduction to IoT.
2	To Study methodology of IoT.
3	To Develop IoT applications using Arduino and Intel Edition.

COURSE OUTCOMES

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

CO1: To Understand the basics in Introduction to IoT in terms of constructs, control statements, string functions	Understand
CO2: To Understand the use of Introduction to IoT fundamentals.	Understand & Apply
CO3: Learn to apply Introduction to IoT for Communicating Sequential Process	Understand & Apply
CO4: Able to appreciate and apply the Introduction to IoT from a statistical perspective	Understand & Apply
CO5 To learn Introduction to IoT Challenges	Understand & 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	L	S	S	M	S	L	S	-	**S**	M	S
CO2												M	M	M	S
CO3	M	S	M	M	M	S	S	M	S	M	M	-	M	-	S
CO4												M	M	S	M
CO5	S	S	S	S	M	S	S	S	S	M	S	S	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT I –INTRODUCTION to IoT

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

.

UNIT II- IoT & M2M

Machine to Machine, Difference between IoT and M2M, Software define Network

UNIT III – Network & Communication aspects

Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT IV – Domain specific applications of IoT

Design challenges, Development challenges, Security challenges, Other challenges

UNIT V – Reflection, Low-Level Programming

Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

TEXT BOOKS

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

REFERENCES

1. Macro Schewartz, “Internet of Things with the Arduino Yun” Packet Publishing, 2014.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.M.Jayachandran	Professor	CSE	jayachandran@avit.ac.in
2	Dr.M.Nitya	Professor	CSE	nithya@vmkvec.edu.in

	CYBER SECURITY	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE
To understand the need for Cyber Security in real time and to study techniques involved in it.

PREREQUISITE : NIL

COURSE OBJECTIVES

1.	To understand the fundamentals of Cyber Security and issues
2.	To study various cyber crimes and legal remedies
3.	To apply various privacy and security
4.	To study E-Commerce and digital payments
5.	To study the basic security aspects related to Computer and Mobiles

COURSE OUTCOMES

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

CO1: Able to understand the concept of Cyber security and issues and challenges associated with it.	Understand
CO2: Able to understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures	Apply
CO3: Able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.	Apply
CO4: Able to understand the basic concepts related to E-Commerce and digital payments.	Apply
CO5: Able to understand the basic security aspects related to Computer and Mobiles.	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	-	-	-	-	-	-	-	-	M	M	M
CO2	M	M	M	M	M	-	-	-	-	-	-	-	M	M	M
CO3	M	M	S	M	M	-	-	-	-	-	-	-	M	M	M
CO4	S	M	M	M		-	-	-	-	-	-	-	M	M	S
CO5	S	M	M	M	S	-	-	-	-	-	-	-	M	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO CYBER SECURITY 9 hours
Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.
CYBER CRIME AND CYBER LAW 9 hours
Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.
SOCIAL MEDIA OVERVIEW AND SECURITY 9 hours
Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.
E - C O M M E R C E AND DIGITAL PAYMENTS 9 hours
Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payament Settlement Act,2007.
DIGITAL DEVICES S E C U R I T Y , TOOLS AND TECHNOLOGIES FOR CYBER SECURITY 9 hours
End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.
REFERENCES
1. Cyber Crime Impact in the New Millennium, by R. C Mishra, Auther Press. Edition 2010. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011) 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001) 4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd. 5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers. 6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd. 7. Fundamentals of Network Security by E. Maiwald, McGraw Hill

COURSE DESIGNERS

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	DESIGN OF ELECTRONIC EQUIPMENT	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

The objective of this course is to sensitise a registrant to various aspects of an electronics product. Specifically on non-Electrical aspects like mechanical design and detailing. Starting from a need translated into specifications, leading to design and prototyping and ending up in a manufacturable physical prototype.

PREREQUISITE – BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OBJECTIVES

1	*To understand the various Concept of Industrial Design process.*
2	*To apply the basic Concept of electronic Product designs methodology.*
3	*To classify the Concept of Ergonomics & aesthetics in product design.*
4	*To understand the Knowledge regarding the design of product packaging and working environment.*
5	*To understand the Knowledge of different industrial standard and value analysis.*

COURSE OUTCOMES

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

CO1. Visualize the concept for product design with respect to ergonomics and aesthetics.	*Remember*
CO2. Analyze, design and implement control panels of electronic equipment	*Apply*
CO3. Apply creativity in the design of system by formulating architecture with proper placement of components.	*Apply*
CO4. Apply the concept of visual communication techniques in product design.	*Apply*
CO5. Apply the process of value analysis in existing product.	*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*	-	-	*S*	-	-	*L*	*M*	*L*	-	-	*S*	-	-
CO2	*M*	*L*	-	*M*	*S*	-	-	*L*	*M*	*L*	-	-	*S*	-	-
CO3	*M*	*L*	-	*M*	*S*	-	-	*L*	*M*	*L*	-	*L*	*S*	-	*M*
CO4	*S*	*M*	*L*	-	*S*	-	-	*L*	*M*	*L*	-	*L*	*S*	*M*	*M*
CO5	*S*	*M*	*L*	-	*S*	-	-	*M*	*L*	*L*	-	*L*	*S*	*M*	*M*

S- Strong; M-Medium; L-Low

SYLLABUS

MODULE 1: INTRODUCTION

Introduction to industrial design, Role of industrial design in the domain of industry, Generic product development process, ID process, Product innovations, tools and methods.

MODULE 2: PRODUCT PROTOTYPES

Management of ID process, Product architecture, Structure: standard and non-standard structures. Product prototypes.

MODULE 3: PRODUCT DESIGN AND PLANNING

Electronic product design and devel ...*ies, brainstorming documentation.*

Product planning: Defining the task ...*sting and Pricing of Industrial design,*

MODULE 4: ERGONOMICS

Ergonomics: Ergonomics of electronic equipment, Ergonomics of control panel design. Use of ergonomics at work places and plant layout. Aesthetics: Elements of aesthetics, aesthetics of control panel design.

MODULE 5: CASE STUDIES

Value engineering, Product quality and design management. Industrial standards, Graphics and packaging

TEXTBOOKS:

1. Carl T. Ulrich, Steven. D. Eppinger," "Product Design and Development", McGraw Hill Companies.

REFERENCE BOOKS:

1. Ernest J Mccormick ,"Human factors in Engineering and Design" -, McGraw-Hill Co.

2. Yammiyavar P," Control Panel Design and Ergonomics", CEDT/IISc Publication.

3. Murrell K, Chapman," Ergonomics: Man in his Working Environment", &Hall. London. Flurschiem C H, "Industrial Design and Engineering Design ", Council, London and Springer Verlag, 1983

COURSE DESIGNERS

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1	*Mr.Rajat Kumar Dwibedi*	*Assistant Professor*	*ECE*	*rajatkumar.ece@avit.ac.in*
2	*Dr. L.K.Hema*	*Prof.&Head/ECE*	*ECE*	*hodece@avit.ac.in*
3	*Mr.G.Murali*	*Assistant Professor*	*ECE*	*muralig@vmkvec.edu.in*

	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

Industry 4.0 and Industrial Internet of Things is the pioneer of today's modern technology. To match the engineering skills with the industry skills this subject will induce and impart the knowledge among the young professionals.

PREREQUISITE

Basic knowledge of computer and internet

COURSE OBJECTIVES

1	*Industry 4.0 concerns the transformation of industrial processes through the integration of modern technologies such as sensors, communication, and computational processing.*
2	*Technologies such as Cyber Physical Systems (CPS), Internet of Things (IoT), Cloud Computing, Machine Learning, and Data Analytics are considered to be the different drivers necessary for the transformation.*
3	*Industrial Internet of Things (IIoT) is an application of IoT in industries to modify the various existing industrial systems.*
4	*IIoT links the automation system with enterprise, planning and product lifecycle.*
5	*Real case studies*

COURSE OUTCOMES

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

CO1. Apply & Analyzing the transformation of industrial process by various techniques.	*Analyze*
CO2. Evaluate the transformation technologies are considered to be the different drivers.	*Apply*
CO3. Existing industrial systems will adopt the applications of IIoT.	*Apply*
CO4. Intensive contributions over automation system with enterprise, planning and product life cycle	*Analyze*
CO5. Analyze of various Real time case studies.	*Analyze*

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	S	S	M	-	M	-	-	-	-	-	-	M	S	M	-
CO2	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO3	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO4	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO5	S	S	S	S	M	-	-	-	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO INDUSTRY 4.0 ANDINDUSTRIAL INTERNET OF THINGS*Introduction: Sensing & actuation, Communication-Part I, Part II, Networking-Part I, Part II.Industry 4.0: Globalization, The Fourth Revolution, LEAN Production Systems, Cyber Physical Systems and Next Generation Sensors, Collaborative Platformand Product Lifecycle Management*

INDUSTRIAL INTERNET OF THINGS& IT'S LAYERS

Cybersecurity in Industry 4.0, Basics of Industrial IoT: Industrial Processes-Part I, Part II, Industrial Sensing & Actuation. IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II, Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II.

IIoT COMMUNICATION

Communication-Part I, Industrial IoT- Layers: IIoT Communication, IIoT Networking-Part I, Part II, Part III. Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Industrial IoT

IIoT BIG DATA & SDN APPLICATIONS

Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II, and Industrial IoT-Application Domains. Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

APPLICATIONS & REAL TIME CASE STUDIES

Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies - Virtual reality lab, Manufacturing industries – part one, Manufacturing industries – part two, Milk processing and packaging industries, Steel technology lab, Student projects – part one, Student projects – part two

TEXT BOOKS:

1. *Anandarup Misra, Sudip | Roy, Chandana | Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0, CRC press, 2003.*

REFERENCE BOOKS:

1. *Gilchrist, Alasdair, "Introduction to IoT", Apress, 2016*
2. *Gilchrist, Alasdair "IIoT Reference Architecture", Apress, 2016*

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	*Dr. L.K.Hema*	*Professor &Head*	*ECE*	*hodece@avit.ac.in*
2	*Dr.T.Muthumanickam*	*Professor& Head*	*ECE*	*hodece@vmkvec.edu.in*

	3D PRINTING AND ITS APPLICATIONS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

Preamble

The course is designed to impart knowledge and skills related to 3D printing technologies its type applications.

Prerequisite – NIL

Course Objective

1	To Know the importance of 3D printing in Manufacturing
2	To know about Vat Photo Polymerization & Material Jetting.
3	To know about binder jetting material extrusion & sheet lamination
4	To know about the methods for powder bed fusion & direct energy deposition.
5	To know about the applications of 3D Printing.

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

CO1.	Importance of 3D printing in Manufacturing	Remember
CO2.	Vat Photo Polymerization & Material Jetting.	Understand
CO3.	Binder jetting material extrusion & sheet lamination	Understand
CO4.	Powder bed fusion & direct energy deposition.	Understand
CO5.	Applications of 3D Printing.	Understand

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	PSO2	PSO3
CO1	M	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	M	L	M	-	S	M	M	-	-	-	-	-	M	M-	M
CO3	M	L	M	-	S	M	M	-	-	-	-	-	M	M-	M
CO4	M	L	M	-	S	M	M	-	-	-	-	-	M	M-	M
CO5	M	L	L	-	-	-	-	-	-	-	-	-			

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Need - Development of AM systems – AM process chain -Classification of AM processes- Applications- Advantages of AM and Types of materials for AM.Introduction to STL format, Pre & Post-processing of STL files, Various slicing methods, Part orientation and support generation, Support structure design, Tool path generation

VAT PHOTO POLYMERIZATION & MATERIAL JETTING

Vat Photo polymerization - Stereo lithography process, working principle, advantages and disadvantages, Material Jetting - process, working principle, advantages and disadvantages.

BINDER JETTING-MATERIAL EXTRUSION & SHEET LAMINATION

Binder Jetting- process, working principle, advantages and disadvantages. Material Extrusion –Fused Deposition Modeling process, working principle, advantages and disadvantages. Sheet Lamination – Laminated Object Manufacturing process, working principle, advantages and disadvantages.

POWDER BED FUSION & DIRECT ENERGY DEPOSITION

Powder Bed Fusion – Selective Laser Sintering process, working principle, advantages and disadvantages, Direct Energy Deposition- process, working principle, advantages and disadvantages.

APPLICATIONS OF 3D PRINTING

Applications for 3D Printing - Use of 3D Printing-Limitations of 3D Printing and Further Development of Medical 3D Printing Applications. Use of Multiple Materials in 3D Printing-Embedded Component 3D Printing, Commercial Applications Using Multiple Materials, Future Directions, Business Opportunities and Future Directions.

Text Books

1	Ian Gibson, David Rosen, and Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, New York, NY, 2015.
2	Venuvinod, Patri K., and Weiyin Ma. Rapid prototyping: laser-based and other technologies. Springer Science & Business Media, 2013.

Reference Books

1	Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2003.
2	Ali K. Kamrani, Emand Abouel Nasr,"Rapid Prototyping: Theory & Practice", Springer, 2006.
3	Kumar, L. Jyothish, Pulak M. Pandey, and David Ian Wimpenny, eds. 3D printing and additive manufacturing technologies. Singapore: Springer, 2019.

Course Designers

Sl.No	**Faculty Name**	**Designation**	**Department/ Na me of the college**	**Email id**
1	S.Kalyanakumar	Assistant Professor Gr II	Mech / AVIT	kalyanakumar@avit.ac.in

	INDUSTRIAL ROBOTICS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

Preamble

Theobjectiveofthiscourseistoimpartknowledgeaboutindustrialrobotsfortheircontrolanddesign.

Prerequisite :
NIL

CourseObjective

1	Tointroducebasicconcepts,partsofrobotsandtypesofrobots
2	TolearnaboutRobot kinematicsanddynamics
3	Tolearndifferent typesofsensorsusedinrobotsanditscontrol
4	Tounderstandthedifferenttypesofactuationsystemsusedinrobots
5	TounderstandtherobotcontrolSystems,programmingofrobotsanditsApplications.

CourseOutcomes:On thesuccessfulcompletionofthecourse,studentswillbeableto

CO1.	Understandthebasicconfigurationsandkinematicsystemsofrobots	Understand
CO2.	Solveproblemsofrobotkinematicsanddynamics	Apply
CO3.	Understandthedifferenttypesofsensorsusedinrobotsystemsandtheira pplications,different typesofcontrolsystemsused inrobots	Understand
CO4.	Understandandapplicationsofthedifferent types ofactuatorsusedin robot systems	Understand
CO5.	Understandthe RobotApplications in various fields	Understand

MappingwithProgrammeOutcomesandProgrammeSpecificOutcomes

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

S-Strong;M-Medium;L-Low

SYLLABUS

INTRODUCTIONTOROBOTICS

Introduction to Automation and Robotics– Basic concepts, Need, Law, History, Anatomy, specificationsclassification, present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, degrees of freedom, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

ROBOT ARM KINEMATICS

Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation. Control of robot manipulators – Point to point, Continuous Path Control

GRIPPERS AND SENSORS FOR ROBOTICS

Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics, Selections of sensors. Necessity for sensors and vision system in the working and control of a robot.

ROBOTACTUATIONSYSTEMS

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools

ROBOTAPPLICATIONS

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. ApplicationsinMedical, Household, Entertainment, Space, Underwater, Defense, Disaster management. Micro and Nano robots, Future Applications.

TextBooks

1	Saha,S.K.,"IntroductiontoRobotics,2ndEdition,McGraw-HillHigherEducation,NewDelhi,2014.
2	MikellPGroover,NicholasGOdrey,MitchelWeiss,Roger NNagel,AshishDutta,"IndustrialRobotics, TechnologyprogrammingandApplications",McGrawHill,2012.
3	MittalR.K.andNagrathI.J.,"RoboticsandControl",TataMcGrawHill.

ReferenceBooks

1	Ghosal, A.,"Robotics",Oxford, NewDelhi,2006.
2	NikuSaeedB.,"IntroductiontoRobotics:Analysis,Systems,Applications",PHI,NewDelhi.
3	SteveHeath,"EmbeddedSystemDesign",2ndEdition,Newnes,Burlington,2003
4	MerzoukiR.,SamantarayA.K.,PhathakP.M.andBouamamaB.Ould,"IntelligentMechatronicSystem:Modeling, ControlandDiagnosis",Springer.

CourseDesigners

S.No	FacultyName	Designation	Department/ Nameofthe College	Emailid
1	P.KUMARAN	AP-II	MECH/AVIT	kumaranp@avit.ac.in

	BIOMOLECULES - STRUCTURE, FUNCTION IN HEALTH AND DISEASE	Category	L	T	P	C
		OE-EA	3	0	0	3

PREAMBLE

Biomolecules like carbohydrates, proteins, fat are vital components of any living system. Basic knowledge about them helps in maintaining a healthy lifestyle, free of sickness and a general awareness about hygiene.

PREREQUISITE NIL

COURSE OBJECTIVES

1	To give an overview of importance of biomolecules
2	To elaborate the structure of proteins and nucleic acids and its role in disease.
3	To enumerate the role of carbohydrates and their cellular function in physiology and pathology
4	To enumerate the role of lipids and their cellular function in physiology and pathology.
5	To briefly cholesterol and its role in diseases

COURSE OUTCOMES

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

CO1. Relate the basics of biomolecules in and around him	Understand
CO2. Understand the structure of biomolecules such as proteins and nucleic acids	Understand
CO3. Discover the role of carbohydrates in healthy and diseased conditions	Apply
CO4. Relate disfunctioning of lipids with disease	Analyse
CO5. Criticize the role of cholesterol in diseases.	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	L	L	-	-	L	-	-	-	-	-	-	-	L	-
CO2	S	M	S	-	-	M	-	-	-	-	-	-	-	L	-
CO3	M	L	M	M	-	S	-	-	-	-	-	-	-	L	-
CO4	L	L	L	L	S	L	-	-	S	-	-	M	L	M	M
CO5	S	-	L	L	-	M	-	-	-	-	-	S	S	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

PROTEINS

Protein – Structure – primary, secondary, tertiary. Types of proteins and their function. Role of each type of Protein in Health and Disease.

NUCLEIC ACIDS

Nucleic Acids – Components of nucleic acids, Conformational parameters. Nucleic acids – Types of DNA and RNA. DNA Polymorphism, Circular DNA, Supercoil DNA, DNA-Protein interactions. Role of nucelic acids in Health and disease

CARBOHYDRATES

Carbohydrates – Introduction. Types – monosaccharide, disaccharide, oligosaccharide and polysaccharides. Structure of each type. Artificial sugars. Role of carbohydrates in Health and Disease

FATTYACIDS AND LIPIDS

Fatty acids- Introduction, nomenclature, types - Saturated and unsaturated fatty acids, Essential and non-essential fatty acids.

Lipids – Introduction, Classification - simple and compound lipids, phospholipids, Cholesterol and its role in health and disease, Micelles and Liposomes : Applications in biology and medicine

CELL MEMBRANE AND CELL SIGNALING

Cell membrane - components and architecture, Various membrane models including Fluid-mosaic model. Ion channels, Receptors, Signaling molecules, Signaling mechanism, Role of cell signaling in Health and Disease. Inter-relationship of biomolecules.

TEXTBOOKS

1. Biophysical Chemistry, Part II, Techniques for the study of biological structure and function, by Cantor C.R. and Schimmel P R., W.H. Freeman and Company, 1980.

2. Nucleic Acids in chemistry and Biology, by Blackburn G.M. and gait M.J., IRL Press, 1990.

3. Biochemistry, by Voet D. and Voet J.G., John Wiley and sons, 1995.

4. Physical Biochemistry, by Freifelder D., W.H. Freeman and company, 1976-1982.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID

1	Dr.P.David Annaraj	Assistant professor	Pharmaceutical Engineering	davidannaraj@vmkvec.edu.in
2	Ms.S.Sowmiya	Assistant Professor	Pharmaceutical Engineering	sowmiya.vmkvec@vmrf.edu.in

	PHARMACOGENOMICS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

Pharmacogenomics involves the study of the relationship between an individual's genetic makeup and his or her response to a drug. Pharmacogenetics, a component of pharmacogenomics, is the study of the relationship between a single gene and its response to a drug.

PREREQUISITE - NIL

COURSE OBJECTIVES

1	Discuss about the basic knowledge about pharmacogenomics and drug design using genomic applications for drug action and toxicity.
2	Perform how individualization of drug therapy can be achieved based on a person's genetic makeup while reducing unwanted drug effects.
3	Outline the Pharmacogenomics studies on how genetic differences between individuals can affect responses to various drugs.
4	Formulate on medicine skills acquired by the student and his action in different pathologies
5	Develop acquire knowledge about the influence of genetic alterations on the therapeutic effect and adverse reactions of the drugs, from a perspective of individualized therapy.

COURSE OUTCOMES

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

CO1.Recognize the effect of genetic differences between individuals in the outcome of drug therapy and in drug efficacy and toxicity.	Remember
CO2. Describe the role of single nucleotide polymorphism as a biomarker for the prediction of risk, therapeutic response and prognosis of malignancies.	Understand
CO3. Utilize and manage the new genomics based tools as they become available as well as make best treatment choices.	Understand
CO4. Examine the applications of genomics principles in drug action and toxicology	Analyze
CO5. Validation of case studies related to pharmacogenomics	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	L	L	L	L	L	-	L	L	L	L	L	L	
CO2	M	M	M	M	L	-	-	-	M	-	L	L	L	L	-
CO3	S	S	S	S	L	-	-	-	M	-	L	L	L	L	-

CO4	M	M	M	M	M	-	-	-	S	-	L	L	M	L	-
CO5	L	L	L	L	S	-	-	-	M	-	M	M	S	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

PHARMACOGENOMICS AND PERSONALIZED MEDICINE

Pharmacogenetics - Roots of pharmacogenomics and it is not just pharmacogenomics, Genetic drug response profiles, the effect of drugs on Gene expression, pharmacogenomics in drug discovery and drug development. Concept of individualized drug therapy, Drivers and the promise of personalized medicine, Strategies for application of pharmacogenomics to customize therapy,Barriers.

HUMAN GENOME

Expressed sequence Tags (EST) and computational biology, Microbial genomics, computational analysis of whole genomes, computational genome analysis, Genomic differences that affect the outcome of host pathogen interactions, Protein coding genes, repeat elements, genome duplication, analysis of proteome, DNA variation, Biological complexity. Single nucleotide polymorphisms (SNP's) in Pharmacogenomics - approaches, number and types of SNPs, Study design for analysis, Analytical issues, Development of markers.

ASSOCIATION STUDIES IN PHARMACOGENOMICS

Viability and Adverse drug reaction in drug response, Multiple inherited genetic factors influence the outcome of drug treatments, Association studies in pharmacogenomics, Strategies for pharmacogenomics Association studies, Benefits of Pharmacogenomics in Drug R & D.

GENOMICS APPLICATIONS FOR DRUG ACTION, TOXICITY AND DESIGN

Platform technologies and Pharmaceutical process, its applications to the pharmaceutical industry, Understanding biology and diseases, Target identification and validation, Drug candidate identification and optimization, safety and toxicology studies. The need of protein structure information, protein structure and variation in drug targets-the scale of problem, Mutation of drug targets leading to change in the ligand binding pocket.

PHARMACOGENOMICS – CASE STUDIES

Study of pharmacogenomics of human P-Glycoprotein, drug transporters, lipid lowering drugs,

chemotherapeutic agents for cancer treatment.

TEXT BOOKS

1. Martin M. Zdanowicz, M.M. “Concepts in Pharmacogenomics” Second Edition, American Society of Health-System Pharmacists, 2017.
2. Licinio, J and Wong, Ma-Li. “Pharmacogenomics: The Search for the Individualized Therapies”, Wiley-Blackwell, 2009.
3. Yan Q, “Pharmacogenomics in Drug Discovery and Development” Humana Press, 2nd Edition, 2014.

REFERENCES

1. Brazeau, D.A. and Brazeau, G.A. “Principles of the Human Genome and Pharmacogenomics” American Pharmacist Association, 2011
2. Werner, K., Meyer, U.A., Tyndale, R.F. “Pharmacogenomics”, Second Edition, Taylor and Francis, 2005.
3. Langman, L.J. and Dasgupta, A. "Pharmacogenomics in Clinical Therapeutics", Wiley – Blackwell, 2012

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms. R. Jaishri	Assistant Professor	Pharmaceutical Engineering	jaishri@vmkvec.edu.in

	PROJECT WORK	Category	L	T	P	Credit
		PI-P	0	0	16	8

PREAMBLE

The project provides learners with the opportunity to explore a problem or issue of particular personal or professional interest and to address that problem or issue through focused study and applied research under the direction of a faculty member. The project demonstrates the learner's ability to synthesize and apply the knowledge and skills acquired in his/her academic program to real-world issues and problems. This final project affirms learners' ability to think critically and creatively, to solve practical problems, to make reasoned and ethical decisions, and to communicate effectively.

PREREQUISITE –Nil

COURSE OBJECTIVES

1	To provide learners with the opportunity to apply the knowledge and skills acquired in their courses to a specific problem or issue.
2	To allow learners to extend their academic experience into areas of personal interest, working with new ideas, issues, organizations, and individuals.
3	To encourage learners to think critically and creatively about academic, professional, or social issues and to further develop their analytical and ethical leadership skills necessary to address and help solve these issues.
4	To provide learners with the opportunity to refine research skills and demonstrate their proficiency in written & oral communication skills.
5	To take on the challenges of teamwork, prepare a presentation in a professional manner, and document all aspects of design work.

COURSE OUTCOMES

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

CO1. Apply the knowledge and skills acquired in their courses to a specific problem or issue.	Apply
CO2. Extend their academic experience into areas of personal interest, working with new ideas, issues,organizations, and individuals.	Analyze
CO3. Think critically and creatively about academic, professional, or social issues and to furtherdevelop their analytical and ethical leadership skills necessary to address and help solve theseissues.	Create
CO4. Refine research skills and demonstrate their proficiency in written & oral	Evaluate

communication skills.	

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

CO'S	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	PSO2	PSO3
CO1	S	L	L	M	M	-	-	-	M	M	-	M	M	M	-
CO2	M	M	M	M	L	-	-	-	M	L	-	M	M	M	M
CO3	S	S	M	M	-	-	-	L	-	L	S	M	S	S	-
CO4	S	M	M	M	-	-	-	L	-	L	M	M	S	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

1. The project is a major component of our engineering curriculum: it is the culmination of the program of study enabling the learners to showcase the knowledge and the skills they have acquired during the previous four years, design a product/service of significance, and solve an open-ended problem in engineering.
2. Each student must register to the project course related to his or her program
3. Project course consists of one semester and would be allowed to register only during the final year of study.
4. Project may be initiated during the pre-final semester but will be assessed and credits transferred only during the last semester of study, upon completion of all other degree requirements. Generally the undergraduate project is a team based one.
5. Each team in the major course will consist of maximum of 5 learners.
6. Each project will be assigned a faculty, who will act as the supervisor.
7. The project shall be driven by realistic constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability.
8. Each group must document and implement a management structure. Group leadership roles must be clearly identified including who has responsibility for monitoring project deliverables and group coordination.
9. A group project may be interdisciplinary, with learners enrolled in different engineering degrees, or in Engineering plus other faculties such as Management, Medical and Health Sciences, Science and Humanities.
10. Each student team is expected to maintain a log book that would normally be used to serve as a record of the way in which the project progressed during the course of the session.
11. Salient points discussed at meetings with the supervisor (i.e., suggestions for further meetings, changes to experimental procedures) should be recorded by the student in order to provide a basis for subsequent work.
12. The logbook may be formally assessed;

13. The contribution of each individual team member will be clearly identified and the weightage of this component will be explicitly considered while assessing the work done.
14. A project report is to be submitted on the topic which will be evaluated during the final review.
15. Assessment components will be as spelt out in the regulations.
16. The department will announce a marking scheme for awarding marks for the different sections of the report.
17. The project report must possess substantial technical depth and require the learners to exercise analytical, evaluation and design skills at the appropriate level.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.R.Devarajan	Professor	EEE/VMKVEC	deverajan@vmkvec.edu.in
2	Dr. L.Chitra	Asso. Prof.	EEE/AVIT	chitra@avit.ac.in

	MINI PROJECT	Category	L	T	P	Credit
		PI-M	0	0	6	3

PREAMBLETo obtain hands-on experience in converting a small novel idea / technique into a working model / prototype involving multi-disciplinary skills and / or knowledge and working in at team.

PREREQUISITE –Nil

COURSE OBJECTIVES

1	To conceptualize a novel idea / technique into a product
2	Apply the acquired knowledge to carry out a capstone project having substantial multidisciplinary component
3	To understand the management techniques of implementing a project
4	To take on the challenges of teamwork, prepare a presentation in a professional manner, and document all aspects of design work

COURSE OUTCOMES

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

CO1. Apply the knowledge and skills acquired in their courses to a specific problem or issue.	Apply
CO2.Apply the acquired knowledge to carry out a capstone project having substantial multidisciplinary component	Apply
CO3. Take the challenges of teamwork, prepare a presentation in a professional manner, and document all aspects of design work	Analyze
CO4. Explain design thinking practices and their applications	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	L	-	-	-	M	M	-	M	M	M	M
CO2	S	L	L	M	M	-	-	-	M	M	-	M	M	M	-
CO3	M	M	M	M	L	-	-	-	M	L	-	M	M	M	M
CO4	S	S	M	M	-	-	-	L	-	L	S	M	S	M	-

S- Strong; M-Medium; L-Low

Norms

- Each student must register to the project course related to his or her program
- Mini Project course consists of one semester and would be allowed to register only during the final year of study.
- Minor design project identification, the objective and methodology and expected outcome of the proposed work.
- Presentation of the proposed work design, implementation and partial result
- Presentation of complete project work with results and discussion Demonstration of project work
- Minor Project Report

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Dept	Mail ID
1	Dr.R.Devarajan	Professor	EEE	deverajan@vmkvec.edu.in
2	Dr. L.Chitra	Asso. Prof.	EEE	chitra@avit.ac.in

Course Code	Course Title	Category	L	T	P	C
	YOGA AND MEDITATION	**AC**	**0**	**0**	**2**	**0**

OBJECTIVES:

Yoga is derived from a Sanskrit word 'yuj' which loosely means 'union.' It is a path through which an individual unites with the entire existence. Sounds heavy, right? It basically means how you are not a separate entity but part of a greater energy. It increases your consciousness and makes you realize your true self-clearing the clutter of all that you imbibed as part of your culture, family, and education. It makes you realize that there is something more than what you see around. It is a deeply spiritual practice that is part philosophy, religion, science, and exercise.

COURSE CONTENT

- Surya namaskar,Padmasana, Uttakatasana
- Surya pranayama, BrahmariPranayama
- Anjalimudra, Mahamudra, Chin Mudra
- Kapalabathikriya,Bhastrika, Tratakkriya
- Simple Meditation,YogaBreath awareness meditation,.

OUTCOMES :

- It incorporates breathing exercises, meditation and poses designed to encourage relaxation and reduce stress.
- Practicing yoga is said to come with many benefits for both mental and physical health.
- Yoga is known for its ability to ease stress and promote relaxation.
- Many people begin practicing yoga as a way to cope with feelings of anxiety.
- Could Improve Heart Health
- Improves Quality of Life.
- Could Promote Sleep Quality.
- Improves Flexibility and Balance.
- Could Help Improve Breathing.
- Promotes Healthy Eating Habits.
- Can Increase Strength.

TEXT BOOK:

YogacharyaSundaram, *Sundra Yoga Therapy*, Asana Publications, 2009

REFERENCES:

1. Dr.V.Krishnamoorthy, *Simple Yoga for Health*, Sri MathiNilayam, 2012.
2. Dr.AnandaBalayogiBhavanani, *A Primer of Yoga Theory*, Dhivyananda Creations,2008.
3. Dr.S.Hema, Easy *Yoga for Beginners*, Tara yoga Publications,2008.
4. Dr.AsanaAndiappan, *Ashtanga Yoga*, Asana Publications, 2009.
5. Dr.JohnB.Nayagam, *MudumaikkuMutrupulliVaikkumMuthiraigal*, SaaruPrabha Publications, 2010.

Subject Code _____	Gender Equity and Law (Common to all Branches)	Category	L	T	P	Credit
		AC	0	0	2	0

Gender Equity is the provision of fairness and justice in the distribution of benefits and responsibilities between Men, Women, Transgender, and Gender non-binary individuals. Gender equity is important because, historically, societies around the world have deemed females, transgender people, and nonbinary people as “weaker” or less important than males. Gender equity emphasizes respecting individuals without discrimination, regardless of their gender. There are legal provisions thataddress issues like inequalities that limit a person’s ability to access opportunities to achieve better health, education, and economic opportunity based on their gender.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To sensitize the students regarding the issues of gender and thegender inequalities prevalent in society.
2	To raise and develop social consciousness about gender equity among thestudents.
3	To build a dialogueand bring a fresh perspective on transgender and gender non-conforming individuals.
4	To create awareness among the students and to help them face gender stereotype issues.
5	To help the studentsunderstand the various legal provisions that are available in our society.

COURSE OUTCOMES

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

CO1.Understand the importance of gender equity	Understand
CO2.Initiate the awareness and recognize the social responsibility with regards to gender equity.	Apply
CO3.To develop a sense of inclusiveness and tolerance towards various genders without any discrimination.	Apply
CO4. To evaluate the social issues and apply suitable gender-related regulations for inclusive living.	Evaluate
CO5.To identify and analyze the existing gender inequality problems faced in various institutions.	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	S	M	L	-	-	S	S	S	-	-	-	S	-	-	-
CO2	S	M	M	-	-	S	S	S	-	-	-	S	-	-	-
CO3	S	L	M	-	-	S	S	S	-	-	-	S	-	-	-
CO4	S	S	S	L	-	S	S	S	-	-	-	S	-	-	-
CO5	S	S	S	M	-	S	S	S	-	-	-	S	-	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT –I INTRODUCTION TO GENDER AND SEX **6hrs**

Definition of Sex – Definition of Gender - Sex Vs. Gender - Social Construction of Gender and Gender Roles – GenderStereotypes - Gender Division of Labour - Patriarchy, Masculinity and Gender Equality -Feminism and Patriarchy.

UNIT –II - GENDER BIAS **6 hrs**

Introduction to Gender Inequality in India - Gender Bias in Media - Misleading Advertisement And Poor Portrayal of Women and gender non-conforming individuals- Objectification of Women, Transgender, and gender non-conforming individuals - Differential Treatment of Women, Transgender, Exploitation Caused by Gender Ideology - Female Infanticide - Honor Killing.

UNIT –III GENDER SENSITIZATION AND INTERNATIONAL CONVENTIONS **6 hrs**

Gender Sensitization -Need and Objective - Gender Sensitivity Training at Workplace – GenderSensitization in Judiciary - Gender Sensitization in School Curriculum.

UNIT-IV - SEXUAL OFFENCES AGAINST WOMEN **6 hrs**

Indian Penal Code, 1860 - S., 304B, 354, 354C, 354d, 376, 498A & 509 - The ImmoralTrafficPrevention Act 1986 - The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 - Protection of Women from Domestic Violence Act, 2005- Indecent Representation of Women Act, 1986**.**

UNIT-V ROLE OF GOVERNMENT FOR INCLUSIVE DEVELOPMENT **6hrs**

Initiatives of NCERT -Role of Ministry of Women and Child Development - Governmental Initiatives: Beti BachaoBeti Padhao (BBBP) - Ujjawala Scheme - Working Women Hostels (WWH), National Council for Transgender Persons.

TEXT BOOKS

1. IGNOU: Gender Sensitization: Society, Culture and Change (2019) BGSE001, New Delhi IGNOU
2. Jane Pilcher and Imelda Whelehan (2005): Fifty Key Concepts in Gender Studies

REFERENCES:

1. Women's Empowerment & Gender Parity: @Gender Sensitization, Dr. Shikha Bhatnagar, Repro Books (2020).

2. Gender Sensitization: Issues and Challenges, Anupama Sihag Raj Pal Singh, Raj Publications (2019).

3. Violence Against Women: Current Theory and Practice in Domestic Abuse, Sexual Violence, andExploitation (Research Highlights in Social Work), Jessica Kingsley Publishers (2012).

4. Gill, Rajesh, Contemporary Indian Urban Society- Ethnicity, Gender and Governance, BookwellPublishers, New Delhi (2009).

5. Sexual Violence Against Women: Penal Law and Human Rights Perspectives, Lexis Nexis (2009) 6. Chatterjee, Mohini, Feminism and Gender Equality, Aavishkar, Jaipur,2005.

7. Mies, Maria, Indian Women and Patriarchy, Concept Publishing Company, New Delhi, 2004.

COURSE DESIGNERS

S.No.	Name of the Faculty	Mail ID
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Course Code	Course Title	Category	L	T	P	C
	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	**AC**	**0**	**0**	**2**	**0**

Course Objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day to day life

Course Outcomes:

At the end of the Course, Student will be able to:

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. Illustrate the various enactments related to the protection of traditional knowledge.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Explain the importance of Traditional knowledge in Agriculture and Medicine.

UNIT-I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT-2:

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT-3:

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT-4:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT-5:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation

and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Text Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

Web Links:

1.https://www.youtube.com/watch?v=LZP1StpYEPM

Course Code	Course Title	category	L	T	P	C
	INDIAN CONSTITUTION	**AC**	**0**	**0**	**2**	**0**

Course Objectives:

On completion of this course, the students will be able:

1 To understand the nature and the Philosophy of the Constitution.

2 To understand the outstanding Features of the Indian Constitution and Nature of the Federal system.

3 To Analyse Panchayat Raj institutions as a tool of decentralization.

4 To Understand and analyse the three wings of the state in the contemporary scenario.

5 To Analyse Role of Adjudicatory Process.

5 To Understand and Evaluate the recent trends in the Indian Judiciary.

Course Content

UNIT I

The Constitution - Introduction

The Historical background and making of the Indian Constitution –Features of the Indian Constitution- Preamble and the Basic Structure - Fundamental Rights and Fundamental Duties –Directive Principles State Policy

UNIT II –Government of the Union

The Union Executive- Powers and duties of President –Prime Minister and Council of Ministers - Lok Sabha and Rajya Sabha

UNIT III –Government of the States

The Governor –Role and Powers - Cheif Minister and Council of Ministers- State Legislature

UNIT IV – Local Government

The New system of Panchayat, Municipalities and Co-Operative Societies

UNIT V – Elections

Powers of Legislature -Role of Chief Election Commissioner-State Election Commission

TEXTBOOKS AND REFERENCE BOOKS:

1 Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008

2 The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)

3 Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Fourth 2020 edition Suggested.

Total Hours: 30 hours

Software/Learning Websites:

1. https://www.constitution.org/cons/india/const.html
2. http://www.legislative.gov.in/constitution-of-india
3. https://www.sci.gov.in/constitution
4. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of india/

Alternative NPTEL/SWAYAM Course:

S.NO	NPTEL ID	NPTEL Course Title	Course Instructor
1	12910600	CONSTITUTION OF INDIA AND ENVIRONMENTAL GOVERNANCE: ADMINISTRATIVE AND ADJUDICATORY PROCESS	PROF. M. K. RAMESH NATIONAL LAW SCHOOL OF INDIA UNIVERSITY

COURSE DESIGNER				
S.NO	**NAME OF THE FACULTY**	**DESIGNATION**	**NAME OF THE INSTITUTION**	**MAIL ID**
1	Dr.Sudheer	Professor	AV School of Law	Sudheersurya18@gmail.com