AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR, CHENNAI
&
VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM

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

(AICTE APPROVED AND NAAC ACCREDITED)

Faculty of Engineering and Technology

REGULATIONS 2017

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Programme:

B.E / B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING

Full Time (4 Years)

STRUCTURED CHOICE BASED CREDIT SYSTEM (SCBCS)

CURRICULUM AND SYLLABUS

(Semester I to VIII)

VINAYAKA MISSION'S KIRUPANANDA VARIYAR

ENGINEERING COLLEGE, SALEM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision

- To continuously strive to uplift the youth for the betterment of the society both in the Rural and Urban areas by offering Quality Engineering Education through the Department.

Mission

- To sculpt the students as foundational pillars of Knowledge and Skill in problem analysis.
- To make the students to be competence that stand up to all challenges in the realms of Engineering, Sciences, Technology and Management with Ethics, Morals and Principles.
- Promoting research activity skills through the application of Electronic gadgets.

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 Electronics and Communication Engineering programme will be able to:

PSO1	The ability to absorb and apply fundamental knowledge of Core Electronics subjects to Analyze, Design and develop various types of Integrated Electronic Systems.
PSO2	Select and apply Modern Engineering Hardware and Software Tools to Analyze Complex Electronics Engineering associated problems.
PSO3	Knowledge of Social & Environmental awareness along with Ethical Responsibility to achieve Successful Career Addresses the real world applications using Optimal Resources as an Entrepreneur.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO1	Provides a forum for graduates to attain firm foundation in Electronics and Communication Engineering fundamentals with an attitude to pursue Continuing Education.
PEO2	Offers an environment to create ample opportunities to graduates to cherish needed skills for their successful Professional Career & Societal Developments.
PEO3	Facilitate to sculpt their Skills and Competence in the realm of research in Engineering & Technology.

Credit Requirement for the Course Categories

Sl. No.	Category of Courses	Credits to be earned Min – Max.
01	**A. Foundation Courses (FC)**	**54 - 81**
	i. Humanities and Sciences (English and Management Courses)	12 – 21
	ii. Basic Sciences (Maths, Physics and Chemistry Courses)	24 – 33
	iii. Engineering Sciences (Basic Engineering Courses)	18 - 27
02	**B. Core courses (CC) relevant to the chosen Programme of study.**	**81**
03	**C. Elective Courses (EC)**	**18 - 24**
	i. Programme Specific (Class Room or Online)	12 – 15
	ii. Open Elective (Class Room or Online)	6 - 9
04	**D. Project + Internship + Industry Electives (P + I + I)**	**18**
	i. Project	9
	ii. Internship	3
	iii. Industry Supported Courses	6
05	**E. Employability Enhancement Courses + Co - Curricular Courses + Extra Curricular Courses	**9 - 18**
	i. Employability Enhancement Courses (Personality Development Training, Participation in Seminars, Professional Practices, Summer Project, Case Study etc.)	3 - 6
	ii. Co - Curricular Courses (NCC, NSS, Sports, Games, Drills and Physical Exercises)	3 - 6
	iii. Extra Curricular Courses	3 - 6
Minimum Credits to be earned		**180**
**** - Mandatory, Credits would be mentioned in Mark sheets but not included for CGPA Calculations. For overall CGPA calculations, a student has to earn minimum 171 credits in Categories A to D.**		

CURRICULUM

B.E / B.Tech. ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER
I TO VIII

B.E./B.TECH. – ELECTRONICS AND COMMUNICATION ENGINEERING - SEMESTER I TO VIII									
CATEGORY A – FOUNDATION COURSES - HS, BS AND ES COURSES - CREDITS (54-81)									
(i) HUMANITIES AND SCIENCES (ENGLISH AND MANAGEMENT SUBJECTS) - CREDITS (12 - 21)									
SL. NO	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.	17EGHS01	TECHNICAL ENGLISH	ENGLISH	FC (HS)	3	0	0	3	NIL
2.	17EGHS02	BUSINESS ENGLISH	ENGLISH	FC (HS)	3	0	0	3	NIL
3.	17EGHS81	ENGLISH LANGUAGE LAB	ENGLISH	FC (HS)	0	0	4	2	NIL
4.	17YMHS82	YOGA & MEDITATION	PHYSICAL EDUCATION	FC (HS)	0	0	4	2	NIL
5.	17MBHS01	ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	MANAGEMENT	FC (HS)	3	0	0	3	NIL
6.	17MBHS02	FINANCE AND ACCOUNTING FOR ENGINEERS	MANAGEMENT	FC (HS)	3	0	0	3	NIL
(ii) BASIC SCIENCES (MATHS, PHYSICS AND CHEMISTRY SUBJECTS) - CREDITS (24 - 33)									
1.	17CHBS01	ENVIRONMENTAL SCIENCE AND ENGINEERING	CHEMISTRY	FC (BS)	3	0	0	3	NIL
2.	17MABS01	ENGINEERING MATHEMATICS	MATHEMATICS	FC (BS)	2	2	0	3	NIL
3.	17MABS06	DIFFERENTIAL EQUATIONS AND TRANSFORMS	MATHEMATICS	FC (BS)	2	2	0	3	ENGINEERING MATHEMATICS
4.	17MABS10	PARTIAL DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	MATHEMATICS	FC (BS)	2	2	0	3	DIFFERENTIAL EQUATIONS AND TRANSFORMS
5.	17MABS17	NUMERICAL METHODS, RANDOM PROCESSES AND OPTIMIZATION	MATHEMATICS	FC (BS)	2	2	0	3	ENGINEERING MATHEMATICS DIFFERENTIAL EQUATIONS AND TRANSFORMS
6.	17PCBS02	PHYSICAL SCIENCES	PHYSICS & CHEMISTRY	FC (BS)	4	0	0	4	NIL
7.	17PHBS05	SMART MATERIALS	PHYSICS	FC (BS)	3	0	0	3	NIL
8.	17PCBS81	PHYSICAL SCIENCES LAB	PHYSICS & CHEMISTRY	FC (BS)	0	0	4	2	NIL
(iii) ENGINEERING SCIENCES (BASIC ENGINEERING COURSES) - CREDITS (18 - 27)									
1.	17CMES02	BASICS OF CIVIL AND MECHANICAL ENGINEERING	CIVIL & MECHANICAL	FC(ES)	4	0	0	4	NIL
2.	17EEES03	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	EEE & ECE	FC(ES)	4	0	0	4	NIL
3.	17MEES84	ENGINEERING GRAPHICS (THEORY & PRACTICE)	MECHANICAL	FC(ES)	1	0	4	3	NIL
4.	17CSES01	ESSENTIALS OF COMPUTING	CSE	FC(ES)	3	0	0	3	NIL
5.	17CSES05	PROGRAMMING IN PYTHON	CSE	FC(ES)	3	0	0	3	NIL
6.	17EEES82	ENGINEERING SKILLS PRACTICE LAB A. BASIC ELECTRICAL ENGINEERING B. BASIC	EEE & ECE	FC(ES)	0	0	4	2	NIL

		ELECTRONICS ENGINEERING							
7.	17CMES81	ENGINEERING SKILLS PRACTICE LAB A. BASIC CIVIL ENGINEERING B. BASIC MECHANICAL ENGINEERING	CIVIL & MECHANICAL	FC(ES)	0	0	4	2	NIL
8.	17CSES83	PROGRAMMING IN PYTHON LAB	CSE	FC(ES)	0	0	4	2	NIL

B.E./B.TECH. – ELECTRONICS AND COMMUNICATION ENGINEERING - SEMESTER I TO VIII									
CATEGORY B – CORE COURSES RELEVANT TO THE PROGRAMME - CREDITS (81)									
SL. NO	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1.	17ECCC01	SEMICONDUCTOR DEVICES	ECE	CC	3	0	0	3	NIL
2.	17ECCC02	ANALOG CIRCUITS	ECE	CC	3	0	0	3	SEMICONDUCTOR DEVICES
3.	17ECCC03	PASSIVE NETWORK ANALYSIS & SYNTHESIS	ECE	CC	3	0	0	3	NIL
4.	17ECCC04	SIGNALS AND SYSTEMS	ECE	CC	3	0	0	3	NIL
5.	17CSCC33	PROBLEM SOLVING USING COMPUTERS	CSE	CC	3	0	0	3	NIL
6.	17ECCC05	DIGITAL LOGIC CIRCUITS & DESIGN	ECE	CC	3	0	0	3	BASIC ELECTRICAL & ELECTRONICS ENGG
7.	17ECCC06	ELECTRONICS MEASUREMENT AND INSTRUMENTATION	ECE	CC	3	0	0	3	NIL
8.	17EECC08	CONTROL SYSTEMS	EEE	CC	3	0	0	3	BASIC ELECTRICAL & ELECTRONICS ENGG
9.	17ECCC07	MICROCONTROLLERS & ITS APPLICATIONS	ECE	CC	3	0	0	3	NIL
10.	17ECCC08	ELECTROMAGNETICS AND TRANSMISSION LINES & WAVEGUIDES	ECE	CC	3	0	0	3	PASSIVE NETWORK ANALYSIS & SYNTHESIS
11.	17ECCC09	SIGNAL PROCESSING	ECE	CC	3	0	0	3	SIGNALS AND SYSTEMS
12.	17ECCC10	LINEAR INTEGRATED CIRCUITS	ECE	CC	3	0	0	3	SEMICONDUCTOR DEVICES
13.	17ECCC11	DATA COMMUNICATION NETWORKS	ECE	CC	3	0	0	3	NIL
14.	17ECCC12	DIGITAL CMOS SYSTEMS	ECE	CC	3	0	0	3	DIGITAL LOGIC CIRCUITS & DESIGN
15.	17ECCC13	ANTENNA AND WAVE PROPAGATION	ECE	CC	3	0	0	3	ELECTROMAGNETICS AND TRANSMISSION LINES & WAVEGUIDES
16.	17ECCC14	DIGITAL IMAGE PROCESSING	ECE	CC	3	0	0	3	SIGNAL PROCESSING
17.	17ECCC15	ANALOG & DIGITAL COMMUNICATION	ECE	CC	3	0	0	3	NIL
18.	17ECCC16	MICROWAVE & OPTICAL COMMUNICATION SYSTEMS (THEORY & PRACTICE)	ECE	CC	2	0	2	3	NIL
19.	17ECCC17	FPGA SYSTEM DESIGN	ECE	CC	3	0	0	3	NIL
20.	17ECCC18	INTERNET OF THINGS FOR ELECTRONICS	ECE	CC	3	0	0	3	NIL
21.	17ECCC19	WIRELESS COMMUNICATION SYSTEMS (THEORY & PRACTICE)	ECE	CC	2	0	2	3	ANALOG & DIGITAL COMMUNICATION
22.	17ECCC81	SEMICONDUCTOR DEVICES LAB	ECE	CC	0	0	4	2	NIL
23.	17ECCC82	DIGITAL LOGIC CIRCUITS & DESIGN LAB	ECE	CC	0	0	4	2	BASIC ELECTRICAL & ELECTRONICS ENGG
24.	17ECCC83	ANALOG CIRCUITS LAB	ECE	CC	0	0	4	2	SEMICONDUCTOR DEVICES
25.	17CSCC84	COMPUTER PROGRAMMING LAB	CSE	CC	0	0	4	2	NIL
26.	17ECCC85	LINEAR INTEGRATED CIRCUITS &	ECE	CC	0	0	4	2	SEMICONDUCTOR DEVICES & ANALOG

		MICROCONTROLLERS LAB							CIRCUITS
27.	17ECCC86	SIGNAL PROCESSING LAB	ECE	CC	0	0	4	2	SIGNALS AND SYSTEMS
28.	17ECCC87	DIGITAL IMAGE PROCESSING LAB	ECE	CC	0	0	4	2	SIGNAL PROCESSING
29.	17ECCC88	DATA COMMUNICATION NETWORKING LAB	ECE	CC	0	0	4	2	NIL
30.	17ECCC89	ANALOG & DIGITAL COMMUNICATION LAB	ECE	CC	0	0	4	2	NIL
31.	17ECCC90	FPGA SYSTEM DESIGN LAB	ECE	CC	0	0	4	2	NIL
32.	17ECCC91	MICROWAVE & OPTICAL COMMUNICATION LAB	ECE	CC	0	0	4	2	NIL
33.	17ECCC92	INTERNET OF THINGS LAB	ECE	CC	0	0	4	2	NIL

B.E./B.TECH. – ELECTRONICS AND COMMUNICATION ENGINEERING - SEMESTER I TO VIII

DETAILS OF ELECTIVE COURSES FOR DEGREE WITH SPECIALISATION

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

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

SL. NO	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1.	17ECEC01	ADVANCED DIGITAL SYSTEM DESIGN	ECE	EC (PS)	3	0	0	3	NIL
2.	17ECEC02	PCB & PLC	ECE	EC (PS)	3	0	0	3	NIL
3.	17ECEC03	SATELLITE COMMUNICATION	ECE	EC (PS)	3	0	0	3	ANALOG & DIGITAL COMMUNICATION
4.	17ECEC04	DSP WITH FPGA	ECE	EC (PS)	3	0	0	3	NIL
5.	17ECEC05	RADIO FREQUENCY INTEGRATED CIRCUITS	ECE	EC (PS)	3	0	0	3	ELECTROMAGNETICS AND TRANSMISSION LINES & WAVEGUIDES
6.	17ECEC06	MEMS AND SENSORS	ECE	EC (PS)	3	0	0	3	NIL
7.	17ECEC07	RF SYSTEM DESIGN	ECE	EC (PS)	3	0	0	3	NIL
8.	17ECEC08	MIMO WIRELESS COMMUNICATIONS	ECE	EC (PS)	3	0	0	3	ANALOG & DIGITAL COMMUNICATION
9.	17ECEC09	RADAR SIGNAL PROCESSING	ECE	EC (PS)	3	0	0	3	SIGNAL PROCESSING
10.	17ECEC10	DATA COMPRESSION	ECE	EC (PS)	3	0	0	3	DIGITAL IMAGE PROCESSING
11.	17ECEC11	SATELLITE IMAGE ANALYSIS	ECE	EC (PS)	3	0	0	3	DIGITAL IMAGE PROCESSING, SATELLITE COMMUNICATION
12.	17ECEC12	VIDEO PROCESSING	ECE	EC (PS)	3	0	0	3	DIGITAL IMAGE PROCESSING
13.	17ECEC13	COMMUNICATION NETWORK SECURITY	ECE	EC (PS)	3	0	0	3	DATA COMMUNICATION NETWORKS
14.	17ECEC14	NETWORK MANAGEMENT	ECE	EC (PS)	3	0	0	3	DATA COMMUNICATION NETWORKS
15.	17ECEC15	HIGH PERFORMANCE COMMUNICATION NETWORKS	ECE	EC (PS)	3	0	0	3	DATA COMMUNICATION NETWORKS
16.	17ECEC16	WIRELESS AD-HOC AND SENSOR NETWORKS	ECE	EC (PS)	3	0	0	3	DATA COMMUNICATION NETWORKS
17.	17ECEC17	ELECTROMAGNETIC INTERFERENCE &	ECE	EC (PS)	3	0	0	3	ELECTROMAGNETICS AND

		COMPATIBILITY							TRANSMISSION LINES & WAVEGUIDES
18.	17CSCC04	COMPUTER ARCHITECTURE	CSE	EC (PS)	3	0	0	3	NIL
19.	17ECEC18	SDR & COGNITIVE RADIO	ECE	EC (PS)	3	0	0	3	ANALOG & DIGITAL COMMUNICATION
20.	17ECEC19	ISDN	ECE	EC (PS)	3	0	0	3	ANALOG & DIGITAL COMMUNICATION
21.	17ECEC20	ROBOTICS AND AUTOMATION	ECE	EC (PS)	3	0	0	3	NIL
22.	17ECEC21	ADVANCED ROBOTICS	ECE	EC (PS)	3	0	0	3	NIL
23.	17ECEC22	INNOVATIVE PROJECT	ECE	EC (PS)	0	0	6	3	NIL
24.	17ECEC23	MACHINE VISION	ECE	EC (PS)	3	0	0	3	NIL
SPECIALIZATION – EMBEDDED SYSTEMS									
1.	17ECSE01	ADVANCED PROCESSORS	ECE	EC (SE)	3	0	0	3	NIL
2.	17ECSE02	EMBEDDED CONTROL SYSTEMS	ECE	EC (SE)	3	0	0	3	NIL
3.	17ECSE03	EMBEDDED SYSTEMS ARCHITECTURE	ECE	EC (SE)	3	0	0	3	NIL
4.	17ECSE04	EMBEDDED SYSTEM DESIGN	ECE	EC (SE)	3	0	0	3	NIL
5.	17ECSE05	REAL TIME OPERATING SYSTEMS	ECE	EC (SE)	3	0	0	3	NIL
6.	17ECSE06	SYSTEM ON CHIP	ECE	EC (SE)	3	0	0	3	NIL
7.	17ECSE07	SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEM	ECE	EC (SE)	3	0	0	3	NIL
8.	17ECSE08	ADVANCED PROCESSORS LAB	ECE	EC (SE)	0	0	4	2	NIL
9.	17ECSE09	EMBEDDED SYSTEMS LAB	ECE	EC (SE)	0	0	4	2	NIL
10.	17ECSE10	EMBEDDED SYSTEMS DESIGN LAB	ECE	EC (SE)	0	0	4	2	NIL
11.	17ECSE11	RTOS LAB	ECE	EC (SE)	0	0	4	2	NIL
SPECIALIZATION – BIOMEDICAL									
1.	17BMCC04	BIOMEDICAL INSTRUMENTATION & MEASUREMENTS	BME	EC (SE)	3	0	0	3	NIL
2.	17BMCC03	BIOSENSORS AND TRANSDUCERS	BME	EC (SE)	3	0	0	3	NIL
3.	17BMEC02	BIOTELEMETRY	BME	EC (SE)	3	0	0	3	NIL
4.	17BMEC12	HOSPITAL MANAGEMENT	BME	EC (SE)	3	0	0	3	NIL
5.	17ECSE12	MEDICAL ELECTRONICS	ECE	EC (SE)	3	0	0	3	NIL
6.	17BMCC10	MEDICAL IMAGE PROCESSING AND ANALYSIS	BME	EC (SE)	3	0	0	3	NIL
7.	17BMSE16	WEARABLE TECHNOLOGY	BME	EC (SE)	3	0	0	3	NIL
8.	17BMCC82	BIOMEDICAL INSTRUMENTATION LAB	BME	EC (SE)	0	0	4	2	NIL
9.	17ECSE13	BIOMEDICAL IMAGE PROCESSING LAB	ECE	EC (SE)	0	0	4	2	NIL
10.	17ECSE14	BIOMEDICAL SIGNAL PROCESSING LAB	ECE	EC (SE)	0	0	4	2	NIL
11.	17ECSE15	DATA ACQUISITION LAB	ECE	EC (SE)	0	0	4	2	NIL

SPECIALISATION – INTERNET OF THINGS AND SENSORS									
1.	17ECSE16	FIBER OPTIC SENSORS AND APPLICATIONS	ECE	EC (SE)	3	0	0	3	NIL
2.	17ECSE17	IOT IN AUTOMOTIVE SYSTEMS	ECE	EC (SE)	3	0	0	3	NIL
3.	17ECSE18	IOT FOR INDUSTRIAL SYSTEMS	ECE	EC (SE)	3	0	0	3	NIL
4.	17ECSE19	RFID AND FLEXIBLE SENSORS	ECE	EC (SE)	3	0	0	3	NIL
5.	17ECSE20	SMART IOT APPLICATIONS	ECE	EC (SE)	3	0	0	3	NIL
6.	17ECSE21	WIRELESS SENSOR NETWORKS AND IOT	ECE	EC (SE)	3	0	0	3	NIL
7.	17ECSE22	WIRELESS TECHNOLOGIES FOR IOT	ECE	EC (SE)	3	0	0	3	NIL
8.	17ECSE23	CHEMICAL SENSOR LAB	ECE	EC (SE)	0	0	4	2	NIL
9.	17ECSE24	SENSOR SYSTEMS LAB	ECE	EC (SE)	0	0	4	2	NIL
10.	17ECSE25	WIRELESS SENSOR NETWORKS LAB	ECE	EC (SE)	0	0	4	2	NIL
(ii) OPEN ELECTIVE (CLASS ROOM OR ONLINE) - CREDITS (6 - 9)									
1.	17EECC15	ELECTRICAL TECHNOLOGY	EEE	EC (OE)	3	0	0	3	NIL
2.	17EEEC21	NON CONVENTIONAL ENERGY SOURCES	EEE	EC (OE)	3	0	0	3	NIL
3.	17EEEC22	SCADA	EEE	EC (OE)	3	0	0	3	NIL
4.	17EECC16	POWER ELECTRONICS AND DRIVES	EEE	EC (OE)	3	0	0	3	NIL
5.	17MECC12	COMPUTER INTEGRATED MANUFACTURING	MECH	EC (OE)	3	0	0	3	NIL
6.	17MESE32	COMPOSITE MATERIALS	MECH	EC (OE)	3	0	0	3	NIL
7.	17MESE17	MODERN MANUFACTURING METHODS	MECH	EC (OE)	3	0	0	3	NIL
8.	17MESE22	AUTOMOTIVE INFOTRONICS	MECH	EC (OE)	3	0	0	3	NIL
9.	17MEEC04	AGRICULTURAL ENGINEERING EQUIPMENTS	MECH	EC (OE)	3	0	0	3	NIL
10.	17MEEC11	INDUSTRIAL ROBOTICS	MECH	EC (OE)	3	0	0	3	NIL
11.	17MEEC13	INDUSTRIAL SAFETY	MECH	EC (OE)	3	0	0	3	NIL
12.	17MECC16	INDUSTRIAL AUTOMATION	MECH	EC (OE)	3	0	0	3	NIL
13.	17ATCC04	AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEMS	AUTO	EC (OE)	3	0	0	3	NIL
14.	17ATCC10	AUTOMOTIVE POLLUTION CONTROL	AUTO	EC (OE)	3	0	0	3	NIL
15.	17ATEC13	COMPUTER SIMULATION OF IC ENGINE PROCESSES	AUTO	EC (OE)	3	0	0	3	NIL
16.	17ATEC14	COMPUTER CONTROLLED VEHICLE SYSTEMS	AUTO	EC (OE)	3	0	0	3	NIL
17.	17CSCC16	CLOUD COMPUTING	CSE	EC (OE)	3	0	0	3	NIL
18.	17CSCC09	JAVA PROGRAMMING	CSE	EC (OE)	3	0	0	3	NIL
19.	17CSPI10	MOBILE APPLICATION DEVELOPMENT	CSE	EC (OE)	3	0	0	3	NIL
20.	17CSEC34	WEB DESIGN AND MANAGEMENT	CSE	EC (OE)	3	0	0	3	NIL
21.	17CSEC09	ETHICAL HACKING	CSE	EC (OE)	3	0	0	3	NIL

22.	17CSEC11	GREEN COMPUTING	CSE	EC (OE)	3	0	0	3	NIL
23.	17CSEC32	VIRTUAL REALITY	CSE	EC (OE)	3	0	0	3	NIL
24.	17CSCC01	DATA STRUCTURES	CSE	EC (OE)	3	0	0	3	NIL
25.	17CSCC02	OBJECT ORIENTED PROGRAMMING	CSE	EC (OE)	3	0	0	3	NIL
26.	17CSCC03	DATABASE MANAGEMENT SYSTEM	CSE	EC (OE)	3	0	0	3	NIL
27.	17CSEC06	CRYPTOGRAPHY AND NETWORK SECURITY	CSE	EC (OE)	3	0	0	3	NIL
28.	17BMEC09	DESIGN OF MEDICAL DEVICES	BME	EC (OE)	3	0	0	3	NIL
29.	17BMEC01	MEDICAL OPTICS	BME	EC (OE)	3	0	0	3	NIL
30.	17BMEC21	MEDICAL SIMULATION IN LIFE SUPPORTING DEVICES	BME	EC (OE)	3	0	0	3	NIL
31.	17BMSE07	MEDICAL RADIATION SAFETY ENGINEERING	BME	EC (OE)	3	0	0	3	NIL
32.	17BMSE18	ROBOTICS & AUTOMATION IN MEDICINE	BME	EC (OE)	3	0	0	3	NIL
33.	17CVEC08	REMOTE SENSING TECHNIQUES AND APPLICATIONS	CIVIL	EC (OE)	3	0	0	3	NIL
34.	17CVEC18	WIND ENGINEERING	CIVIL	EC (OE)	3	0	0	3	NIL

B.E./B.TECH. – ELECTRONICS AND COMMUNICATION ENGINEERING - SEMESTER I TO VIII									
CATEGORY D – PROJECT + INTERNSHIP + INDUSTRY ELECTIVES (P + I + I)- CREDITS (18)									
(i) PROJECT - CREDITS (9)									
(i) INTERNSHIP + INDUSTRY ELECTIVES - CREDITS (9)									
SL. NO	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.	17ECPI01	PROJECT	ECE	PI	0	0	18	9	NIL
2.	17ECPI02	MINI PROJECT	ECE	PI	0	0	6	3	NIL
3.	17ECPI03	ADVANCED MICROPROCESSOR	ECE	PI	3	0	0	3	NIL
4.	17ECPI04	VIRTUAL INSTRUMENTATION FOR ELECTRONICS	ECE	PI	3	0	0	3	NIL
5.	17CSPI04	BUSINESS INTELLIGENCE AND ITS APPLICATIONS	CSE	PI	3	0	0	3	NIL
6.	17CSPI07	LEARNING IT ESSENTIALS BY DOING	CSE	PI	3	0	0	3	NIL

CATEGORY E – EMPLOYABILITY ENHANCEMENT COURSES, CO - CURRICULAR COURSES AND EXTRA CURRICULAR COURSES (EEC) - CREDITS (9 - 18)**
(- MANDATORY, CREDITS WOULD BE MENTIONED IN MARK SHEETS BUT NOT INCLUDED FOR CGPA CALCULATIONS.)**

SL. NO	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
(i) EMPLOYABILITY ENHANCEMENT COURSES (EEC)									
1.	17APEE01	PERSONALITY SKILLS DEVELOPMENT – I	MATHS	EE	2 WEEKS OF TRAINING			1	NIL
2.	17APEE02	PERSONALITY SKILLS DEVELOPMENT – II	ENGLISH & MANAGEMENT	EE	2 WEEKS OF TRAINING			1	NIL
3.	17ECEE01	BASICS ON ELECTRONIC GADGETS, COMPONENTS ASSEMBLING AND SOLDERING	ECE	EE	0	0	2	1	NIL
4.	17ECEE02	TELEVISION SERVICING	ECE	EE	0	0	2	1	NIL
5.	17ECEE03	BASICS ON PLC	ECE	EE	0	0	2	1	NIL
6.	17ECEE04	PCB DESIGNING	ECE	EE	0	0	2	1	NIL
7.	17ECEE05	MOBILE SERVICING	ECE	EE	0	0	2	1	NIL
(ii) CO - CURRICULAR COURSES (CCC)									
1.	17APEE03	NCC	NCC CELL	EE	2 WEEKS OF TRAINING IN NCC CAMP			1	NIL
2.	17APEE04	NSS	NSS CELL	EE	2 WEEKS OF SOCIAL SERVICE IN NSS CAMP			1	NIL
3.	17APEE05	SPORTS AND GAMES (INTER –UNIVERSITY LEVEL)	PHYSICAL EDUCATION	EE	-			1	NIL
4.	17APEE06	SPORTS AND GAMES (INTRA-UNIVERSITY LEVEL)	PHYSICAL EDUCATION	EE	-			2	NIL
5.	17APEE07	SPORTS AND GAMES (STATE AND NATIONAL LEVELS)	PHYSICAL EDUCATION	EE	-			3	NIL
EXTRA CURRICULAR COURSES									
1.	17ECEE06	EXTRA CURRICULAR COURSE – I	ECE	EE	15 HOURS			1	NIL
2.	17ECEE07	EXTRA CURRICULAR COURSE – II	ECE	EE	15 HOURS			1	NIL
3.	17ECEE08	EXTRA CURRICULAR COURSE – III	ECE	EE	15 HOURS			1	NIL
4.	17ECEE09	EXTRA CURRICULAR COURSE – IV	ECE	EE	15 HOURS			1	NIL

17EGHS01	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 to become effective communicators
3	To ensure that learners use Electronic media materials for developing language
4	To aid the students with employability skills.
5	To motivate students continuously to use English language
6	To develop the students communication skills in formal and informal situations

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

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

ARTICLES

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

TENSE FORM

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.

IMPERSONAL PASSIVE VOICE

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.

SENTENCE PATTERN

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

TEXT BOOK:

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

REFERENCE BOOKS:

1. 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	Designation	Department	Mail ID
1	Dr.P.Saradha	Associate Professor	English	saradhap@vmkvec.edu.in
2	Mr.S.K.Prem Kishor	Assistant Professor	English	prem.english@avit.ac.in

17EGHS02	BUSINESS ENGLISH	Category	L	T	P	Credit
		FC(HS)	3	0	0	3

PREAMBLE

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

PREREQUISITE: Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

STRESS

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

READING SKILL

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

CORPORATE COMMUNICATION

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

CRITICAL READING

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

COURSE DESIGNERS:

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

17EGHS81	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 communicate effectively through different activities
4	To understand and apply the telephone etiquette
5	Case study to understand the practical aspects of communication
6	To improve the oral skills of the students

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		S	M	S		L			S	S	M				S
CO2	M								M	S		M	S	M	S
CO3	M									S		M	S	S	S
CO4	M									M			M	S	S
CO5	M			S						M			M	S	S
CO6		M	M							M			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 a song and understanding- (fill in the blanks) Telephone Conversation

MODULE II

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

MODULE III

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

MODULE IV

Telephone Etiquette, Dining Etiquette, Meeting Etiquette.

MODULE V

Case study of Etiquette in different scenario.

COURSE DESIGNERS:

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

17YMHS82	YOGA & MEDITATION	Category	L	T	P	Credit
		FC(HS)	0	0	4	2

PREAMBLE

Yoga is a physical, mental and spiritual practice or discipline which originated in ancient India and is followed in all over the world. Yoga is a discipline to improve or develop one's inherent power in a balanced manner. The University has been celebrating International Yoga day every year on 21st June. The University has developed Yoga to provide physical, mental and spiritual practices to the employees, students of the university.

PREREQUISITE - NIL

COURSE OBJECTIVES

1	To understand the fundamental concepts of yogic practices
2	To study the selected yogic practices and its impact on selected systems in the human body.
3	Learned the Principles of Practicing Asana, Pranayama and Meditation.

COURSE OUTCOMES

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

CO1. Understanding the purpose of learning of yogic practices.

CO2. Knowledge of the interconnections between the body, the breath, the mind and the emotions in the context of maintaining resilience and well-being

CO3. Understanding the principles of practicing asana, pranayama and meditation

CO4. Knowledge of health and disease relevant to the practice of the yoga therapy.

CO5. Creating awareness about international yoga day.

SYLLABUS

1. Starting Prayer.
2. Surya Namaskar.
3. Asanas-Padmasana,Vajrasana, Tadasana, Ardhakati chakrasana ,Uthana Padasana, Ustrasana,Makarasana,Paschimottanasana, Halasana, Savasana
4. Pranayama-Nadishuddhi,Kapalabhati,Sitkari, Sitali
5. Meditation-Deep Relaxation.
6. Mudra-Chin Mudra,Chinmaya Mudra.
7. Closing Prayer.

TEXTBOOKS

1. Iyengar B.K.S (2001), Yoga the path to holistic health, Dorling: Kindersley.
2. Mariayyah.P (2000) Suriyanamaskar, Perunthurai: Jaya Publishing House.

REFERENCE BOOKS

1. Saraswati, Niranjanananda (2010) Prana and pranayama. Mungaer.
2. Iyengar B.K.S (2003), The art of yoga, New Delhi. Harper Collins publishers.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail Id
1.	Dr.G.S.Thangapandiyan	Assistant Professor	Physical Education	yogistp@gmail.com
2.	Mr.N.Jayaraman	Assistant Professor	Physical Education	narayanajayaram82@gmail.com

17MBHS01	ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	Category	L	T	P	Credit
		FC(HS)	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.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	-	-	-	M	M	S	-	M	-	M	-	L	L
CO2	S	S	M	M	M	L	-	-	-	-	-	M	L	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: Create Management Team and Board of Directors – Evaluate market and Target Customers – Define your product or service –Write your Business Plan

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

COURSE DESIGNERS:

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

17MBHS02	FINANCE AND ACCOUNTING FOR ENGINEERS	Category	L	T	P	Credit
		FC(HS)	3	0	0	3

PREAMBLE: Engineers are in a position to do Decision Making during every activity in the industry. The activities ranging from Operation to Non-Operation during the routine functions of the organization. Especially, Finance and Accounting also becomes the part of responsibility of every engineer to do data analysis activities. His interpretation through data analysis and reporting in every transaction helps the organization to do decision making to run the organization effectively and efficiently. Finance and Accounting Practices enable the engineers to handle the resources to do cost and Financial decisions with optimum resources for the betterment of the organization.

PREREQUISITE: NIL

COURSE OBJECTIVES:

1. To understand the concepts and conventions to prepare Income Statement, and Balance Sheet.
2. To apply the various methods to claim depreciation and
3. To practice fundamental investment decision through capital budgeting techniques.
4. To analyse cost-volume profit analysis for decision making and analyse standard costing techniques.
5. To estimate the working capital requirements for day-to-day activities and handling inventories with economic ordering quantities.

COURSE OUTCOMES:

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

CO1.Understand the importance of recording, book keeping and reporting of the business transaction.	Understand
CO2. Identify and Apply suitable method for charging depreciation on fixed assets.	Apply
CO3. Analyse the various methods of capital budgeting techniques for investment decision.	Apply
CO4.Justify the scope of cost-volume-profit analysis, standard costing, and marginal costing techniques for decision making.	Analyse
CO5. Estimation of working capital requirements of the organization.	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	S	M	-	S	-	M	M	L	M	L	M
CO2	L	-	-	L	M	-	L	L	-	-	L	M	L	L	-
CO3	-	M	-	M	L	-	-	L	S	M	-	L	-	L	M
CO4	L	L	-	S	-	-	L	-	-	L	M	L	M	L	M
CO5	L	-	L	S	L	-	-	M	M	L	-	L	M	M	-

S- Strong; M-Medium; L-Low

SYLLABUS:

Introduction: Business Environment – Forms of business – Book Keeping and Accounting – Accounting Concepts and Conventions – Journal – Subsidiary books - Ledger – Trial Balance – Final Accounts

Deprecation: Meaning – Causes - Methods of Calculating Depreciation: Straight Line Method, Diminishing Balance Method and Annuity Method.

Capital Budgeting Decisions: Meaning – Nature & Importance of Investment Decisions – Types - Evaluation Techniques – Non-Discounting Cash Flow Techniques: Pay Back Period – Accounting Rate of Return – Discounting Cash Flow Techniques: NPV – IRR - Profitability Index.

Costing Accounting: Concepts - Elements of Cost - Preparation of Cost Sheet - Types of Costs – Marginal Cost - Breakeven Analysis - Cost Volume Profit Relationship - Applications of Standard and marginal Costing Techniques.

Working Capital Management: – Types of Working Capital – Operating Cycle – Determinants of Working Capital - Receivables Management –ACP, Aging schedule –Inventory Management – Need for holding inventories – Objectives – Inventory Management Techniques: EOQ & Reorder point – ABC Analysis - Cash Management – Motives for holding cash.

Text Book

1. Kesavan, C. Elenchezhian, and T. Sunder Selwyan, "Engineering Economics and Financial Accounting", Firewall Media, 2005.
2. Kasi Reddy .M and Saraswathi .S, "Managerial Economics and Financial Accounting", PHI Learning Pvt., Ltd. 2007.

Reference Book

1. Periyasamy .P, "A Textbook of Financial, Cost and Management Accounting", Himalaya Publishing House, 2010.
2. Palanivelu V.R., "Accounting for Managers", Lakshmi Publications, 2005.
1. Mark S Bettner, Susan Haka, Jan Williams, Joseph V Carcello, "Financial and Management Accounting", Mc-Graw-Hill Education, 2017

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	M.Manickam	Associate Professor	Management Studies	manickam@vmkec.edu.in
2	Dr. Rajeshkumar	Assistant Professor	Management Studies	Rajesh.mba@avit.ac.in

17CHBS01	ENVIRONMENTAL SCIENCE & ENGINEERING	Category	L	T	P	C
		FC(BS)	3	0	0	3

Preamble

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

Prerequisite

NIL

Course Objectives

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

Course Outcomes:

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

CO3.	S	-	-	-	-	M	S	M	L	-	-	S	M	-	S
CO4.	S	-	-	-	-	M	S	S	M	M	-	S	-	M	S
CO5.	S	-	-	-	-	M	S	S	M	M	-	S	-	M	S
CO6.	S	-	-	-	-	M	S	S	M	M	-	S	M	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

ENVIRONMENT AND NATURAL RESOURCES

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

ECOSYSTEMS AND BIO – DIVERSITY

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

ENVIRONMENTAL POLLUTION

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

SOCIAL ISSUES AND ENVIRONMENT

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

HUMAN POPULATION AND ENVIRONMENT

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

TEXTBOOK

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

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

Course Designers:

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

17MABS01	ENGINEERING MATHEMATICS	Category	L	T	P	Credit
		FC(BS)	2	2	0	3

PREAMBLE

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

PREREQUISITE --NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

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

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

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

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

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS

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

17MABS06	DIFFERENTIAL EQUATIONS AND TRANSFORMS	Category	L	T	P	Credit
		FC(BS)	2	2	0	3

PREAMBLE

Ordinary Differential Equation is used in contrast with the term partial differential equation which may be with respect to more than one independent variable. 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 with the help of Transformations. Transform techniques are very important tool in the analysis of signals.

PREREQUISITE

17MABS01 - Engineering Mathematics

COURSE OBJECTIVES

1	To learn ordinary differential equations with constant and variable coefficients
2	To learn Laplace transform and its Inverse method to solve differential Equations and integral transforms
3	To derive a Fourier series of a given periodic function by evaluating Fourier coefficients
4	To calculate the Fourier transform of periodic functions
5	To learn about Z- transforms and its applications

COURSE OUTCOMES

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

CO1. Solve differential equations with constant and variable coefficients and Simultaneous first order linear equations with constant coefficients	Apply
CO2. Use the Laplace Transform technique to solve ordinary differential equations.	Apply
CO3. To apply Fourier series methods to solve boundary value problems for linear ODEs.	Apply
CO4. To use the Fourier transform as the tool to connect the time domain and frequency domain in signal processing.	Apply
CO5. To gain the knowledge in Z Transform to the Analysis of Digital Filters and Discrete Signal.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

ORDINARY DIFFERENTIAL EQUATIONS: Solutions of second and third order linear ordinary differential equation with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

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.

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.

TEXT BOOKS:

1. Engineering mathematics I & II ", by Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2017).
2. Dr.A.Singaravelu, "Engineering Mathematics I & II", 23rd Edition, Meenakshi Agency, Chennai (2016).
3. Dr.A.Singaravelu, "Transforms and Partial differential Equations", 18th Edition, Meenakshi Agency, Chennai (2013).

REFERENCES:

1. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2012).
2. Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore (2012).
3. Veerarajan, T., "Engineering Mathematics I,II and III", Tata McGraw Hill Publishing Co., New Delhi (2011).

COURSE DESIGNERS

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

17MABS10	PARTIAL DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	Category	L	T	P	Credit
		FC(BS)	2	2	0	3

PREAMBLE

Partial differential equations are applied in many Engineering field like Electromagnetic field, Electronics circuit and fiber optics. It can be solved by various mathematical techniques. The general theory of mathematical systems involving addition and scalar multiplication has the applications to many areas of communication systems. Linear Algebra is used in analog and digital communication system.

PREREQUISITE

17MABS06 - Differential Equations and Transforms

COURSE OBJECTIVES

1	To be familiar with applications of partial differential equations
2	To formulate and solve partial differential equations.
3	To understand the concepts of vector space, linear transformations and diagonalization
4	To apply the concept of inner product spaces in orthogonalization.
5	To compute the linear transformations and find matrices of general linear transformations.

COURSE OUTCOMES

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

CO1. Understand the basic concepts of linear, non-linear partial differential equations related to Engineering Field	Understand
CO2. Solve partial differential equations arising in engineering problems like wave equations and heat flow equation by Fourier series.	Apply
CO3. Use computational techniques and algebraic skills to compute the dimension of row space and column space for the given vector space.	Apply
CO4. Apply the concept of inner product space in various linear system related problems.	Apply
CO5. Form orthogonal basis and use them to solve engineering 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	M	--	M	M	--	--	--	--	--	--	M	S	M	--
CO2	S	S	--	M	M	--	--	--	--	--	--	M	S	M	--
CO3	S	S	--	M	M	--	--	--	--	--	--	M	S	M	M
CO4	S	S	--	M	M	--	--	--	--	--	--	M	S	M	M
CO5	S	S	--	M	M	--	--	--	--	--	--	M	S	M	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.

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

VECTOR SPACE AND SUBSPACE: Introduction to vector space and subspace, Linear independent and dependent, spanning set, Basis and dimension, Row space and column space.

INNER PRODUCT SPACES: Inner products, inner product spaces- Cauchy-Schwarz inequality, Linear functional and adjoints, unitary operations and normal operators- spectral theorem.

ORTHOGONALITY AND LINEAR TRANSFORMATION: Introduction to orthogonality, Least square approximation, Orthogonal basis and Gram Schmidt orthogonalisation, Linear transformation and its matrix representation.

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.
3. M.Artin, "Algebra", Prentice Hall of India Pvt. Ltd., New Delhi, 2005.

REFERENCES:

1. A.Singaravelu, "Transforms and Partial Differential Equations", Meenakshi Agencies, Chennai, 2015.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons, (Asia) Pvt. Ltd., Singapore, 2000.
3. Dr.Gunadhar Paria, "Linear Algebra", New Central Book Agency (P) Ltd, 2009.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.V.T.Lakshmi	Asso.Prof	Mathematics	lakshmi@vmkvec.edu.in
2	Ms.S.Sarala	Asst.Prof. grade II	Mathematics	sarala@avit.ac.in

17MABS17	NUMERICAL METHODS, RANDOM PROCESSES & OPTIMIZATION	Category	L	T	P	Credit
		FC(BS)	2	2	0	3

PREAMBLE

Numerical analysis naturally finds applications in all fields of engineering and the physical sciences. The course will develop numerical methods aided by technology to solve differential equations and numerical linear algebra is important for data analysis. The purpose of the course is, to provide the students with the theoretical framework fundamental to the processing of signals with random variation. Starting from basic probability, the course proceeds to a thorough study of models for stochastic processes which are relevant in processing of random signals. The optimization is the process of maximizing of a desired quantity or the minimizing of an undesired one. Further the course will develop problem solving skills.

PREREQUISITE

1. 17MABS01 - Engineering Mathematics   2.17MABS06 - Differential Equations & Transforms

COURSE OBJECTIVES

1	To familiar with interpolation concepts.
2	To find numerical solutions of Ordinary differential equations.
3	To be thorough with probability concepts and Random Variables.
4	To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems etc in communication engineering.
5	To acquire skill on optimization techniques.

COURSE OUTCOMES

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

CO1. Apply various numerical methods to find intermediate numerical value & Polynomial of Numerical Data.	Apply
CO2. Solve the Initial value problems in ordinary differential equations using single step and multistep methods.	Apply
CO3. Calculate the probabilities associated with the distributions of random variables.	Apply
CO4. Illustrate the fundamentals of probability theory and random processes to practical engineering problems, and identify and interpret the key parameters that underlie the random nature of the problems.	Analyze
CO5. Focus optimization methods to realistic engineering problems, including developing a model, defining an optimization problem, applying optimization methods, exploring the solution, and interpreting results.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

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).

INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS: 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.

RANDOM VARIABLES: Discrete and continuous random variables- Probability mass function – Probability density functions - moments, Moment generating functions and their properties.

RANDOM PROCESSES: Classification, Stationary and Markov process, Binominal process, Poisson process, Sine-wave process, Ergodic processes.

OPTIMIZATION :LPP – Concave & convex steps, Global and Local optimization, Formation of LPP – Standard form of LPP, Graphical solution of LPP – Simplex method – Transportation and Assignment problems.

TEXT BOOKS:

1. Jain M.K., Iyengar S.R.K and Jain R.K., "Numerical Methods for Engineering and Scientific Computation (Fourth Edition)", New Age International (P) Ltd., New Delhi, 2010.
2. Ross S.M., "Stochastic Processes", John Wiley & Sons, 3rd Edition, 2010.
3. Sharma.J.K, "Operations Research: Theory and Applications", Macmillan India Ltd., Fourth Edition, 2009.

REFERENCES:

1. Gerald C.F., Wheatley P.O., "Applied Numerical Analysis" (Fifth Edition), Addison – Wesley, Singapore, 1998.
2. P.Kandasamy, K.Thilagavathy, K.Gunavathy "Probability, Random Variables and Random Processes": S.Chand & Company Ltd., New Delhi. (First Edition 2003).
3. Hamdy A. Taha, "Operations Research – An Introduction", Macmillan Co., Seventh Edition, 2000.

COURSE DESIGNERS

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

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

PREAMBLE

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

PREREQUISITE : NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	S		M									M			
CO2	S		L									M			
CO3	S			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

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

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.

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

TEXT BOOK

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

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

3. Dr.M. N. Avadhanulu, Engineering Physics, S.Chand & Co, 2010.

REFERENCE BOOKS

1. Beiser, Arthur, Concepts of Modern Physics, 5th Ed., McGraw-Hill, 2009.

2. Halliday.D, Resnick.R, Walker.J, Fundamentals of Physics, Wiley & sons, 2013.

3. Gaur R. K. and Gupta S. L., Engineering Physics, DhanpatRai publishers, New Delhi, 2001.

4. Avadhanulu.M.N., Arun Murthy.T.V.S, Engineering Physics Vol. I, S.Chand, 2014.

5. Rajendran. V, Engineering Physics, Tata McGraw Hill Publication and Co., New Delhi, 2009.

6. Baldev Raj et al. Practical Non-Destructive Testing, Narosa Publications, 2017.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. C. SENTHIL KUMAR	PROFESSOR	PHYSICS	senthilkumarc@vmkvec.edu.in
2	Dr. R. SETHUPATHI	ASSOCIATE PROFESSSOR	PHYSICS	sethupathi@vmkvec.edu.in
3	Dr. G. SURESH	ASSOCIATE PROFESSSOR	PHYSICS	suresh.physics@avit.ac.in
4	Dr. B.DHANALAKSHMI	ASSOCIATE PROFESSSOR	PHYSICS	dhanalakshmi.phy@avit.ac.in

17PCBS02	PHYSICAL SCIENCES PART B -ENGINEERING CHEMISTRY	Category	L	T	P	C
		FC(BS)	2	0	0	2

Preamble

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

Prerequisite

NIL

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

TEXT BOOKS

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

REFERENCE BOOKS

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

COURSE DESIGNERS:

S. No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. V. Anbazhagan	Professor	Chemistry	anbazagan@vmkvec.edu.in
2.	Mr. A. Gilbert Sunderraj	Assistant Professor	Chemistry	gilbertsunderraj@vmkvec.edu.in
3.	Dr. R. Nagalakshmi	Professor	Chemistry	nagalakshmi.chemistry@avit.ac.in
4.	Dr.K.Sanghamitra	Associate Professor	Chemistry	sanghamitra.chemistry@avit.ac.in

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

PREAMBLE

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

PREREQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

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

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

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

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

TEXT BOOK:

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

REFERENCES:

1. Pillai S.O., Solid State Physics, New Age International (P) Ltd., publishers, 2018.

2. Senthilkumar G. Engineering Physics II. VRB Publishers, 2018.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. S. MOHAMMED HARSHULKHAN	Asst.Prof	Physics	harshulkhan@vmkvec.edu.in
2	Mr. R. SAKTHI GANAPATHY	Asst.Prof	Physics	sakthiganapthy@vmkvec.edu.in
3	Dr .G. LATHA	Professor	Physics	latha.physics@avit.ac.in
4	Dr. R. N. VISWANATH	Professor	Physics	viswanath.physics@avit.ac.in

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

PREAMBLE

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

PREREQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	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 Missions 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
3	Dr. G. SURESH	ASSOCIATE PROFESSSOR	PHYSICS	suresh.physics@avit.ac.in
4	Dr. B.DHANALAKSHMI	ASSOCIATE PROFESSSOR	PHYSICS	dhanalakshmi.phy@avit.ac.in

17PCBS81	PHYSICAL SCIENCES PART B - ENGINEERING CHEMISTRY LAB	Category	L	T	P	C
		FC(BS)	0	0	2	1

Preamble

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

Prerequisite

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

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

TEXT BOOKS

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

REFERENCE BOOKS

1. Laboratory Manual on Engineering Chemistry, K. Bhasin S, Dhanpat Rai Publishing Co Pvt Ltd

COURSE DESIGNERS:

S. No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. V. Anbazhagan	Professor	Chemistry	anbazagan@vmkvec.edu.in
2.	Mr. A. Gilbert Sunderraj	Assistant Professor	Chemistry	gilbertsunderraj@vmkvec.edu.in
3.	Dr. R. Nagalakshmi	Professor	Chemistry	nagalakshmi.chemistry@avit.ac.in
4.	Dr.K.Sanghamitra	Associate Professor	Chemistry	sanghamitra.chemistry@avit.ac.in

17CMES02	BASIC CIVIL ENGINEERING

Category	L	T	P	Credit
CC	2	0	0	2

Preamble

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

Prerequisite

Nil

Course Objectives

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

Course Outcomes

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

CO1. Describe the scientific terms related to surveying and construction materials.	Apply
Co2. Familiarize with the different components of building and forces acting on them.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT - I	SURVEYING AND CIVIL ENGINEERING MATERIALS	15 - hours
Surveying: Objects – types – classification – principles – measurements of distances – angles – levelling – determination of areas – illustrative examples. **Civil Engineering Materials:** Bricks – stones – sand – cement – concrete – steel sections.		
UNIT - II	**BUILDING COMPONENTS AND STRUCTURES**	**15 - hours**
Foundations: Types, Bearing capacity – Requirement of good foundations. **Superstructure:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.		

Text Books

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

Reference Books

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

Course Designers:

S.No.	Name of the Faculty	E-Mail ID
1.	S.SUPRIYA	jansupriyanair@gmail.com
2.	C.VAIDEVI	Vaidevi.c@avit.ac.in

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

Preamble

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

Prerequisite –NIL

Course Objective

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

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

FOUNDRY AND WELDING

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

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

AUTOMOTIVE ENGINES AND COMPONENTS

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

Text Books

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

Reference Books

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

Course Designers

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

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

PREAMBLE

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

PREREQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

HISTORY OF ELECTRICITY, QUANTITIES AND CIRCUITS

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

MEASURING INSTRUMENT AND ENERGY CALCULATION

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

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

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.

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

TEXT BOOKS:

1. Metha.V.K, 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.
4. P. Selvam, R. Devarajan, A.Nagappan, T. Muthumanickam and T. Sheela"Basic Electrical and Electronics Engineering", First Edition, VMRFDU, Anuradha Agencies, 2017

REFERENCE BOOKS:

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

COURSE DESIGNERS

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

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

PREAMBLE

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

PRERQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

SEMICONDUCTOR DEVICES

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

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

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

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS

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

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

Preamble

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

Prerequisite – NIL

Course Objective

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

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

PLANE CURVES AND FREE HAND SKETCHING

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

PROJECTION OF POINTS, LINES

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

PROJECTION OF SOLIDS

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

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

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

ISOMETRIC VIEW AND PERSPECTIVE PROJECTION

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

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

PREAMBLE

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

PRERQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

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

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

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

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

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS

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

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

PREAMBLE

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

PRERQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT-1 INTRODUCTION

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

UNIT-2 DATA STRUCTURES

Strings-Lists-Tuples-Dictionaries-Sets

UNIT-3 CONTROL STATEMENTS

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

UNIT-4 FUNCTIONS

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

UNIT-5 EXCEPTION HANDLING

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

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS

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

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

PREAMBLE

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

PRERQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	--	S	--	--	--	--	--	--	L	L	M	L
CO2	S	M	S	S	--	--	--	--	M	--	--	M	L	M	L
CO3	L	S	L	--	S	--	--	--	--	L	--	L	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. Measurement of resistance to earth of an electrical equipment.

REFERENCES

1. Laboratory Reference Manual.

COURSE DESIGNERS

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

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

PREAMBLE

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

PRERQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

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

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

COURSE DESIGNERS

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

17CMES81	**ENGINEERING SKILLS PRACTICE LAB** **PART A - BASIC CIVIL ENGINEERING**	

Category	L	T	P	Credit
CC	**0**	**0**	**2**	**1**

Preamble

Engineering Skills Practice is a hands-on training practice to Mechanical, Civil and Mechatronics Engineering students. It deals with fitting, carpentry, sheet metal and related exercises. Also, it will induce the habit of selecting right tools, planning the job and its execution

Prerequisite

Nil

Course Objectives

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

Course Outcomes

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

CO1. Prepare the different types of fitting.	Apply
Co2. Prepare the different types of joints using wooden material	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS:
<u>Buildings:</u> 1. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects. **<u>Plumbing Works:</u>** 2. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings. 3. Study of pipe connections requirements for pumps and turbines. 4. Preparation of plumbing line sketches for water supply and sewage works. 5. Hands-on-exercise: Mixed pipe material connection – Pipe connections with different joining components. 6. Demonstration of plumbing requirements of high-rise buildings. **<u>Carpentry using Power Tools only:</u>** 7. Study of the joints in roofs, doors, windows and furniture. 8. Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

Text Books

1.“ Laboratory Reference Manual

Course Designers:

S.No.	Name of the Faculty	E-Mail ID
1.	S.Supriya	jansupriyanair@gmail.com
2.	C.Vaidevi	Vaidevi.c@avit.ac.in

17CMES81	ENGINEERING SKILLS PRACTICE LAB B. BASIC MECHANICAL ENGINEERING	Category	L	T	P	Credit
		FC(ES)	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 utilize the different type of joints using wooden materials.
3	To perform and acquire in depth knowledge in metal joining processes.
4	To demonstrate the pattern using foundry processes.

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

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

Text Books

1	**BASIC MECHANICAL ENGINEERING, LAB MANUAL**

Reference Books

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

Course Designers

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

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

PREAMBLE

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

PRERQUISITE

NIL

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1	S	M	L	-	-	-	-	-	-	-	-	-	-	-	-
CO2	S	M	L	-	-	-	-	-	-	-	-	-	M	-	M
CO3	S	M	M	-	-	-	-	-	-	-	-	-	M	-	M
CO4	S	M	M	-	-	-	-	-	-	-	-	-	M	-	M
CO5	S	M	M	-	-	-	-	-	-	--	-	-	-	M	-

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

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

REFERENCES:

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

COURSE DESIGNERS

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

17ECCC01	SEMICONDUCTOR DEVICES	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The course is designed to teach the physical principles and operational characteristics of semiconductor devices with emphasis on metal-oxide systems, bipolar, high-electron mobility, and field-effect transistors. Topics also include SCR, TFET, HEMT, Silicon Nano Wire tubes. The course provides advanced background in solid state electronic devices and is intended to help students to develop their basic analytical skills and continue advanced research in the varied branches of semiconductor devices.

PRERQUISITE NIL

COURSE OBJECTIVES

1	To emphasis the physics of semiconductors and the working of semiconductor devices like PN and Zener diodes with their applications.
2	To impart knowledge on working principle, configuration, operational characteristics and limitation of BJTs.
3	To understand the construction and Characteristics of JFETs and MOSFETs.
4	To study the working principle and applications of discrete and integrated voltage regulators
5	To familiarize with several special semiconductor devices like SCR, MISFET, TFET, HEMT and Silicon Nano Wire tubes.

COURSE OUTCOMES

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

CO1. Explain the electron transport properties and operation of semiconductor devices like Diode and their relevant applications like HWR, FWR, Clipper and Clamper, etc.,	Understand
CO2. Quantify the specification and characteristics of BJT in different configuration.	Apply
CO3. Demonstrate RMS and ripple factor values of RC filters in simple power supply and voltage regulators circuits	Apply
CO4. Relate the construction and characteristics of JFET and its families.	Apply
CO5. Examine the characteristics and applications of special devices like Shockley Diode, Unijunction Transistor, Phototransistors, MISFETs, MESFETs, etc.,	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	-	-
CO2	M	M	M	-	-	-	-	-	M	-	-	M	M	M	-
CO3	M	M	M	-	-	-	M	-	M	-	-	M	M	-	-
CO4	S	M	M	M	-	-	M	-	M	-	-	M	S	M	-
CO5	S	M	-	M	-	-	-	-	M	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

SEMICONDUCTOR DIODES AND APPLICATIONS

Introduction, Semiconductor Materials - Ge, Si, and GaAs, Covalent Bonding and Intrinsic Materials, Energy Levels, n-Type and p-Type Materials, Semiconductor Diode, Resistance Levels, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Reverse Recovery Time, Diode Specification Sheets, Semiconductor Diode Notation, Diode Testing, Zener Diodes, Light-Emitting Diodes, Sinusoidal Inputs; Half-Wave Rectifier, Full-Wave Rectifier, Clipper, Clamper, Zener Diode, Voltage-Multiplier Circuits, Practical Applications

BIPOLAR JUNCTION TRANSISTORS

Introduction, Transistor Construction, Transistor Operation, Common-Base Configuration, Common-Emitter Configuration, Common-Collector Configuration, Limits of Operation, Transistor Specification Sheet, Transistor Testing, Transistor Casing and Terminal Identification.

FIELD EFFECT TRANSISTORS

Introduction, Construction and Characteristics of JFETs, Transfer Characteristics, Important Relationships, Depletion-Type MOSFET, Enhancement-Type MOSFET, MOSFET Handling.

VOLTAGE REGULATORS

Introduction, General Filter Considerations, Capacitor Filter, RC Filter, Discrete Transistor Voltage Regulation, IC Voltage Regulators.

SPECIAL PURPOSE DEVICES

Introduction, Silicon-Controlled Rectifier, Basic Silicon-Controlled Rectifier Operation, SCR Characteristics and Applications, Shockley Diode, Diac, Triac, Unijunction Transistor, Phototransistors, MISFETs, MESFETs, TFETs, HEMTs, Silicon Nano Wire Transistor.

TEXT BOOK:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 11th Edition, 2013.

REFERENCE BOOKS:

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill, 2010.
2. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford Press, 2009.
3. B L Theraja, R S Sedha, "Principles of Electronic Devices and Circuits", S.Chand, 2004.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1.	Dr.P.Selvam	Professor	ECE	hodeee@vmkvec.edu.in
2.	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
3.	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
4.	Mr. R. Karthikeyan	Assistant Professor	ECE	rrmdkarthikeyan@avit.ac.in

17ECCC02	ANALOG CIRCUITS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Analog circuits enables the students to have an insight knowledge on fundamentals of various electronic circuits. The designed course makes the students to work on the various applications of the electronic devices. This subject helps the students to design, model and develop rectifier circuits, amplifier circuits, oscillator circuits and many other real time application circuits

PREREQUISITE

17ECCC01 - Semiconductor Devices

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 and tuned amplifiers.
5	To learn about various compound configurations of multivibrators.

COURSE OUTCOMES

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

CO1. Illustrate the small signal models of BJT/FET amplifiers.	Apply
CO2. Design an amplifier for a given frequency response.	Apply
CO3. Construct different oscillators, multivibrators & compound configurations and feedback amplifier circuits.	Apply
CO4. Design oscillator circuits by using simulation tools.	Apply
CO5. Analyze various parameters of feedback amplifier (voltage series, voltage shunt, current series and current shunt) by using simulation tools.	Analyze
CO6. 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	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
C06	S	S	S	S	M	-	-	-	-	-	-	M	S	M	M
S- Strong; M-Medium; L-Low															

SYLLABUS

BIASING CIRCUITS AND SMALL SIGNAL MODELS

Biasing circuits: DC load line and bias point – BJT biasing circuits – FET biasing circuits. Small-signal models: AC load line, Two port devices and hybrid Model, Analysis of transistor amplifier circuits using hparameters, Hybrid-π CE transistor model.

BJT AND JFET FREQUENCY RESPONSE

BJT amplifiers: CE, CB and CC amplifiers, FET amplifiers: CS, CG and CD amplifiers –designing BJT & FET amplifier networks Frequency response: low frequency response of BJT with RL, Low frequency response of FET amplifiers – Miller effect capacitance – high frequency response of BJT and FET amplifiers, Multistage frequency effect.

FEEDBACK AMPLIFIERS AND OSCILLATOR CIRCUITS

Classification of Amplifiers, Feedback Concepts, Effect of Negative Feedbacks, Voltage Series Feedback , Current Series Feedback, Voltage Shunt Feedback and Current Shunt Feedback , Oscillator basics, Types of Oscillators-RC oscillator, LC Oscillator and Crystal Oscillator.

LARGE SIGNAL AMPLIFIERS AND TUNED AMPLIFIERS

Class A Large Signal amplifier, Second Order Distortion, Push –Pull Amplifier, Class B, Class AB amplifiers, Class C amplifiers, Tuned amplifiers– single tuned – double tuned – synchronously tuned amplifiers –Real Time Applications of amplifiers.

COMPOUND CONFIGURATIONS AND MULTIVIBRATORS

Introduction, Cascade Connection, Cascode Connection, Darlington Connection, Differential Amplifier Circuit, CMRR, Schmitt Trigger.

TEXT BOOKS:

1. Jacob Millman, Christos C Halkias, Satyabrata Jit,“Electron Devices and Circuits”, Tata McGraw Hill, 4TH Edition, 2015.

2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education, 11th Edition, 2013.

REFERENCE BOOKS:

1. Adel S Sedra,Kenneth C Smith,“Microelectronic Devices”,,Oxford University Press,7th Edition,2015.

2. David A Bell, “Fundamentals of Electronic Devices and Circuits”, Oxford University Press, 5th Edition,2008.

3. Jacob Millman, Christos C Halkias, Chetan D Parikh ,“Integrated Electronics”, Tata McGraw Hill, 2nd Edition, 2010.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.A.Nagappan	Professor	BME	principal@vmkvec.edu.in
2	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
3	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
4	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECCC03	PASSIVE NETWORK ANALYSIS & SYNTHESIS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

A network refers to any interconnected set of objects. An 'electrical network' is an interconnection of electrical elements (Active and Passive) such as resistors, inductors, capacitors, transformers, diodes, sources, controlled sources and switches. Passive networks have interconnection of elements which cannot generate energy but can dissipate or stored energy. All electrical and electronic devices can be represented by electric circuits. So formulation of equivalent circuit and the study of behavior of the devices such as filters and attenuators or networks is formulated by analyzing the equivalent circuit with network laws, theorem and graph theory.

PREREQUISITE:- NIL

COURSE OBJECTIVES

1	To understand basic circuit concepts.
2	To study networks and solution of DC and AC circuits.
3	To understand series and parallel resonance concepts and analysis of coupled circuits.
4	To introduce different methods of circuit analysis using Network theorems, duality and topology.
5	To understand transient analysis of RL, RC and RLC circuits with DC and sinusoidal excitations.

COURSE OUTCOMES

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

CO1. Explain the basic circuit analysis concepts	Understand
CO2. Apply the knowledge of basic circuital law and simplify the network using reduction techniques	Apply
CO3. Infer and analyze transient response, Steady state response, network functions	Analyze
CO4. Analyze circuits using ideal passive elements and controlled sources	Analyze
CO5. Synthesize one port and two port networks and 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	M	M	L	-	-	-	-	-	-	-	-	-	S	M	-
CO2	S	S	M	-	M	-	-	-	M	-	-	M	S	M	-
CO3	S	S	M	-	M	-	-	-	M	-	-	M	S	M	-
CO4	S	S	M	-	M	-	-	-	M	-	-	M	S	M	-
CO5	S	S	M	-	M	-	-	-	M	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

BASIC CIRCUIT ANALYSIS AND NETWORK TOPOLOGY

Ohm's Law – Kirchhoff's laws – Mesh current and node voltage method of analysis for D.C and A.C. circuits - Network terminology - Graph of a network - Incidence and reduced incidence matrices –Trees – Cutsets - Fundamental cutsets - Cutset matrix – Tie sets - Link currents and Tie set schedules -Twig voltages and Cutset schedules, Duality and dual networks.

NETWORK THEOREMS AND TRANSFORMATIONS

Network theorems - Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, and Maximum power transfer theorem ,application of Network theorems - Network reduction: voltage and current division, source transformation – star delta conversion.

RESONANCE AND COUPLED CIRCUITS

Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency -Variation in current through and voltage across L and C with frequency – Bandwidth - Q factor -Selectivity. Self inductance - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multiwinding coupled circuits - Series, Parallel connection of coupled inductors - Single tuned and double tuned coupled circuits.

TRANSIENT ANALYSIS

Natural response - Forced response - Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources - Complete response of RC, RL and RLC Circuits to sinusoidal excitation.

TWO PORT NETWORKS AND SYNTHESIS

Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) Parameters, Interconnection of two port networks, Symmetrical properties of T and TT networks.

Synthesis of One Port and two port Networks: Properties and synthesis of R-L, R-C, L-C Impedance and Admittance Functions. Filters and attenuators.

TEXT BOOKS:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", McGraw Hill Science Engineering, Eighth Edition, 11th Reprint 2016.
2. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.

REFERENCE BOOKS:

1. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Fifth Edition,McGraw Hill, 9th Reprint 2015.
2. A.Bruce Carlson," Circuits: Engineering Concepts and Analysis of Linear Electric Circuits", Cengage Learning, India Edition 2nd Indian Reprint 2009.
3. Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Dept	Mail ID
1	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.edu.in
2	Mr.R.Thirunavukkarasu	Assistant Professor	ECE	thirunavukkarasu@vmkvec.edu.in
3	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in

17ECCC04	SIGNALS AND SYSTEMS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Signals and Systems arise in a wide variety of fields. These concepts and techniques associated with in areas of science and technology. Signals are functions of one or more independent variables contain information about the behavior or nature of some phenomenon. Signals vary continuous / discrete in time. Systems respond to particular signals by producing other signals (output) having some desired behavior. It introduces the students to analyze signals and systems and to design systems to enhance or restore signals that have been degraded in some way.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand the various classifications of Continuous time and Discrete time Signals and Systems.
2	To learn about the spectral analysis of Periodic and Aperiodic Signals using Fourier series.
3	To impart the knowledge in analysis and characterization of the CT system through Laplace transforms.
4	To learn about the analysis and characterization of the DT system through Discrete Fourier Transforms and Z Transform.

COURSE OUTCOMES

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

CO1. Classify the type of signals and systems.	Understand
CO2. Determine the time and frequency domain characteristics of continuous time periodic and aperiodic signals with the properties of Fourier Series and Fourier transform respectively.	Apply
CO3. Find the response of a continuous time LTI System using convolution.	Apply
CO4. Determine the time and frequency domain characteristics of discrete time periodic and aperiodic signals using the properties of DTFT, DFT & Z-Transforms respectively.	Apply
CO5. Compute DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithms.	Apply
CO6. Apply and characterize the causality and stability of Discrete LTI system using Z-Transforms.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES															
COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	L	-	-	-	-	-	-	-	-	-	S	M	-
CO2	S	M	M	-	M	-	-	-	M	-	-	M	-	-	-
CO3	S	M	M	-	M	-	-	-	M	-	-	M	-	-	-
CO4	S	M	M	-	M	-	-	-	M	-	-	M	-	-	-
CO5	S	M	M	-	M	-	-	-	M	-	-	M	S	M	S
C06	S	S	M	-	M	-	-	-	M	-	-	M	S	M	M
S- Strong; M-Medium; L-Low															

SYLLABUS

CLASSIFICATION OF SIGNALS AND SYSTEMS

Continuous time signals, Discrete time signals, Unit step, Unit ramp, Unit impulse – Representation of signals in terms of unit impulse, Classification of continuous time signals & Discrete time signals-Continuous time systems-Discrete time systems- Classification of continuous time systems and Discrete time systems.

ANALYSIS OF CONTINUOUS TIME SIGNALS

Fourier series analysis-Representation of Continuous time Periodic signals – Trigonometric and exponential-Spectral Properties of Periodic power signals - Properties of Continuous time Fourier series – Parseval’s relation for power signals, Fourier transform analysis-Representation of Continuous time signals- Properties of Continuous time Fourier transform –Fourier transform of a Periodic function, Rayleigh’s Energy theorem.

LTI CONTINUOUS TIME SYSTEM

Convolution Integral, Impulse response, Solution of Differential equation with initial conditions- Zero state response and Zero input response, Block diagram representation, Fourier methods for analysis, Laplace transform analysis.

ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS

Representation of sequences – Discrete Time Fourier Transform (DTFT) - Discrete Fourier Transform (DFT) and its properties –Fast Fourier Transform- FFT Algorithm, DIF & DIT-Z Transform-Inverse Z Transform, Unilateral Z-Transform.

LTI DT SYSTEM

Convolution sum - Impulse response and properties of LTI systems - Difference equations - Z Transform analysis - System stability and causality - Frequency response - Block Diagram representation.

TEXT BOOKS:

1. Alan V.Oppenheim, Ronald W. Schafer, "Discrete time signal processing", Pearson education , 2nd edition, 2007.
2. John G. Proakis and Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson Education, 4thEdition, 2007.

REFERENCE BOOKS:

1. B.P. Lathi, "Linear Systems & Signals", Oxford Press, Second Edition, 2009.
2. Rodger E Ziemer, William H. Tranter, D. Ronald Fannin, "Signals and Systems – continuous and Discrete", Pearson Education, 4th Edition, 2009.
3. Douglas K Linder, "Introduction to Signals and Systems",Mc-Graw Hill, 1st Edition, 1999.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Muthumanickam	Professor & Head	ECE	muthumanickam@vmkvec.edu.in
2	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
3	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17CSCC33	PROBLEM SOLVING USING COMPUTER	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This 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.

PRERQUISITE

Nil

COURSE OBJECTIVES

1.	To understand the basic concepts of problem solving methodology.
2.	To study and apply algorithm design.
3.	To study and apply programming and developing skills.
4.	To understood, analyze and evaluate the problem.
5.	To apply, analyze, evaluate and solve the problem by using programming concepts.

COURSE OUTCOMES

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

CO1. Comprehend the role of computing and use of programming concepts in developing engineering solutions.	Understand
CO2. Develop algorithms to solve fundamental mathematical problems, merging, sorting and searching.	Apply
CO3. Develop algorithms for text processing and pattern searching	Analyze
CO4. Analyze a problem, identify the data in the problem, divide a problem into parts, solve individual parts using proper control structures and compose into an overall solution	Evaluate
CO5. Design algorithmic solutions to problems drawn from engineering contexts and implement using any structured programming language	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	-	-
CO2	M	M	M	M	-	-	-	-	-	-	-	-	M	-	-
CO3	M	M	S	M	-	-	-	-	-	-	-	-	M	-	-
CO4	S	M	M	M	-	-	-	-	-	-	-	-	M	-	M
CO5	S	M	M	M	-	-	-	-	-	-	-	-	M	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to problem solving with computers - Computing Systems:

Hardware and Software – Engineering Problem Solving Methodology: problem specification and analysis, algorithm design, flowchart, implementation, program testing and verification.

Algorithm Design: Fundamental algorithms:

Swapping of two variables – counting – summation of set of numbers – factorial – Fibonacci sequence – base conversion Factoring Techniques: smallest divisor of an integer – greatest common divisor – generating prime number – generating prime factor

Merging, Sorting and Searching Techniques:

Two way merge – sorting by selection sort – sorting by exchange – sorting by insertion – linear search – binary search Array techniques: Array order reversal – Statistical measurement - array counting - array Partitioning Text Processing and Pattern Searching: Key word search – text line editing –linear pattern search.

Programming Concepts:

Basics of programming -Constant, variable, keywords, data types - Operators, operator precedence, expressions - Control Structures: Selection structure- Repetition Structure.

Modular Programming and Functions:

User defined functions- Recursive functions Array Handling: 1-D, 2-D: declaration – initialization, Using arrays as function arguments- Strings Pointers: Basics of Pointers - Arrays and Pointers - Pointers and Functions - Structures and Union - File Handling.

TEXT BOOK:

1. R. G. Dromey, "How to solve it by Computer", Pearson Education India,2014

REFERENCES:

1. Maureen Sprankle, Jim Hubbard, "Problem Solving & Programming Concepts",
2. Prentice Hall, 2012
3. Jeri R. Hanly - Elliot B. Koffman, "Problem Solving and Program Design in C", 7th Edition, Pearson, 2013
4. Delores M. Etter, "Engineering Problem Solving with C", Pearson, 4th Edition, 2013.
5. Donald E. Knuth, "Art of Computer Programming", Pearson Education, 2012.
6. Yashavant Kanetkar, "Let us C", 8th Edition, BPB Publications, 2007.

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	Mail ID
1.	Mr. B. Sundharamurthy	Assistant Professor	CSE	sundharamurthy@vmkvec.edu.in
2.	Mr.K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in

17ECCC05	**DIGITAL LOGIC CIRCUITS & DESIGN**	**Category**	**L**	**T**	**P**	**Credit**
		CC	**3**	**0**	**0**	**3**

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

17EEES03 - Basics of Electrical and Electronics Engineering

COURSE OBJECTIVES

1	To understand the various number systems and their conversions.
2	To learn the Boolean expressions, Boolean postulates and Karnaugh map method to reduce the variables.
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 RTL for various logic circuits.

COURSE OUTCOMES

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

CO1. Explain the basic principles of digital system, Logic gates and Boolean laws.	Understand
CO2. Simplify Boolean expression using K-Map techniques.	Apply
CO3. Examine various Combinational circuits using logic gates.	Apply
CO4. Illustrate the operation of sequential circuits using Flip flops	Analyze
CO5.Analyze various digital circuits using HDL programming.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS O2	PSO3
CO1	S	M	L	-	-	-	-	-	-	-	-	L	S	-	-
CO2	S	M	M	L	L	-	-	-	-	-	-	L	S	M	-
CO3	S	S	M	M	M	-	-	-	-	-	-	L	S	M	M
CO4	S	S	M	M	M	-	-	-	-	-	-	L	S	M	M
CO5	S	S	M	M	M	-	-	-	-	-	L	L	S	M	M
S- Strong; M-Medium; L-Low															

SYLLABUS

Basics of digital system:

About Digital system, Analog versus Digital, Advantages of processing information in digital form, Number System-Binary,Octal,Decimal & Hexadecimal Number Systems & its Conversion, Complement Arithmetic, Signed Binary Numbers, Binary Codes, Binary Storage And Registers.

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 K-maps, Product of Sums (POS) & Sum of Products (SOP) simplification, don't care conditions, NAND & NOR implementations, Exclusive-OR Function, Hardware Description Language(HDL).

Combinational logic:

Introduction, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder, Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Code Converters, Encoders, Decoders, Multiplexers.

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.

Design At The Register Transfer Level:

Register Transfer Level Notation, Register Transfer Level In HDL, ASM, Sequential Binary Multiplier, Control Logic, HDL Description Of Binary Multiplier, Design With Multiplexers, Race Free Design, Latch Free Design.

TEXT BOOKS :

1. Morris Mano, "Digital Design (with an introduction to the verilog HDL)", Prentice-Hall of India.
2. John F. Wakerly, "Digital Design Principles & Practices", 4th edition, Prentice-Hall, 2005.

REFERENCE BOOKS:

1. Stephen D. Brown, and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design, 2nd Edition," McGraw Hill, June, 2007.
2. William Kleitz, "Digital Electronics: A Practical Approach with VHDL", Ninth Edition, Pearson, 2002.
3. Floyd T.L., "Digital Fundamentals ", Charles E. Merrill publishing Company, 1982.
4. Tokheim R.L., "Digital Electronics - Principles and Applications ", Tata McGraw Hill, 1999.
5. Jain R.P., "Modern Digital Electronics ", Tata McGraw Hill, 1999

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.B.Rajasekaran	Associate Professor	ECE	rajasekaran@vmkvec.edu.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
3	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECCC06	ELECTRONICS MEASUREMENT AND INSTRUMENTATION	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

To understand the Basic concepts of electronic measurements, Signal Generator and Analysers, Transducers, Data Acquisition Systems and Fiber Optic Measurements.

PRERQUISITE

NIL

COURSE OBJECTIVES

1	To familiarize with the basic concepts of measurement and the related instrumentation Systems.
2	To impart knowledge on Electronic measurements and calibration of instruments.
3	To learn the concepts in signal generators and signal analyzers in measurements.
4	To introduce various Data acquisition systems, Transducers, and fiber optic power measurements.

COURSE OUTCOMES

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

CO1. Identify errors in different types of electronic measurements.	Understand
CO2. Determine the unknown values of capacitance and inductance using AC bridges.	Apply
CO3. Explain concepts and circuit construction of various Analog & Digital voltage measurement methods.	Apply
CO4 Illustrate different signal generators and frequency synthesizer	Analyze
CO5. Analyze the various elements in data acquisition systems and fiber optic measurements.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

BASIC MEASUREMENT

Measurement and error – Units and standards of measurements – Permanent Magnet Moving Coil Mechanism – DC Ammeters, Voltmeters Multimeters, Ohmmeter, AC Indicating Instruments, Thermo instruments, Electrodynamometers, Watt-hour meter. Bridge measurements –Wheatstone, Kelvin, Maxwell, Hay, Schering, and Wien bridge.

BASIC ELECTRONIC MEASUREMENTS

Amplified DC Meter, AC Voltmeter using rectifiers, True RMS Responding Voltmeter, Electronic Multimeter, Consideration in Choosing an Analog Voltmeter, Digital Voltmeters-Ramp, Integrating, Successive approximation. Q meters – RF voltage and power measurements. Cathode ray oscilloscopes – block schematic – Special oscilloscopes–Storage Oscilloscope, Sampling Oscilloscope, Digital Storage Oscilloscopes

SIGNAL GENERATORS AND ANALYZERS

Function generators – RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer.

FREQUENCY COUNTERS AND TRANSDUCERS

Simple Frequency Counter, Measurement Errors, Extending the frequency range, Automatic and computing counters. Classification of Transducers, Selecting a Transducer, Strain gauges, Displacement Transducers, Temperature Transducers, and Photosensitive Devices.

DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS

Elements of digital data acquisition system – interfacing of transducers – multiplexing – IEEE 488 bus – fiber optic measurements-Sources and Detectors-Fiber Optic Power measuring- Light sources – Optical time domain reflectometer.

TEXT BOOKS:

1. Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2008

REFERENCES:

1.Joseph J.Carr, Elements of Electronics Instrumentation and Measurement, 2nd Edition Pearson education, 2009.

2. Alan. S. Morris, Principles of Measurements and Instrumentation, Prentice Hall of India, 2nd edn.,2003.

3. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill- 2004.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.P.Selvam	Professor	ECE	hodeee@vmkvec.edu.in
2	Mr.G.Murali	Assistant Professor	ECE	muralig@vmkvec.edu.in
3	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in
4	Mr. S. Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17EECC08	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

17EEES03 – Basic Electrical and Electronics Engineering

COURSE OBJECTIVES

1	Understand the feedback and feed-forward control; apply block diagram 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 closed and open loop 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	PO 10	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 – Open and closed loop systems – Mechanical Translational and 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, Minimum phase, Non minimum phase and all pass transfer functions, 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, Construction of root loci, Nyquist stability criterion. Lag, Lead and Lag-Lead networks, Compensator design using Bode plots & Root Locus.

STATE VARIABLE ANALYSIS, AND APPLICATION OF CONTROL SYSTEMS

Introduction to State variable analysis: Introduction, Concept of State, State variables & State model, State model for Linear Continuous & Discrete time systems. Synchros – AC servomotors- DC Servo motors -Stepper motors- Tacho generator.

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	N.P. GOPINATH	Assistant Professor GR-II	EEE / AVIT	gopinathnp@avit.ac.in
2	R. SATHISH	Assistant Professor	EEE/VMKVEC	sathish@vmkvec.edu.in

17ECCC07	MICROCONTROLLERS & ITS APPLICATIONS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Microcontroller is used as the main controller in most of the embedded systems nowadays. Due to the development in VLSI technology, microcontrollers evolve which function similar to microprocessors but they have most of the peripherals built on-chip. This course makes the students to be familiar with the architecture and programming of Microcontrollers. This course also introduces the architecture and hardware features of PIC 16F877 and ARM7 (LPC2148) microcontrollers.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To learn the concepts of microprocessors and knowledge of interfacing devices.
2	To study the Architecture of 8051 microcontroller
3	To develop skill in simple program writing of microcontroller
4	To study the interfacing and applications of microcontroller
5	To study the advanced microcontrollers.

COURSE OUTCOMES

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

CO1. Explain the concept of microprocessor and interfacing devices.	Understand
CO2. Explain the architecture and function of 8051 microcontroller	Apply
CO3. Design and implement programs on 8051 Microcontroller	Analyze
CO4. Design and implement applications using 8051 Microcontroller	Analyze
CO5. Illustrate various applications using advanced Microcontrollers.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTEL 8086 MICROPROCESSOR & I/O INTERFACING

Introduction to 8086 - Architecture of 8086 - Register organization – Signal Description of 8086 - Addressing modes – Data Transfer Instruction – Arithmetic Instruction - Branching Instruction - Program Transfer Instruction – simple programs- Programmable Peripheral Interface 8255 – Programmable Communication Interface 8251 USART – Programmable Interrupt Controller 8259A – Direct Memory Access Controller 8257- Programmable Interval Timer 8253 – Keyboard/Display Controller 8279.

INTEL 8051 MICROCONTROLLER

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

ASSEMBLY LANGUAGE PROGRAM OF INTEL 8051

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

INTERFACING AND APPLICATION OF INTEL 8051

LCD Interfacing - A/D and D/A Interfacing- Sensor Interfacing- Relays and Optoisolators- Stepper Motor Interfacing- DC Motor Interfacing.

ADVANCED MICROCONTROLLERS

PIC 16F877 microcontroller – Architecture On chip ADC, I^2C – SPI – Watchdog timer – ARM7 (LPC2148) microcontroller – Architecture and applications.

TEXTBOOKS:

1. Muhammad Ali Mazidi and Janica Gilli Mazidi, The 8051 microcontroller and embedded systems, Pearson Education, 5th Indian reprint, 2003.
2. Frank D. Petruzella. “Programmable Logic Controllers”, McGraw–Hill Book, Company, 1989

REFERENCE BOOKS:

1. B.P. Singh, Microprocessors and Microcontrollers, Galcotia Publications (P) Ltd, First edition, New Delhi, 1997.
2. Embedded Controller Hand book, Intel Corporation, USA.
3. Microcontroller Hand Book, INTEL, 1984.
4. Ajay V.Deshmukh, “Microcontrollers- Theory and applications”, Tata McGraw-Hill, publisher,2005.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.S.Selvam	Assistant Professor	ECE	selvam@avit.ac.in
2	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
3	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECCC08	ELECTROMAGNETICS AND TRANSMISSION LINES & WAVEGUIDES	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Electronics and communication engineers need to understand the fundamental principles and laws of electromagnetism to develop and implement better analog and digital electronic communication system that take into account the electromagnetic propagation and radiation effects. Students will learn scientific and mathematical knowledge on Theorem, Laws, Principle & Applications of Static Electric field, Static Magnetic field and Time varying Electromagnetic fields and phenomena of Electrical signal propagation along the transmission lines.

PREREQUISITE

17ECCC03 - Passive Network Analysis & Synthesis

COURSE OBJECTIVES

1	To recognize the "constitutive relationships" for fields and understand why they are required.
2	To acquire knowledge for estimating static electric and static magnetic fields using various laws and thermos.
3	To understand estimate Time Varying Fields using Faraday's Law and Ampere's Law
4	To understand the role of characteristics impedance and propagation constant on electrical signal during propagation along the line.
5	To acquire knowledge for the measurement of basic transmission line parameters, such as the reflection coefficient, standing wave ratio, and impedance

COURSE OUTCOMES

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

CO1: Formulate potential problems within electrostatics, and stationary current distributions in linear, isotropic media, and also solve such problems in simple geometries using separation of variables.	Understand
CO2. Deduce potential problems within magnetostatics, using Ampere's force law, Biot-savart law and Gauss law. Also solve such problems in simple geometries using separation of variables.	Apply
CO3 Define and derive expressions for the energy both for the electrostatic and magnetostatic fields, and derive Poyntings theorem from Maxwells equations and interpret the terms in the theorem physically	Apply
CO4. Derive and Apply the line equations in terms of characteristic impedance and propagation constant and to determine voltage and current at distance of transmission line with specific frequency	Apply
CO5. Apply the specific condition to validate the telephone cable fit for Audio frequency range only also apply the condition to design distortion less line using loading of transmission line	Apply
CO6. Analyze SWR, Reflection factor, Reflection loss and Zin in terms of reflection co- efficient in zero dissipation line.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	M	-	-	-	-	-	-	-	M	S	M	-
CO2	S	S	M	M	-	-	-	-	-	-	-	M	S	M	-
CO3	S	S	M	M	-	M	M	-	-	-	-	M	S	M	-
CO4	S	S	M	M	-	M	M	-	-	-	-	M	S	M	-
CO5	S	S	M	M	-	M	M	-	-	-	-	M	S	M	-
CO6	S	S	M	M	-	M	M	-	-	-	-	M	S	M	-
S- Strong; M-Medium; L-Low															

SYLLABUS

STATIC ELECTROMAGNETIC FIELDS

Introduction to co-ordinate system, Gradient, Divergence, Curl, Divergence Theorem, Stroke's Theorem, Coulomb's Law, Electric field Intensity, Principle of superposition, Electric Scalar potential, Line charge distribution by Moment method, Electric flux Density, Gauss's Law and its applications, Field Computations and Problems.

STATIC MAGNETIC FIELD

Magnetic field of a current carrying element, Ampere's Force law, The Biot-Savart Law, Magnetic Flux density, Gauss law for magnetic fields, Torque on a loop, Magnetic moment, Ampere's Law and Magnetic field intensity, Magneto motive force, Field cells and permeability, Vector potential, Field computation and problems.

TIME VARYING ELECTRIC & MAGNETIC FIELDS

Faraday's Law, Transformer and Motional Induction, Maxwell's equation from Faraday's Law, Self and Mutual inductance, Displacement current, Maxwell's equation from Ampere's Law and its in-consistency, Boundary relation, Poynting Vector, Comparison of field and circuit theory, Circuit Application of pointing Vector.

TRANSMISSION LINE THEORY

Introduction - Types of transmission lines – General theory of transmission line – Line constants – Transmission line equation – Physical significance of the equations – The Infinite line – Distortion in a line – Distortion-less line – Telephone cables – Loading of lines – Types of loading– General equation for line with any termination – Input impedance – Open and Short circuited line.

RADIO FREQUENCY TRANSMISSION LINES

Line approximations – Parameters of open wire line at radio frequency, parameters of coaxial lines at radio frequencies, constants for the line of zero dissipation – Voltages and Currents on the dissipation-less lines – input impedance of a lossless line – Wavelength and velocity of propagation – Reflection – Reflection coefficient, Reflection loss, Reflection factor, Standing wave ratio, Input impedance in terms of reflection coefficient .

TEXT BOOKS:

1. John D. Krauss, "Electromagnetics ", McGraw Hill, 1992.
2. David K. Chang, "Field and Wave Electromagnetics ", Second edition, Addison Wesley, New Delhi, 2004.
3. John D. Ryder, Network lines and fields, 2nd Edition, Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Hayt W.H., "Engineering Electromagnetics", McGraw Hill, 8th Edition, 2012
2. Seth S.P., Elements of Electromagnetic Fields, 2nd Edition, Dhanpat Rai& Sons, 2007.

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.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
3.	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.edu.in

17ECCC09	SIGNAL PROCESSING	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Signal processing is an area of science and engineering which has developed very rapidly over past few decades. It is method of extracting information from the signal which, in turn depends upon type of the signal and nature of information it carriers. Digital signal processing has a tremendous growth in today's techniques and is applied almost in every field because off numerous advantages. In fact digital circuits do not depend upon precise values of digital signal. Also digital circuits are less sensitive to changes in components values, and temperature. In a digital processor any accuracy can be achieved by changing number of bits assigned for the coefficient.

PREREQUISITE

17ECCC04 - Signals and Systems

COURSE OBJECTIVES

1	To learn the computation steps for the DFT and FFT algorithm.
2	To acquire knowledge in various design and implementation methods for IIR and FIR filters.
3	To learn and realization of FIR and IIR Systems.
4	To identify the coefficient effects in finite word length registers.
5	To recognize the sampling rate conversion with filter design
6	To study the TMS320C5X DSP processor architecture and their addressing modes.

COURSE OUTCOMES

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

CO1: Compute DFT, FFT algorithms by using radix 2 DIT and DIF methods.	Apply
CO2. Design IIR digital filters in analog domain for given specifications and transforming to digital domain using transformation techniques	Apply
CO3.Realize IIR structure in Direct Form - I, II, Cascade and Parallel Forms	Apply
CO4. Design FIR filter in digital domain using Fourier series, frequency sampling and windowing techniques	Apply
CO5. Illustrate the issues of finite word length effects.	Apply
CO6. Design a linear phase filter for implementing sampling rate conversion and describe the TMS320C5X DSP processor architecture and their addressing modes.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

DISCRETE FOURIER TRANSFORMS & FAST FOURIER TRANSFORMS :

Introduction to DFT, Efficient computation of DFT, properties of DFT - FFT using DIT and DIF algorithms, – Circular convolution.

DESIGN AND IMPLEMENTATION OF IIR FILTERS

Design of analog filters using Butterworth and Chebyshev approximations – IIR digital filter design from analog filter using impulse invariance technique and bilinear transformations-IIR Realizations.

DESIGN AND IMPLEMENTATION OF FIR FILTERS:

Linear phase response – Design techniques for FIR filters – Fourier series method and frequency sampling method –Design of Linear phase FIR filters using windows: Rectangular, Hanning and Hamming windows.

FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS:

Fixed point arithmetic – effect of quantization of the input data due to Finite word length. Product round off – need for scaling – Zero input limit cycle oscillations - Limit cycle oscillations due to overflow of adders

PROCESSOR FUNDAMENTALS & MULTIRATE DIGITAL SIGNAL PROCESSING:

Introduction – Memory architecture of Von Neumann, Harvard & VLIW – pipelining – TMS320C5x architecture - Addressing modes – Decimation by a factor D - Interpolation by a factor I - Filter design and Implementation of sampling - rate conversion, sampling- rate conversion of Band pass filters.

TEXT BOOKS:

1. John .G. Proakis and Dimitris C. Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education, Fourth edition, 2007.
2. B.Venkataramani, M.Bhaskar, “Digital Signal Processors, Architecture, Programming and Application”, Tata McGraw Hill, New Delhi, 2003.
3. Alan V.Oppenheim, Ronald W. Schafer, “Discrete time signal processing”, Prentice Hall, Third Edition, 2009.

REFERENCE BOOKS:

1. Sanjit Mitra, “Digital Signal Processing – A Computer based approach”, Tata McGraw Hill, New Delhi, 2011.
2. M.H.Hayes, “Digital Signal Processing”, Tata McGraw Hill, New Delhi, Edition, 2009.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Muthumanickam	Professor	ECE	muthumanickam@vmkvec.edu.in
2	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
3	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
4	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17ECCC10	LINEAR INTEGRATED CIRCUITS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Linear Integrated circuits enables the students to have an insight knowledge on fundamentals of various integrated circuits. The designed course makes the students to work on the various applications of the Integrated Circuits. This subject helps the students to design, model and develop amplifier circuits, comparators, regulators, filters, timer, D/A and A/D converters and PLL.

PREREQUISITE

17ECCC01 - Semiconductor Devices

COURSE OBJECTIVES

1	To Understand the basics of Integrated Circuits and its fabrication.
2	To get familiarized with operational amplifiers and its Characteristics.
3	To Construct various circuits using operational amplifier and analyze its performance.
4	To design and the working of waveform generators, regulators, filters and timers circuits.
5	To Understand the basic concepts of PLL.

COURSE OUTCOMES

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

CO1. Describe the Concepts of Fabrication of active and passive components	Understand
CO2. Interpret the Operational Amplifier with its characteristics.	Apply
CO3. Design and analyze the various applications of Operational Amplifier.	Analyze
CO4. Design and analyze wave generators and regulators.	Analyze
CO5. Designing and analyzing filters and Timer circuits.	Analyze
CO6. Analyze the various functional blocks of PLL.	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	-	-	-	-	-	-	-	-	M	S	-	-
CO2	S	M	M	M	M	-	-	-	-	-	-	M	S	-	-
CO3	S	S	M	M	M	-	-	-	-	-	-	M	S	-	M
CO4	S	S	M	M	M	-	-	-	-	-	-	M	S	-	-
CO5	S	S	M	M	M	-	-	-	-	-	-	M	S	M	-
CO6	S	S	M	M	M	-	-	-	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTEGRATED CIRCUIT FABRICATION AND CHARACTERISTICS

Integrated Circuit Technology –Basic Monolithic Integrated Circuits-Epitaxial Growth-Masking and Etching-Diffusion of Impurities-Transistors for monolithic circuits-Monolithic Diodes-Integrated Resistors-Integrated Capacitors and Inductors-Monolithic –Circuit Layout-Additional Isolation Methods-Large Scale and Medium Scale Integration.

OPERATIONAL AMPLIFIER

Basic operational Amplifier – Ideal Operational Amplifier - Operational Amplifier Internal Circuits – Examples of IC Op Amps – FET Operational Amplifiers – DC Characteristics – AC Characteristics – Analysis of Data Sheets of an Op Amp.

OPERATIONAL AMPLIFIER APPLICATIONS

Basic Op Amp Applications – Instrumentation Amplifiers – AC Amplifiers – V to I and I to V Converters – Op Amp Circuits Using Diodes – Sample and Hold Circuits – Log/Antilog Amplifiers – Adder/ Sub tractor – Multiplier and Divider – Differentiator and Integrator – Operational Transconductance Amplifier-Pspice Simulation Tools.

COMPARATORS, REGULATORS, FILTERS AND TIMERS

Comparators – Square, Triangular and Sawtooth wave Generators, Series Op Amp Regulators – IC Voltage Regulators – 723 General Purpose Regulators – RC Active Filters – Active Filters using OTA's, Timer – Description of Functional Diagram – Monostable and Astable Operation – Schmitt Trigger

PLL, D/A AND A/D CONVERTERS

PLL – Basic Principles – Phase Detectors/ Comparators – Voltage Controlled Oscillator – Low Pass Filter – Monolithic PLL – PLL Applications – Basic DAC Techniques – A–D Converters – DAC/ ADC Specifications.

TEXT BOOKS:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers, 5th Edition 2018.
2. Jacob Millman,Chirstos C.Halkias,"Integrated Electronics",Tata Mc-GRAW Hill, Edition,3rd Edition, 2010

REFERENCE BOOKS:

1. Robert F Coughlin, Fredrick F.Driscoll," Operational Amplifiers and Linerar Integrated Circuits", Phi Learning,6th Edition,2009.
2. Sergio Franco,"DesignwithOperational Amplifiers and Analog Integrated Circuits", Tata Mc-GRAW Hill ,4th Edition, 2016.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
2	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
3	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECCC11	DATA COMMUNICATION NETWORKS	Category	L	T	P	Credits
		CC	3	0	0	3

PREAMBLE

To introduce the concepts of communication networks, in depth understanding of network architecture of different layers of data communications and its security protocols.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To understand the physical layers of layered models.
2	To be exposed to error detection/correction & medium access controls.
3	To be familiar with Internet Protocols & current scenario
4	To understand the concepts of Transport & Application layers.
5	To be familiar with Network & Internet security.

Course Outcomes

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

CO1. Understand the basics and working of layered architecture	Understand
CO2. Differentiate different error control, Link control, access control and different LAN Technologies. Also to evaluate merits and demerits	Apply
CO3. Explain the role of protocol and design it for appropriate routing mechanism.	Analyze
CO4. Analyze the various transport and application layer protocols in real time.	Analyze
CO5. Study the functioning and methods of data and network security.	Understand

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

S- Strong; M-Medium; L-Low

SYLLABUS

Physical Layer.

Data Communications-Networks & its types-Standards-Networks models –Protocol layering-TCP / IP protocol suite-OSI model.

Digital to Digital conversion-Analog to Digital conversion-Transmission modes-Digital to Analog conversion-Analog to Analog conversion-Multiplexing-Spread spectrum-Guided and Unguided Transmission media-Switching-Circuit switched networks-Packet switching-Structure of Switch.

Data Link Layer.

Link layer addressing.

Error Detection & Correction: Block coding-Cyclic codes-Checksum-Forward error correction. Data link control: DLC services-Data link layer protocols-HDLC-PPP.

Medium Access Control: Random access-Controlled access-Channelization.

Wired LANS: Ethernet protocol-Standard Ethernet-Fast Ethernet & Gigabit Ethernet.

Wireless LANS: IEEE 802.11 project-WiMAX-Cellular Telephony-Satellite networks.

Connecting devices, Virtual LANS.

Network Layer.
Network layer services-Packet switching-Performance-IPv4 Addresses.
Internet Protocol, ICMPv4, Mobile IP.
Unicast Routing: Routing algorithms-Unicast routing protocols.
Multicast routing: Multicasting basis-Intra domain & Inter domain Multicast protocols, IGMP.
Next Generation IP: IPv6 Addressing-IPv6 protocol-ICMPv6 protocol-Transition from IPv4 to IPv6.

Transport & Application Layer
Transport layer protocols-User Datagram Protocol-Transmission Control Protocol-SCTP.
Client server programming-WWW & HTTP-FTP-Electronic mail-TELNET-SSH-DNS-SNMP-Compression-Multimedia Data & in the Internet- Real-Time Interactive protocol-P2P Networks-CHORD-PASTRY-KADEMLIA-BITTORNET.

Network & Internet Security
Quality of Service: Data flow characteristics-Flow control to improve QoS-Integrated services-Differentiated services.
Cryptography: Introduction-Confidentiality-Other aspects of Security.
Internet Security: Network layer security-Transport layer security-Application layer security-Firewalls.

TEXT BOOK:

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill, 2013.

REFERENCE BOOKS:

1. 1. Andrew S. Tannenbaum, “Computer Networks”, Pearson Education, Fifth Edition, 2011.
2. James F. Kurose, Keith W. Ross, “Computer Networking- A Top -Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
3. Larry L. Peterson, Bruse S. Davie, "Computer Networks: A System Approach",Fifth Edition, Morgan Kaufmann Publishers, 2011.
4. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.

Course Designers

S.No	Name of the Faculty	Designation	Department	e-Mail ID
1	Dr. D. Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
3	Mr.B.Rajasekaran	Associate Professor	ECE	rajasekaran@vmkvec.edu.in
4	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECCC12	DIGITAL CMOS SYSTEMS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This course deals comprehensively with all aspects of transistor level design of all the digital building blocks common to all CMOS microprocessors, DPSs, network processors, digital backend of all wireless systems etc. The focus will on the transistor level design and will address all important issues related to size, speed and power consumption. The units are classified according to the important building and will introduce the principles and design methodology in terms of the dominant circuit choices, constraints and performance measures.

PREREQUISITE

17ECCC05 - Digital Logic Circuits & Design

COURSE OBJECTIVES

1	To understand the MOS transistor theory, CMOS technologies and the Layout.
2	To understand the concepts of designing combinational and sequential circuit using CMOS logic configuration.
3	To Learn the design of CMOS Logic circuits and subsystems.
4	To Understand the CMOS Fabrication process.
5	To understand the concepts of VERILOG HDL programming.

COURSE OUTCOMES

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

CO1. Understand the design methodology and tradeoffs of the various circuit choices for each of all the blocks discussed.	Understand
CO2. Carry out transistor level hand calculation based design of the most important building blocks used in digital CMOS VLSI circuits.	Apply
CO3. Design various sequential logic circuits and analyze its design methodology.	Apply
CO4. Execute system level design using various VLSI system components.	Apply
CO5. Model the system using Hardware Description Language	Analyze
CO6. Analyze concepts and methods of digital system design techniques through experiments.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

MOS TRANSISTOR PRINCIPLES AND CMOS INVERTER

MOS (FET) Transistors, CMOS Logic, CMOS Fabrication, VLSI Design flow, Ideal I-V Characteristics, Non-Ideal I-V Effects, CMOS Inverter DC Characteristic, Beta Ratio Effects, Noise Margin, Scaling: Transistor scaling, Interconnect scaling and Impacts on design.

COMBINATIONAL LOGIC CIRCUITS

MOS layers, Stick diagram, Design rules and Layout, Propagation Delays, Combinational circuit design- Static CMOS, Dynamic circuits, Pass transistor circuits, differential circuits, BiCMOS circuits, Low Power Logic Design, comparison of circuit families.

SEQUENTIAL LOGIC CIRCUITS

Sequencing Static Circuits, Circuit Design of Latches and Flipflops – Conventional, Pulsed Latches, Resettable and Enabled Latches and Flipflops, Differential flipflops, Static sequencing element methodology, Sequencing dynamic circuits.

VLSI SYSTEM COMPONENTS CIRCUITS AND SYSTEM LEVEL PHYSICAL DESIGN

Multiplexers, Decoders, Comparators, Priority Encoders, Shift Registers, Arithmetic circuits, Ripple carry adder, Carry Look Ahead adder, High Speed adders, Multipliers, Physical design, Crosstalk, Floor planning, Power and Clock distributions.

VERILOG HDL

VLSI design flow ,Hierarchical modeling concepts, Basic Concepts: Data types ,Modules and ports, Gate Level Modeling, Data Flow Modeling, Behavioral Modeling, Switch level Modeling, Task and Function

TEXT BOOKS:

1. N.Weste, D.Harris, Ayan Banerjee "CMOS VLSI Design", Third Edition, 2005.
2. Douglas A. Pucknell, Kamran Eshraghian "Basic VLSI Design",Third Edition, 2011, Prentice Hall of India.
3. Samir Palnitkar, "Verilog HDL Guide to Digital Design and synthesis", 2nd Edition, Pearson Education 2003.

REFERENCE BOOKS:

1. Jan Rabaey, Anantha Chandrakasan, B Nikolic, "Digital Integrated Circuits: A Design Perspective". Second Edition, Feb 2003, Prentice Hall of India.
2. Jacob Baker "CMOS: Circuit Design, Layout, and Simulation,Third Edition", Wiley IEEE Press 2010 3rdEdition.

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.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.edu.in
3	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
4	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17ECCC13	ANTENNA AND WAVE PROPAGATION	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

In the era of multimedia, Internet, Web-world, Mobile and Bluetooth, communication is becoming wireless. Antennas are important component in making wireless communication a reality. This course is essential to understand the fundamental principles of Antenna theory and its parameters computation, and wave propagation with a lucid explanation of the basic concepts and equations.

PREREQUISITE

17ECCC08 - Electromagnetics and Transmission Lines & Waveguides

COURSE OBJECTIVES

1	To study the EM theory and radiation fundamentals
2	To study about wire antenna and arrays
3	To study about the aperture antennas
4	To study about the antenna measurements
5	To study about the wave propagation

COURSE OUTCOMES

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

CO1. Illustrate the antenna parameters like Radiated electric and magnetic fields, Radiation resistance, Aperture area, effective length, Gain and Directivity etc .	Apply
CO2. Apply far field and polynomial equations to obtain maxima ,minim of radiation pattern for N point sources and construction of polynomial ,bi-nominal arrays respectively	Apply
CO3. Design and interpret by choosing appropriate antenna for a given applications (TV, radar, wireless)	Apply
CO4. Design dipole, Yagi and patch antennas for a given specification	Apply
CO5. Analysis by determining the propagation factors in various levels of ground, atmosphere, ionosphere wave propagations	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	L	-	-	-	-	-	-	-	-	S	-	-
CO2	S	-	L	L	-	-	-	-	-	-	-	-	S	-	-
CO3	S	M	M	L	-	-	-	-	-	-	-	-	S	M	-
CO4	S	M	M	M	L	-	-	-	-	-	-	L	S	M	-
CO5	S	S	M	L	L	L	L	L	L	-	-	L	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

ELECTROMAGNETIC RADIATION AND ANTENNA BASICS

Review of electromagnetic theory: Vector potential, Solution of wave equation, retarded case, Hertizian dipole. Antenna characteristics: Radiation pattern, Beam solid angle, Directivity, Gain, Input impedance, Polarization, Bandwidth, Reciprocity, Equivalence of Radiation patterns, Effective aperture, Vector effective length.

POINT SOURCES AND THEIR ARRAYS

Wire antennas: Short dipole, Radiation resistance and Directivity, Half wave Dipole, Monopole, Small loop antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-element Array, Uniform Array, Polynomial representation.

LOOP, SLOT and HORN ANTENNAS

Aperture Antennas: Magnetic Current and its fields, Uniqueness theorem, Field equivalence principle, Pattern properties, Slot antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat reflector, Corner Reflector, Common curved reflector shapes, Lens Antenna.

SPECIAL ANTENNAS and ANTENNA MEASUREMENTS

Special Antennas: Long wire, V and Rhombic Antenna, Yagi-Uda Antenna, Helical Antenna- Axial mode helix, Normal mode helix, Biconical Antenna, Log periodic Dipole Array, Spiral Antenna, Micro strip Patch Antennas.

ANTENNA MEASUREMENTS

Antenna Measurements: Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.

RADIO WAVE PROPAGATION

Structure of atmosphere, Mode of propagation, Ground wave propagation, Reflection, diffraction, Ionospheric propagation, Electrical properties, Effects of Earths magnetic field. Friss formula and Channel Sounding Measurements – Base station and link budget problems.

TEXTBOOK:

1. John D.Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas and Wave Propagation", McGraw-Hill Education, 4ed, 2013.

REFERENCE BOOKS:

1. E.C.Jordan and Balmain, "Electromagnetic waves and Radiating Systems", Pearson Education / PHI, 2006.
2. A.R.Harish, M.Sachidanada, "Antennas and Wave propagation", Oxford University Press, 2007.
3. Constantine A. Balanis, Antenna Theory Analysis and Design, John Wiley, 2nd Edition, 2007.
4. R.E.Collins, "Antenna and Radio wave propagation", McGraw-Hill
5. W.L Stutzman and G.A. Thiele, "Antenna analysis and design", John Wiley, 2000.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. D. Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
3	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
4	Mrs.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in

17ECCC14	DIGITAL IMAGE PROCESSING	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Digital Image Processing has applications in all walks of present day digital life. The student stands to gain knowledge of the basics of images, acquisition of images, enhancement of images, restoration of images, compression of images for efficient storage and transmission, color image processing, image segmentation and morphological image processing.

PREREQUISITE: Signal Processing

COURSE OBJECTIVES

1	To understand the Mathematics behind Image Sampling, Quantization and Image Transforms.
2	To understand different Filtering techniques both in the Frequency domain as well as the Time domain and analyze them.
3	To understand Noise removal and other Restoration techniques and apply them.
4	To understand and apply Multi Resolution techniques for Image Compression.
5	To understand Morphological representation, Image Segmentation and Representation.

COURSE OUTCOMES

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

CO1. Summarize how Digital Images are acquired, stored, processed and interpret of various Image Transformations.	Understand
CO2. Demonstrate the various techniques to enhance Image quality in Spatial & Frequency domain filtering methods.(Also using Simulation tools)	Apply
CO3. Paraphrase the concepts of Image Restoration and Color Image processing.(Also using Simulation tools)	Apply
CO4. Illustrate the various Wavelet transforms & Image Compression methods.(Also using Simulation tools)	Apply
CO5. Examine the different applications of various Morphological processing, Image Segmentation & Representation techniques.(Also using Simulation tools)	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	PO9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PS O3
CO1	S	S	M	M	-	-	-	-	M	-	-	-	M	M	-
CO2	S	S	S	M	S	-	-	-	M	-	-	-	S	S	-
CO3	S	S	M	M	S	-	-	-	M	-	-	-	S	S	-
CO4	S	M	M	M	M	-	-	-	M	-	-	-	S	S	-
CO5	S	M	M	M	M	-	-	-	M	-	-	-	S	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

Digital Image Fundamentals and Image Transforms

Origin of digital image processing – Fundamental steps in digital image processing – Components of an image processing system – Elements of visual perception – Image sensing and acquisition – Image sampling and quantization – Basic relationships between pixels – Introduction to mathematical tools used in digital image processing – Fields that use digital image processing

Transforms for Image processing - Discrete Fourier transform – Discrete Cosine transform – Haar transform – Hadamard transform – Walsh transform

Intensity transformations & Filtering

Basic intensity transformation functions – Histogram processing – Fundamentals of spatial filtering – Smoothing spatial filtering – Sharpening spatial filters – Fuzzy techniques for intensity transformations and spatial filtering

Basics of filtering in frequency transforms – Image smoothing using frequency domain filters - Image sharpening using frequency domain filters.

Image Restoration & Color Image Processing

Image restoration model – Noise parameters – Restoration in the presence of noise only –spatial filtering –Periodic noise reduction by frequency domain filtering – Degrading functions- Estimating the degradation function – Inverse filtering – Wiener filtering – Constrained least square filtering – Geometric mean filtering – Image reconstruction from projections

Color fundamentals – Color models – Pseudo color image processing – Color transformations – Color image Smoothing and sharpening – Color image segmentation – Noise in color images – Color image compression

Wavelets and Multiresolution processing & Image Compression

Background – Multiresolution expansion – Wavelet transform in one dimension – Fast wavelet transform – Wavelet transform in two dimensions- Wavelet packets

Image compression models – Huffman coding – Arithmetic coding – LZW coding – Run length coding – Bit plane coding – Block transform coding – Predictive coding – Wavelet coding

Morphological Processing, Segmentation & Representation

Morphological Processing - Erosion and dilation - Opening and closing – Basic morphological operations – Grey scale morphology. Image Segmentation - Point, Line and Edge detection – Thresholding – Region based segmentation – segmentation using morphological watersheds – use of motion in segmentation. Image Representation – Boundary descriptors – Regional descriptors

TEXT BOOKS:

1) "Digital Image Processing", Rafael C Gonzalez & Richard E Woods, Pearson Education International, Fourth Edition, 2018,Pearson
2) "Fundamentals of Digital Image Processing", A.K. Jain, Pearson Education India, 2015.

REFERENCE BOOKS:

1) Digital Image Processing, Bernd Jahne, Springer -Verlag, Fifth Edition, 2002, ISBN 3-540 - 67754 - 2

2) The Essential Guide to Image Processing", Al Bowik,2009, Elsevier Inc, ISBN 978-0-12-374457-9

3) S. Jayarman, S. Esakkirajan and T. Veerakumar, “Digital Image Processing”, Tata McGraw Hill, 2010.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	DEPT	Mail ID
1	Mr. P. Subramanian	Associate Professor	ECE	subramanian@avit.ac.in
2	Dr. D. Vijendra Babu	Professor	ECE	Vijendrababu@avit.ac.in
3	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
4	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

17ECCC15	ANALOG & DIGITAL COMMUNICATION	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This course provides a thorough introduction to the basic principles of Analog and Digital Communications. It also deals with Analog and Digital Modulation techniques, Communication Transmitter & Receiver design, Baseband and Bandpass Communication Techniques, Noise Analysis and Multiplexing techniques.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To Understand the basic elements of analog communication system
2	To learn the basic concepts behind the transmission and reception of Angle Modulation
3	To impart the knowledge about Analog to Digital Transition Systems &Information Theory
4	To Analyze & design the performance of various digital carrier transmission.
5	To Apply the knowledge of Digital Communication circuits in various fields.

COURSE OUTCOMES

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

CO1.Interpret the various Analog communication systems.	Understand
CO2.Illustrate the principle and operation behind various Modulators , Demodulators in Analog communications	Apply
CO3. Apply different coding theory to estimate Entropy, Mutual information, Information rate etc.	Apply
CO4.Demonstrate the concept of various digital carrier modulation and determine their error probability.	Apply
CO5.Analyze the major classifications of spread spectrum 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	L	-	-	-	-	-	-	-	-	-	L	S	-	-
CO2	S	M	M	-	M	-	-	-	-	-	-	M	S	M	M
CO3	S	M	M	M	-	-	-	-	-	-	-	M	S	M	-
CO4	S	S	M	M	-	-	-	-	-	-	-	M	S	M	M
CO5	S	M	M	M	L	-	-	-	-	-	-	L	S	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

Analog Communication Systems

Principles of Amplitude Modulation – AM Modulators- Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM Demodulators,AM transmitters-Low level & High level Transmitters, AM Receivers – TRF, Super Heterodyne Receiver, Double conversion AM receivers.

Angle Modulation: Transmission And Reception

Angle Modulation - FM and PM, Modulation Index, Frequency Modulators and Demodulators, Phase Modulators, FM transmitters- Direct & Indirect transmitters, Angle Modulation Vs Amplitude Modulation, FM Receivers, Frequency Vs Phase modulation.

Analog to Digital Transition Systems & Information Theory

Pulse Amplitude Modulation, Pulse Position Modulation, Pulse Code Modulation, Sampling Rate, DPCM, Delta Modulation, Time Division Multiplexing, Information Theory- Uncertainty, Information and entropy, source coding theorem, Discrete Memoryless channels, Mutual Information, Channel capacity, Channel coding theorem.

Digital Transmission

Pulse Transmission – Inter Symbol Interference, Eye pattern, Digital carrier Modulation-Binary Amplitude Shift Keying, Binary Frequency Shift Keying, Binary Phase Shift Keying, QPSK, bit and baud rate, BER Analysis

Spread Spectrum Modulation

Pseudo noise sequences, Direct sequence Spread Spectrum with coherent BPSK, Frequency hop spread spectrum modulation, Multiple Access Techniques – Wireless Communication, TDMA and FDMA

TEXT BOOK:

1. Simon Haykin and Michael Moher, "Communication systems" John Wiley & Sons, Fifth Edition, 2016

REFERENCE BOOKS:

1. Simon Haykin and Michael Moher, "An Introduction to Analog and Digital Communications", John Wiley & Sons, second Edition, 2006.
2. Martin S.Roden, "Analog and Digital Communication System", 3rd Edition, PHI, 2002
3. Wayne Tomasi, "Electronic Communication Systems: Fundamentals Through Advanced", Pearson Education, 2001.
4. B. Carlson, "Introduction to Communication systems", 3rd Edition, McGraw Hill, 1989

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.B.Rajasekaran	Associate Professor	ECE	rajasekaran@vmkvec.edu.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
3	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17ECCC16	MICROWAVE & OPTICAL COMMUNICATION SYSTEMS (THEORY & PRACTICE)	Category	L	T	P	Credit
		CC	2	0	2	3

PREAMBLE

Microwave pertains to the study and design of Microwave circuits, Components, and systems. Fundamental principles are applied to Analysis, Design and Measurement techniques in this field. Also to gain knowledge about different types of Optical Emission, Detection Communication Systems and their Applications. This course makes the students to be familiar with the microwave and optical Measurements.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To learn the terminology used in Microwave transmission system, Microwave components and their S-Parameters and its application in various fields
2	To learn the various Microwave sources, semiconductor devices and IC's.
3	To measure different parameters at microwave frequencies
4	To know the basics of solid state physics and understand the nature and characteristics of light And optical sources and amplifiers
5	To learn the principle of optical detection and mechanism in different detection devices.

COURSE OUTCOMES

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

CO1. Summarize the principles of Microwaves and Fiber Optics in Communication System.	Understand
CO2. Demonstrate the various Microwave Sources and Semiconductor Devices.	Apply
CO3. Illustrate the different parameter measurements in Microwave Engineering.	Apply
CO4. Outline the optical fibers and sources used for Communication System.	Analyze
CO5. Analyze the optical detectors and amplifiers used for Communication Systems in different applications.	Analyze
CO6. Evaluate the performance of given antenna and RF filters by applying radio frequency	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO MICROWAVES, COMPONENTS AND THEIR S-PARAMETERS

Microwave history, spectrum and band characteristics of microwaves-a typical microwave system. Applications of

Microwaves: Traditional, industrial and biomedical fields, S-matrix – significance, formulation and properties. S-matrix representation of a multi port network, Waveguide Attenuators, Waveguide Multi port Junctions- E plane and H plane Tees, Magic Tee, and Hybrid Ring, Directional Couplers, Isolator, Circulator- S-matrix calculations.

MICROWAVE SOURCES-O AND M-type TUBES,SEMICONDUCTOR DEVICES AND IC'S
Microwave tubes: O-type – Two cavity Klystron Amplifier, Reflex Klystron oscillator, M-type – cross-field effects, Magnetrons- types, HELIX TWT- types and characteristics of slow wave structures, structure of TWT and amplification process, Avalanche Transit Time Devices- principle of operation and characteristics of IMPATT and TRAPATT diodes, Schottky Barrier Diodes, IC'S:Monolithic Microwave Integrated Circuits (MMIC), MIC materials-Types.

MICROWAVE MEASUREMENTS
Power, Frequency and impedance measurement at microwave frequency, Network Analyzers and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure.

INTRODUCTION -OPTICAL FIBERS AND OPTICAL SOURCES
Introduction to vector nature of light, Basic optical Laws and Definitions, Optical Fiber Modes and Configurations, Single Mode Fibers and Graded- Index Fiber Structures, Fiber Materials, Attenuation- Absorption, Scattering Losses, Bending Losses, Core and Cladding Losses, Optical sources - LED and LASER diode - Principles of operation

OPTICAL DETECTORS AND AMPLIFIERS
Principal of Photodiodes, Types of Optical detectors –PN Photodiode, PIN Photodiode, Avalanche photodiode, Phototransistor, semiconductor Laser Amplifiers, Erbium-Doped Fiber Amplifier, Raman Fiber amplifier, Brillouin Fiber amplifier ,Applications of Optical Amplifiers, Noise in Optical Amplifiers.

RF PRACTICE
Directivity ,Gain and Radiation pattern measurement for dipole, loop and Yagi - Uda antenna - RF Filters.

TEXT BOOKS:

1. Samual Y.Liao, "Microwave Devices and Circuits", PHI, 3rd Edition, 2003.
2. Collin R.E., "Foundation of Microwave Engineering", McGraw Hill, 2nd Edition, 2009.
3. Keiser. G, "Optical fiber communications", 4th Edition Tata McGraw-Hill, New Delhi, 2008
4. Franz & Jain, "Optical communication, Systems and Components", Narosa Publications, New Delhi, 2000.

REFERENCE BOOKS:

1. Microwave Principles – Herbert J.Reich, J.G.Skalnik, P.F.Ordung and H.L.Krauss, CBS Publishers and Distributors, New Delhi, 2004.
2. Peter A.Rizzi, "Microwave Engineering – Passive Circuits", PHI Publications.
3. Chatterjee.R, "Elements of Microwave Engineering", Affiliated East-West Press Pvt. Ltd.
4. John Gowar, "Optical Communication Systems", 2nd Edition Prentice Hall, 1993.
5. Agrawal. G.P, "Fiber-Optic Communication Systems" 3rd Edition John Wiley & Sons, 2002.

COURSE DESIGNERS				
S.No.	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
1	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathysr@vmkvec.edu.in

17ECCC17	FPGA SYSTEM DESIGN	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Field programmable devices are able to match the functional complexity of ASIC Devices such as PROM, PLDs (PLAs, PALs). PALs were widely used for glue logic and replaced SSI and MSI devices. Complex PLD"s are hierarchical PLD"s that connects smaller PLD"s through a central programmable interconnect to enable the implementation of medium complexity digital circuits. Main feature of CPLDs are the wide decoding, but has a low register to logic ratio. CPLD"s architecture is not scalable, due to the central switch used in connecting small PLD structures. Digital designs once built in custom silicon are increasingly implemented in field programmable gate arrays (FPGAs), but effective FPGA system design requires a understanding of new techniques developed for FPGAs. This course deals FPGA fabrics, introduces essential FPGA concepts, and compares multiple approaches to solving basic problems in programmable logic.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To analyze the design principle of synchronous and asynchronous circuits.
2	To design complex programmable logic by analyzing the FPGA architecture.
3	To know the functional operation of various components of FPGA logics.
4	To expertise in VHDL programming.

COURSE OUTCOMES

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

CO1. Analysis, Design and Optimisation of the sequential digital systems.	Understand
CO2. Illustrate the FPGA architecture- logic cell, I/O cell and interconnects	Analyze
CO3. Design Complex Programmable Logic Devices for specific applications	Analyze
CO4. Discriminate the functional operation of various components of FPGA logics	Analyze
CO5. Design new logical design using VHDL programming	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
CO1	S	M	M	M	L	-	M	-	-	-	-	M	S	S	-
CO2	S	M	S	L	M	-	-	-	-	-	-	M	M	L	-
CO3	S	S	S	S	L	-	M	-	-	-	L	M	-	-	L
CO4	S	M	L	L	L	-	-	-	-	-	-	M	-	-	-
CO5	M	S	S	S	S	L	M	-	-	-	L	M	-	-	L

S- Strong; M-Medium; L-Low

SYLLABUS

Sequential Circuit Design using state machine approach

Synchronous and Asynchronous Sequential Circuit -Finite State Machine- Moore and Mealy, State Diagram, State table, State Assignment, Optimization of sequential circuit – State Minimization – Determination of state equivalence using an implication table,Races and Hazards.

Programmable Logic to ASICs

Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs), the Masked Gate Array ASIC, CPLDs and FPGAs.

Complex Programmable Logic Devices

CPLD Architectures, Function Blocks, I/O Blocks, Clock Drivers, Interconnect CPLD Technology and Programmable Elements.

FPGA Systems

Basic Concepts, Digital Design and FPGAs, FPGA-Based System, VLSI Technology-Manufacturing Processes, Transistor Characteristics, CMOS logic gates, Wires, Registers and RAM, Packages and Pads, FPGA Fabrics-FPGA Architectures, SRAM-Based FPGAs, Permanently Programmed FPGAs, Chip I/O, Circuit Design of FPGA Fabrics, Architecture of FPGA Fabrics

Hardware Description Language VHDL

Introduction to VHDL, structural, functional programming, Combinational Logic-Combinational Network Delay, Power and Energy Optimization, Arithmetic Logic, Logic Implementation for FPGAs, Physical Design for FPGAs, Sequential Machines-Sequential Design Styles, Rules for Clocking, Performance Analysis, Power Optimization.

TEXT BOOKS:

1. Charles H.Roth Jr, Larry L.Kinney "Fundamentals of Logic Design", Seventh edition, Cengage Learning 2014.
2. Jan M. Rabey, Anantha Chandrakasan and Borivoje Nikolic " Digital integrated circuits: A Design Perspective (2nd Edition) ", Pearson 2009

REFERENCE BOOKS:

1. Wayne Wolf "FPGA –Based System Design" Pearson Education, 2004.
2. Bob Zeidman, "Designing with FPGAs and CPLDs", Elsevier, CMP Books, 2002.
3. M. Morris Mano and Michael D. Ciletti, "Digital Design", PHI, fourth edition, 2008
4. R.F.Tinder: Engineering Digital Design, (2/e), Academic Press, 2000
5. Stephen Brown Zvonko Vranesic "Fundamentals of Digital Logic with VHDL Design" Tata McGraw-Hill Edition.

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
3	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
4	Mr. S. Selvam	Assistant Professor (Gr-II)	ECE	Selvam@avit.ac.in

17ECCC18	INTERNET OF THINGS FOR ELECTRONICS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

PREREQUISITE - Nil

COURSE OBJECTIVES

1	Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2	Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3	Market forecast for IoT devices with a focus on sensors
4	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi
5	To study the advanced internet of things for electronics

COURSE OUTCOMES

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

CO1. Explain the concept of Internet of Things.	Understand
CO2. Explain the IOT Sensors To Appear	Apply
CO3. Design and implement of technological sensors	Analyze
CO4. Design and implement applications using internet of things	Analyze
CO5. Explain the advanced internet of things used in different applications.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Internet of Things Promises–Definition–Scope–Sensors for IoT Applications–Structure of IoT–IoT Map Device

SEVEN GENERATIONS OF IOT SENSORS TO APPEAR

Industrial sensors –Description & Characteristics–First Generation –Description & Characteristics–Advanced Generation –Description & Characteristics–Integrated IoT Sensors –Description & Characteristics–Polytronics Systems –Description & Characteristics–Sensors' Swarm –Description & Characteristics–Printed Electronics –Description & Characteristics–IoT Generation Roadmap

TECHNOLOGICAL ANALYSIS

Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

IOT DEVELOPMENT EXAMPLES

ACOEM Eagle –EnOcean Push Button –NEST Sensor –Ninja Blocks -Focus on Wearable Electronics

PREPARING IOT PROJECTS

Creating the sensor project -Preparing Raspberry Pi -Clayster libraries -Hardware-Interacting with the hardware -Interfacing the hardware-Internal representation of sensor values -Persisting data -External representation of sensor values -Exporting sensor data -Creating the actuator project-Hardware -Interfacing the hardware -Creating a controller -Representing sensor values -Parsing sensor data -Calculating control states -Creating a camera -Hardware -Accessing the serial port on Raspberry Pi -Interfacing the hardware -Creating persistent default settings -Adding configurable properties -Persisting the settings -Working with the current settings -Initializing the camera

REFERENCE BOOKS:

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 -2024',Yole Développement Copyrights ,2014

2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

3. Editors OvidiuVermesan Peter Friess,'Internet of Things –From Research and Innovation to Market

4. Deployment', River Publishers, 2014
5. N. Ida, Sensors, ‘Actuators and Their Interfaces’, Scitech Publishers, 2014.
6. Qusay F. Hassan,’Internet of things a to z: technologies and applications’ ,John Wiley and Sons Ltd,2018

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. L. K. Hema	Professor	ECE	hemalk@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandrang@vmkvec.edu.in
3	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
4	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECCC19	**WIRELESS COMMUNICATION SYSTEMS (THEORY & PRACTICE)**	**Category**	**L**	**T**	**P**	**Credits**
		CC	**2**	**0**	**2**	**3**

PREAMBLE

To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

PREREQUISITE -

COURSE OBJECTIVES

1	It deals with the fundamental cellular radio.
2	It presents different ways to radio propagation models
3	It provides idea about analog and digital modulation techniques used in wireless communication.
4	It also deals with the different types of equalization techniques and diversity concepts
5	It deals with advanced transceiver schemes and second generation and third generation wireless networks

COURSE OUTCOMES

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

CO1. Discuss the cellular system design and technical challenges.	Understand
CO2. Analyze the Mobile radio propagation, fading, diversity concepts and the channel modeling.	Analyze
CO3. Analyze Multiuser Systems, CDMA, WCDMA network planning and OFDM Concepts.	Analyze
CO4. Analyze the design parameters, link design.	Analyze
CO5. Summarize the principles and applications of wireless systems and standards	Evaluate
CO6. Test digital carrier modulation system and multiplexing accessing system	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	L	L	-	L	-	-	-	-	-	-	M	S	M	-
CO2	L	S	S	-	M	-	-	-	-	-	-	M	S	S	S
CO3	S	M	M	-	L	M	-	-	-	-	-	M	-	M	-
CO4	S	L	L	-	L	S	-	-	-	-	-	M	S	S	-
CO5	S	S	S	-	M	L	-	-	-	-	-	M	M	-	M
CO6	S	S	S	-	M	M	M	-	M	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

SERVICES AND TECHNICAL CHALLENGES
Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

WIRELESS PROPAGATION CHANNELS
Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models.

WIRELESS TRANSCEIVERS
Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying, π/4-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.

SIGNAL PROCESSING IN WIRELESS SYSTEMS
Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.

ADVANCED TRANSCEIVER SCHEMES
Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS–95) and Third Generation Wireless Networks and Standards

PRACTICE
Digital Carrier Transmitter and Receiver (PSK, FSK and ASK), TDM and FDM

TEXT BOOKS:
1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.

REFERENCE BOOKS:
1. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd.,2001.
3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.ac.in
2	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in
3	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in

17ECCC81	SEMICONDUCTOR DEVICES LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

To reinforce learning in the accompanying semiconductor devices course through hands-on experience by examining the electrical characteristics of various semiconductor devices, such as diodes, BJTs and FETs. To provide the student with the capability for performing various analysis of semiconductor devices.

PRERQUISITE- NIL

COURSE OBJECTIVES

1	To emphasize the practical, hands-on component of this course.
2	To complement the theoretical material presented in lecture, and as such, is integral and indispensible to the mastery of the subject.
3	To study experimentally the characteristics of diodes, BJT's and FET's.
4	To verify practically the response of various special purpose electron devices.
5	To provide students engineering skills by way of breadboard circuit design with electronic devices and components.

COURSE OUTCOMES

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

CO1. Construct and find the ripple factor and efficiency of HWR and FWR by conducting experiments.	Apply
CO2. Construct clipper and clamper circuits for any given specifications and illustrate their output.	Apply
CO3. Determine the given transistor parameters from the characteristics of BJT in CE and CC Configuration.	Apply
CO4. Design transistor voltage regulator for given specifications and verify its output.	Analyze
CO5. Examine the characteristics of SCR, DIAC and TRIAC.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

LIST OF EXPERIMENTS

1. Half Wave Rectifier
2. Full Wave Rectifier
3. Clipper
4. Clamper
5. Input/output Characteristics of CE Amplifier
6. Input/output Characteristics of CC Amplifier
7. Transfer Characteristics of JFET
8. Voltage Regulator
9. TRIAC, DIAC
10. SCR

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.P.Selvam	Professor	ECE	hodeee@vmkvec.edu.in
2	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
3	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
4	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17ECCC82	DIGITAL LOGIC CIRCUITS & DESIGN LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

To provide experience & explore designs in analyzing and testing of digital logic circuits like combinational and sequential circuits using lab instruments as well as simulation software.

Prerequisite : Basic Electrical and Electronics Engineering

PRERQUISITE

17EEES03 - Basics of Electrical and Electronics Engineering

COURSE OBJECTIVES

1	To impart the knowledge in analysis and design of various combinational logic circuits.
2	To learn about design and analysis of sequential circuits using flip flops.
3	To Expose students about design and simulation of logic circuits using HDL.

COURSE OUTCOMES

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

CO1.Construct various logic circuits.	Apply
CO2. Demonstrate the various combinational logic circuits by using discrete components	Apply
CO3. Analyze different sequential logic circuits by using discrete components.	Analyze
CO4. Test the various digital logic circuits by using simulation software.	Evaluate
CO5. Measure and record the experimental data for various digital circuits.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

List of Experiments

Hardware Experiments

1. Design and implementation of Adders using logic gates.
2. Design and implementation of Sub tractors using logic gates.
3. Design and implementation of BCD to Excess -3 code converter using logic gates
4. Design and implementation of Binary to Gray code converter using logic gates
5. Design and implementation of 4 bit BCD adder using IC 7483
6. Design and implementation of 2 Bit Magnitude comparator using logic gates
7. Design and implementation of Multiplexer and De-Multiplexer using logic gates
8. Design and implementation of encoder and decoder using logic gates
9. Design and implementation of 3 bit synchronous up/down counter.
10. Implementation of SISO, SIPO, and PISO shift registers using flip flops.

Software Experiments using HDL

1. Design and Simulation of Full adder circuit using Gate level modelling
2. Design and Simulation of 2X2 multiplier circuit using structural level modeling.
3. Design and Simulation of 8 to 1 Multiplexer circuit using behavioural level modeling.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.B.Rajasekaran	Associate Professor	ECE	rajasekaran@vmkvec.edu.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
3	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECCC83	ANANLOG CIRCUITS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The goal of this lab is to supplement the theory course Analog Circuits. Students will gain experience in Analog circuits design for given specification. They will analyze and test electronic circuits using simulation software and laboratory instruments.

PRERQUISITE

17ECCC01 - Semiconductor Devices

COURSE OBJECTIVES

1	To impart the design knowledge of various small signal amplifier circuits
2	To design the feedback amplifier and Oscillator
3	To study the characteristics of Power & Tuned amplifiers circuits

COURSE OUTCOMES

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

CO1. Design & Simulation of Compound configurations of analog circuits.	Apply
CO2. Apply the concepts of transistor biasing to study the small signal behavior of BJT for Amplification	Apply
CO3. Design and infer the frequency response and bandwidth of Feedback amplifiers.	Analyze
CO4. Investigate the concepts of Power & Tuned amplifiers	Analyze
CO5. Simulate & Estimate the frequency of LC and RC Oscillators	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

1. Design, Simulation and Hardware realization of Single Stage Common Emitter amplifier for given specification
2. Simulation & Hardware realization of Feedback amplifiers and its frequency analysis
   a) Voltage Series
   b) Current Shunt
3. Design, Simulation and Hardware realization of Sinusoidal waveform generators.
   a) RC Oscillators
   b) LC Oscillators
4. Design and simulation of Power amplifiers
5. Frequency Response characterization of Tuned amplifier circuit.
   a) Single Tuned
   b) Double Tuned
6. Design and hardware realization of Multistage Amplifier for given specification
   a) Cascade
   b) Darlington
7. Design and simulation of Differential pair circuit with active load and current references and its frequency analysis.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.A.Nagappan	Professor	BME	principal@vmkvec.edu.in
2	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
3	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
4	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17CSCC84	COMPUTER PROGRAMMING LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

This course is designed to complement the course Problem Solving using Computer. The purpose of this laboratory course is to give hands on training to the students in understanding and practicing the programming concepts and algorithms. This will improve the problem solving capability of the students.

PRERQUISITE NIL

COURSE OUTCOMES

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

CO1 Write, compile, debug, link and execute C program for the given specification/application	Apply
CO2. Design and implement algorithms involving decision structures, loops, arrays and pointers.	Apply
CO3. Use different data structures for solving the given problem using computer	Apply
CO4. Create/update data files.	Apply
CO5. Analyze the implementation complexity of algorithm by modularizing the problem into small modules for the given problem	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

1. Basic programs to understand different types of data, operators and expressions.
2. Programs using control structures
    i) Factorial of a number
    ii) Fibonacci series
    iii) Generating prime numbers
    iv) Generating Armstrong numbers
    v) Greatest common divisor
3. Programs using arrays
    i) Merging of arrays
    ii) Array order reversal
    iii) Selection sort
    iv) Bubble sort
    v) Insertion sort
4. Programs using strings
    i) Palindrome checking
    ii) String sorting
    iii) Linear pattern search
    iv) Text line editing
5. Programs using functions
6. Programs using pointers
7. Programs using structures
8. Programs using file structure

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr. B. Sundharamurthy	Assistant Professor	CSE	sundharamurthy@vmkvec.edu.in
2	Mr.K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in

17ECCC85	LINEAR INTEGRATED CIRCUITS & MICROCONTROLLERS 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.

PRERQUISITE

17ECCC01 - Semiconductor Devices
17ECCC02 - Analog Circuits

COURSE OBJECTIVES

1	To learn the characteristics of integrated circuits through op-amp.
2	To implement various operations using Op-amp
3	To write the assembly language program for 8086 and 8051.
4	To write the programs for communication between microcontroller and peripheral devices

COURSE OUTCOMES

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

CO1. Determine Gain of inverting and Non inverting Amplifier using Op-Amp	Apply
CO2. Analyze and Implement various circuits Applications like integrator, differentiator, Comparator etc, using Op-amp.	Analyze
CO3. Design and test the performance of multi-vibrators for given specifications using timer IC	Analyze
CO4. Develop assembly language program for basic applications like arithmetic operations, interrupt and UART, etc	Analyze
CO5. Apply the practical knowledge of Microcontroller in designing various Circuit.	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

LIST OF EXPERIMENTS:

LINEAR INTEGRATED CIRCUITS LAB

Design

1. Inverting, Non-Inverting and Differential Amplifier.
2. Integrator, Differentiator, Comparator and Schmitt trigger.
3. Active LPF and HPF.
4. Astable and Monostable Multivibrators using IC 555
5. Voltage regulation using IC 723

MICROCONTROLLERS LAB

6. 8086 & 8051 Assembly language program for Arithmetic Operations.
7. 8051 Assembly language program for Logical, Interrupt & UART Operations.
8. Interfacing DAC to Microcontroller and generate Square, Triangular and Saw –tooth waveforms.
9. Interfacing ADC to Microcontroller.
10. Interfacing Stepper Motor to 8051 and operate it in Clockwise and Anti-Clockwise directions.

REFERENCES

1. Laboratory Reference Manual.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
2	Mr.R.Ramani	Assistant Professor	ECE	ramani@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

17ECCC86	SIGNAL PROCESSING LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The purpose of this course is to give hands on training to the students in understanding the theory of signals and systems and practicing the algorithms used in digital signal processing. This will improve the understanding capability of the signal and system theory and simulation capability of the signal processing algorithms.

PREREQUISITE

17ECCC04 - Signals and Systems

COURSE OBJECTIVES

1	To generate the elementary signals/ waveforms.
2	To compute the convolution of signal.
3	To design different types of filters and obtain frequency response.
4	To compute magnitude and phase components using DFT.

COURSE OUTCOMES

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

CO1. Test the time and frequency domain representation of discrete time signals through simulation	Analyze
CO2. Analyze the time and frequency domain response of discrete time systems through simulation	Analyze
CO3. Analyze the effects of quantization error in the filter coefficients through simulation	Analyze
CO4. Develop FIR and IIR filter for the specification derived from the given problem and simulate the frequency response.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

1. Generate different time signals and display the same.
2. Compute the linear convolution of a signal using DFT.
3. Compute the circular convolution of a given signal.
4. Design analog Chebyshev filters and apply bilinear transformation
5. Design analog Butterworth filters and apply bilinear transformation
6. Design analog Chebyshev filters and apply impulse invariance transformation
7. Design analog Butterworth filters and apply impulse invariance transformation

8. Design FIR filters using Fourier series method and frequency sampling methods
9. Design FIR filters using Different windowing techniques
10. Effect of quantizations

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Muthumanickam	Professor	ECE	muthumanickam@vmkvec.edu.in
2	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
3	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in
4	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in

17ECCC87	DIGITAL IMAGE PROCESSING LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE
To understand and implement image processing techniques using open source software

PRERQUISITE: Signal Processing

COURSE OBJECTIVES

1	To understand image acquisition and storage using a open source software – SCILAB
2	To study and analyze different image transforms on images
3	To study, analyze and apply different techniques and algorithms for image enhancement
4	To study, analyze and apply different techniques and algorithms for image restoration
5	To study, analyze and apply different techniques and algorithms for image compression

COURSE OUTCOMES

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

CO1. Apply the various Image Transforms and their properties for processing of Digital Images.	Apply
CO2. Demonstrate different Image Smoothening & Sharpening algorithms in Spatial and Frequency domain for Image Enhancement.	Apply
CO3. Use different Spatial Filters to remove Noises in Digital Images.	Apply
CO4. Illustrate the various operators to perform Edge detection in Images.	Apply
CO5. Contrast the metrics of Image Compression & decompression algorithms.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

List of Experiments

1) To acquire an Image, store in different formats and display the properties of the Images

2) To find the discrete Fourier transform of a Grayscale Image and perform Inverse Transform to get back the Image.

3) Analyze the rotation and convolution properties of the Fourier Transform using any Grayscale Image.

3) Find the Discrete Cosine Transform of a given Image. Compare Discrete Fourier Transform

and Discrete Cosine Transforms

4) Apply Histogram Equalization for enhancing the given Images.

5) Perform Image Enhancement, Smoothing and Sharpening, in Spatial domain using different Spatial Filters and compare the performances.

6) Perform Image Enhancement, Smoothing and Sharpening, in Frequency domain using different Filters and compare the performances.

7) Perform Noise removal using different Spatial filters and compare their performances.

8) For the given Image perform Edge detection using different operators and compare the results.

9) For a given Image, Compress and Decompress using Wavelets. Study and compare the efficiency of the scheme with any two schemes.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Mr. P. Subramanian	Associate Professor	ECE	subramanian@avit.ac.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
3	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

17ECCC88	DATA COMMUNICATION NETWORKING LAB	Category	L	T	P	Credits
		CC	0	0	4	2

PREAMBLE

To give in depth knowledge in data communication within the nodes in established network.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To learn the knowledge about the communication between two computers.
2	To Learn and implement different protocols.
3	To Learn and implement routing protocols.

Course Outcomes

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

CO1. Understand the basic communication principles between the two computers.	Analyze
CO2. Construct the network in different topological structures.	Create
CO3. Analyze the performances of different network protocols	Analyze
CO4. Differentiate the performances, merits and demerits of different routing algorithms.	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	PSO2	PSO3
CO1	M	M	-	-	L	-	-	-	L	-	-	L	S	M	-
CO2	S	S	L	-	M	-	-	-	-	L	-	-	S	S	-
CO3	S	S	M	-	-	-	-	-	M	L	L	-	M	S	-
CO4	S	S	L	-	-	-	-	L	L	L	L	L	M	M	-

Syllabus

1. Study of serial data Communication between two computers.
2. Study of Parallel data Communication between two computers.
3. Study of Network Topologies – Star, Bus & Ring
4. Implementation of stop and wait protocol using simulator.
5. Implementation of Sliding window protocol using simulator.
6. Implementation of Go-Back N protocol using simulator.
7. Implementation of Selective Repeat protocol using simulator.
8. Study the performance of the network with CSMA/ CD protocol.
9. Study the performance of the network with CSMA/ CA protocol.
10. Implementation of routing algorithm
    a. Distance vector Routing Algorithm
    b. Link State Routing Algorithm
11. Encryption and Decryption.
12. Study of Ethernets and Fast Ethernets

COURSE DESIGNERS				
S.No	**Name of the Faculty**	**Designation**	**Dept**	**Mail ID**
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.B.Rajasekaran	Associate Professor	ECE	rajasekaran@vmkvec.edu.in

17ECCC89	ANALOG & DIGITAL COMMUNICATION LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The purpose of this course is to give hands on training to the students in understanding the theory of communications and practicing sessions used in analog and digital communication systems. This will improve the understanding capability and simulation capability of the communications.

PRERQUISITE

NIL

COURSE OBJECTIVES

1	To impart the knowledge on generation and detection of Analog signals.
2	To carry out experiments in order to learn about various analog to digital conversion schemes.
3	To Expose students on various digital modulation schemes using kits and MATLAB software.

COURSE OUTCOMES

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

CO1. Construct and test Analog modulation and demodulation circuits	Apply
CO2. Construct and test circuits for pulse amplitude and pulse position modulation circuits	Apply
CO3. Construct and test the performance of digital carrier modulation techniques.	Analyze
CO4. Generate PN sequences and Spread spectrum techniques.	Analyze
CO5. Simulate of Analog modulation and Demodulation using MATLAB.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

List of Experiments

1. Signal Sampling and Reconstruction.
2. Generation of Amplitude Modulation and Demodulation
3. Frequency Modulation and Demodulation
4. Pre-emphasis and De-emphasis
5. Pulse Amplitude Modulation, Pulse Position Modulation
6. Generation of ASK,FSK
7. Generation of PSK and QPSK
8. Generation of PN Sequences and Direct sequence spread spectrum
9. Simulation of Analog Modulation schemes in MATLAB
10. Simulation of Analog Demodulation schemes in MATLAB

COURSE DESIGNERS				
S.No.	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
1	Mr.B.Rajasekaran	Associate Professor	ECE	rajasekaran@vmkvec.edu.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@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

17ECCC90	FPGA SYSTEM DESIGN LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE - This lab-oriented course will focus on the design of large-scale system-on-a-chip (SOC) solutions within field-programmable gate arrays (FPGAs). Modern FPGA densities and commercially available cores enable a single developer to design highly complex systems within a single FPGA.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To design and simulate basic logic circuits, combinational and sequential logic circuits using HDL software.
2	To implement the designed logic circuits in FPGA device.
3	To verify the input and output of designed logic circuits

COURSE OUTCOMES

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

CO1. Design and simulation of digital logic circuits	Apply
CO2. Design and implement the combinational logic circuits in FPGA device	Evaluate
CO3. Design and implement several Sequential circuits in FPGA device	Evaluate
CO4. Develop complex logic circuits	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

1. Implementation of Logic Gates –Data flow model and Behavioral model
2. Combinational logic circuits –Adders and Subtractor
3. Code converters-Binary to Gray and Gray to Binary
4. 3 to 8 Decoder –74138
5. 4 Bit Comparator –7485
6. 8 x 1 Multiplexer –74151 and 2X4 Demultiplexer –74155
7. 16 x 1 Multiplexer –74150 and 4X16 Demultiplexer –74154
8. Sequential circuits -Flip-Flops
9. Decade counter –7490.
10. Synchronous & Asynchronous Counters
11. Shift registers –7495.
12. Universal shift registers –74194/195.
13. RAM (16 x 4) –74189 (Read and Write operations).
14. Stack and Queue Implementation using RAM.

COURSE DESIGNERS

S.No	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
1	Dr.L.K.Hema	Professor & Head	ECE	hemalk@avit.ac.in
2	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in
3	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.edu.in
4	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17ECCC91	MICROWAVE & OPTICAL COMMUNICATION LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

To know and understand how communication is being established at Microwave frequencies and by using fiber in optical communication.

PREREQUISITE –NIL

COURSE OBJECTIVES

1	To learn the characteristics of Microwave Oscillators, Waveguide tees and Couplers
2	To learn the LED,LASER and PHOTODIODE characteristics by using Optical fibers
3	To expose the analog and digital data transmission using fiber optics.

COURSE OUTCOMES

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

CO1. Apply the principles of Microwave Communication and determine the Characteristics of Oscillators and Waveguide Tees.	Apply
CO2. Apply the principles of Microwave Communication and determine the Characteristics of directional coupler and examine the parameters of horn antenna.	Analyze
CO3. Analyze the performance of Analog and Digital data communication through fiber optic link	Analyze
CO4. Measure the characteristics of semiconductor devices using fiber optical communication system.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

MICROWAVE:

1. Characteristics of Gunn diode Oscillator.
2. Characteristics of Reflex Klystron oscillator.
3. Characteristics of Directional Coupler
4. Characteristics of E / H Plane waveguide Tee
5. Characteristics of Magic Tee.
6. Horn Antenna – Gain and directional Characteristics

OPTICAL COMMUNICATION:

1. Numerical aperture determination for fibers
2. D.C. Characteristics of LED and PIN Photo Diode
3. Optical transmission using Analog Modulation
4. Data transmission through Fiber Optic Link.
5. PI Characteristics of LASER diode.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathysr@vmkvec.edu.in
3	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17ECCC92	INTERNET OF THINGS LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE - Purpose and requirement specification, Process specification, Domain model specification, information model specification, Service specifications, IoT level specification, Functional view specification, Operational view specification, Device and component integration, Application development.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To understand fundamentals of IoT and embedded system including essence, basic design strategy and process modelling.
2	To understand fundamentals of security in IoT.
3	To learn real world application scenarios of IoT along with its societal and economic impact using case studies.

COURSE OUTCOMES

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

CO1. Implement an architectural design for IoT for specified requirement	Apply
CO2. Solve the given societal challenge using IoT.	Evaluate
CO3. Design and implement IoT circuits for real time application	Evaluate
CO4. Develop complex IoT circuits	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

1. Definition and characteristics of IoT,
2. Internet of Things: Vision, Emerging Trends, Economic Significance,
3. Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks,
4. IoT communication models, IoT Communication APIs,
5. IoT enabling technologies,
6. IoT levels and deployment templates,
7. IoT Issues and Challenges, Applications

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.L.K.Hema	Professor	ECE	hemalk@avit.ac.in
2	G.Ramachandran	Assistant Professor	ECE	ramachandrang@vmkvec.edu.in

17ECEC01	ADVANCED DIGITAL SYSTEM DESIGN	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE - The course provides an in-depth coverage of systematical development and synthesis of advanced digital integrated circuits with emphasis on Field Programmable Gate Array (FPGA) technology. The course will cover digital hardware system design, digital arithmetic, dynamic partial reconfiguration of FPGA, high level synthesis and functional verification.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To introduce methods to analyze and design synchronous and asynchronous sequential circuits.
2	To introduce the architectures of programmable devices.
3	To introduce design and implementation of digital circuits using programming tools.

COURSE OUTCOMES

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

CO1. Solve the sequential digital circuits	Apply
CO2. Experimentation on Hardware / software co-design (FPGA design)	Apply
CO3. Analyze digital system design using PLD.	Analyze
CO4. Analyze combinational and sequential circuits using VHDL systems.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

SEQUENTIAL CIRCUIT DESIGN

Analysis of clocked synchronous sequential circuits and modeling-State diagram, state table, state table assignment and reduction-Design of synchronous sequential circuits design of iterative circuits-ASM chart and realization using ASM

ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN

Analysis of asynchronous sequential circuit –flow table reduction-races-state assignment-transition table and problems in transition table-design of asynchronous sequential circuit-Static, dynamic and essential hazards –data synchronizers –mixed operating mode asynchronous circuits –designing vending machine controller

FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS

Fault table method-path sensitization method –Boolean difference method-D algorithm -Tolerance techniques –The compact algorithm –Fault in PLA –Test generation-DFT schemes –Built in self test

SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES

Programming logic device families –Designing a synchronous sequential circuit using PLA/PAL –Realization of finite state machine using PLD –FPGA –Xilinx FPGA-Xilinx 4000

SYSTEM DESIGN USING VERILOG

Hardware Modelling with Verilog HDL –Logic System, Data Types and Operators For Modelling in Verilog HDL - Behavioural Descriptions in Verilog HDL –HDL Based Synthesis –Synthesis of Finite State Machines–structural modeling –compilation and simulation of Verilog code –Test bench -Realization of combinational and sequential circuits using Verilog –Registers –counters –sequential machine –serial adder –Multiplier-Divider –Design of simple microprocessor.

REFERENCE BOOKS:

1.Charles H.Roth Jr "Fundamentals of Logic Design" Thomson Learning 2004

2.M.D.Ciletti , Modeling, Synthesis and Rapid Prototyping with the Verilog HDL, Prentice Hall, 1999.

3.M.G.Arnold, Verilog Digital –Computer Design, Prentice Hall (PTR), 1999.

4.Nripendra N Biswas "Logic Design Theory" Prentice Hall of India,2001

5.Parag K.Lala "Digital system Design using PLD" B S Publications,20036.ParagK.Lala "Fault Tolerant and Fault Testable Hardware Design" B SPublications,20027.S. Palnitkar , Verilog HDL –A Guide to Digital Design and Synthesis, Pearson , 2003

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mrs.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in

17ECEC02	PCB & PLC	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

Printed circuit boards are inarguably one of the most influential inventions of the 20th century. Nearly every piece of technology today uses at least one of these devices, and they have played roles in historically significant events like world war II and space travels. To gain an appreciation for PCB technology, let's look at several significant moments in the history of circuit boards.

A Programmable Logic Controller (PLC) is an industrial computer control system that continuously monitors the state of input devices and makes decisions based upon a custom program to control the state of output devices.

PREREQUISITE NIL

COURSE OBJECTIVES

1	To Understand the need for PCB and electronics components.
2	To learn PCB layout design flow and Artwork generation.
3	To obtain knowledge in Etching Soldering and Assembly techniques.
4	To Understand the basic concept of PLC and basic programming.
5	To Earn Knowledge to deploy PLC for varies applications like Timers, Program counters etc.

COURSE OUTCOMES

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

CO1. Appreciate the necessity and evolution of PCB, types and classes of PCB.	Understand
CO2. Apply layout design rules and Artwork generations to prepare for PCB for any specific applications.	Apply
CO3. Interpret varies techniques used in Etching, Soldering process of PCB and components Assembling rules on PCB.	Apply
CO4. Develop varies I/O module, basic PLC programming and design varies types of memory.	Apply
CO5. Design Automation systems for industrial 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	L	-	-	-	-	-	-	-	-	-	S	-	-
CO2	S	M	M	-	M	-	-	-	M	-	-	M	S	M	-
CO3	S	M	M	-	M	-	-	-	M	-	-	M	S	M	M
CO4	S	M	M	-	M	-	-	-	M	-	-	M	S	M	-
CO5	S	M	M	-	M	-	-	M	M	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO PCB: Connectivity in electronic equipment, Evaluation of PCB, Components of PCB, Classification of PCB, Manufacturing of Basic PCB, Challenges in modern PCB Design, PCB with Embedded Components, standards of PCB and useful standards, Basics of Electronic Components – Active and Passive components, Special types of diodes, linear integrated circuits, semiconductor memories, surface mount devices.

LAYOUT PLANNING AND ARTWORK DESIGN: Drawing and diagrams, General PCB Design considerations, Mechanical design considerations, electrical design considerations, Component placement rules, Fabrication and assembly considerations, environmental factors, cooling requirements and packaging density, layout design, Layout design checklist, useful standards. Basic approach to manual Artwork, General design guidelines for Artwork preparations, Automated Artwork generations.

ETCHING, SOLDERING AND ASSEMBLY TECHNIQUES: Etching solutions and chemistry, Etching arrangements, Etching parameters, equipments and techniques, Problems in etching, Theory of soldering, Soldering variables, Soldering materials, Soldering and brazing, soldering tools and other hand soldering tools, PCB assembly process, Mass Soldering. Health and Safety aspects.

INTRODUCTION TO PLC: Programmable Logic Controllers (PLCs): Programmable Logic Controllers, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. PLC Hardware Components - The I/O Section , I/O Modules and Specifications, The CPU, Memory Design and Types, Programming Devices, Recording and Retrieving Data, PLC workstations. Basics of PLC Programming-Processor Memory Organization, Program Scan, PLC Programming Languages and Instructions, Entering the Ladder Diagram, Modes of Operation.

APPLICATIONS OF PLC: Programming Timers-Mechanical Timing Relay and Instructions, Retentive Timer, Cascading Timers. Programming Counters - Counter Instructions and types, Incremental Encoder-Counter Applications, Combining Counter and Timer Functions, Program Control Instructions, PLC Installation Practices. Editing and Troubleshooting.

TEXT BOOKS:

1. Printed Circuit Boards: Design, Fabrication, Assembly and Testing by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi , 2018.
2. Frank D. Petruzella, “Programmable Logic Controllers”, McGraw-Hill Companies, Third Edition, March 2004.

REFERENCE BOOKS:

1. Printed Circuit Boards: Design, Fabrication, and Assembly (McGraw-Hill Electronic Engineering-2006) by Raghbir Singh Khandpur
2. Ian G.Warnock, “Programmable Controller s Operation and Application”, Prentice Hall International, UK, 1992.
3. Electronic Product Design Volume-I by S D Mehta, S Chand Publications
4. John W. Webb and Ronald A.Reis, “Programmable Logic Controllers – Principles and Applications”, III Edition, Prentice Hall Inc., New Jersey, 1995.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.G.SureshKumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in
2	Mr G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in
3	Mr.S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in
4	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
5	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECEC03	SATELLITE COMMUNICATION	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

Electronics and Communication engineer needs to learn about the basics of various types of Communication Systems. This subject also deals with Space & Earth Segment, Broadcasting, Uplink, Downlink and its services.

PREREQUISITE - 17ECCC15 - Analog & Digital Communication

COURSE OBJECTIVES

1	To obtain knowledge on orbital aspects involved in satellite communication.
2	To obtain knowledge on communication establishment in satellite systems.
3	To understand the space segment and earth segment.
4	To obtain knowledge on various Satellite Access methodology
5	To obtain knowledge of Broadcasting using Satellite

COURSE OUTCOMES

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

CO1.Explain the orbital and functional principles of satellite communications system	Understand
CO2.Design, interpret and identify the technologies for satellite communication systems	Apply
CO3. Illustrate the design of space segment and earth segment	Apply
CO4. Demonstrate the various methods of satellite access.	Apply
CO5. Design a various satellite application.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	M	-	-	-	-	-	-	-	-	-	-	M	-	-
CO2	S	S	M	L	M	-	L	-	L	-	-	-	S	M	-
CO3	S	S	M	L	L	-	-	-	-	-	-	L	S	-	-
CO4	S	M	L	-	M	-	-	-	-	-	-	L	S	S	-
CO5	S	S	M	M	S	-	L	-	M	-	M	M	S	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

SATELLITE ORBIT

Satellite orbits: Kepler's laws – Earth satellite orbiting satellite terms-Orbital elements – Orbital perturbations – Inclined Orbits – Sun synchronous orbit. **Constellation:** Geo stationary satellites – Non geostationary constellation – Launching of Geostationary satellites.

LINK DESIGN

EIRP – Transmission Losses – Power Budget equation – System Noise Carrier to noise ratio – Uplink – Downlink –Effects of rain – Inter modulation noise.

SPACE AND EARTH SEGMENT

Space Segment: Power Supply – Altitude control – Station keeping – Thermal Control – TT&C – Subsystems – Antenna subsystem –Transponders – Wideband Receiver. **Earth Segment:** receive only home TV system – Community antenna TV system.

SATELLITE ACCESS

Single Access- Pre assigned FDMA – Demand Assigned FDMA – SPADE system- TWT amplifier operation – Downlink analysis – TDMA – reference bursts – Preamble – Postamble – Carrier recovery – Network synchronization – Pre assigned TDMA – Assigned –CDMA introduction.

BROADCAST AND SERVICES

Broadcast: DBS – Orbital Spacings- Power ratings – Frequency and Polarization – Transponder Capacity – Bit rate – MPEG – Forward Error Correction. ODU-IDU – Downlink Analysis – Uplink – Satellite Mobile services: VSAT–GPS.

TEXT BOOK:

1. Dennis Roddy, "Satellite Communications*",* Tata Mc-Graw Hill Publications, 4th Edition, 2008.

REFERENCE BOOKS:

1. Madhavendra Richharia, Leslie David, "Satellite Systems for Personal Applications Concepts and Technology", Wiley- Blackwell, 2010.
2. Wilbur L.Prichard, Henry G. Suyerhood, Ropert A. Nelson, "Satellite Communication System Engineering", 2nd Edition, Pearson Education, 1993.
3. Pratt, Timothy, Charles W. Bostian, "Satellite Communication", John Wiley and Sons, 2nd Edition, New York, 1986.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.ac.in
2	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
3	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit,.ac.in

17ECEC04	DSP WITH FPGA	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE This course provides the students, the knowledge about implementation of Communication blocks on FPGA. It provides both the fixed point and floating point representation of data used for implementation. It considers algorithms and techniques for the optimal way of implementing the communication system blocks efficiently on FPGA.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To program FPGA device.
2	To discriminate floating point arithmetic for other arithmetic logic.
3	To implement FIR and IIR filters using pipelining and parallel processing
4	To design communication blocks using different types of FFT algorithms

COURSE OUTCOMES

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

CO1. Explore the design flow of FPGA and programming language.	Apply
CO2. Compute simple FPGA logic using floating point arithmetic, MAC and SOP units	Apply
CO3. Implement FIR and IIR Filters using distributed arithmetic, pipelining and/or parallel processing	Apply
CO4. Examine the different types of FFT algorithms including Cooley-Tukey, Winograd and Good-Thomas.	Analyze
CO5. Design communication blocks for modulation, demodulation, convolution codes	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

FPGA Technology

Introduction to FPGA, FPGA Design flow, Programming languages, programming technology

Basic Building Blocks

Number Representation, Binary adders, Binary dividers, Floating point arithmetic, MAC & SOP unit

Digital filter implementation

FIR filter - Theory and structure, Filter Design, Constant coefficient, FIR Design, IIR filter - IIR theory, Coefficient computation, Implementation detail, Fast IIR filter

Fourier Transform

DFT algorithms, Goertzel algorithm, Hartley transform, Winograd DFT, Blustein chirp−z transform, Rader algorithm, FFT algorithms, Cooley-tukey, Good thomas, Winograd FFT

Communication blocks

Error control codes, Linear block code, Convolution codes, Modulation and Demodulation, Adaptive filters, LMS, RLS, Decimator and Interpolator, High Decimation Rate filters.

TEXT BOOKS:

1. Uwe.Meyer-Baese, ―Digital Signal Processing with Field Programmable Gate Arrays‖, Springer, Third edition, May 2007.
2. Keshab K. Parhi, ―VLSI Digital Signal Processing systems, Design and implementation‖, Wiley, Inter Science, 1999.

REFERENCE BOOKS:

1. John G. Proakis, ―Digital Communications,‖ Fourth Ed. McGraw Hill International Edition, 2000.
2. Michael John Sebastian Smith, ― Applications Specific Integrated Circuits‖, Pearson Education, Ninth Indian reprint,13th edition,2004.
3. Sophocles J. Orfanidis, ―Introduction to Signal Processing‖, Prentice Hall, 1996

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.T.Sheela	Assistant Professor	ECE	sheela@vmkvec.edu.in
2	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17ECEC05	RADIO FREQUENCY INTEGRATED CIRCUITS	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

Electronics and Communication engineer needs to learn about the basic wireless principles, RLC network, MOSFET, High frequency amplifier, Low noise amplifier, voltage reference and mixer circuits. Student will be able design radio frequency integrated circuits to be used in many applications.

PREREQUISITE: 17ECCC08 - Electromagnetics And Transmission Lines & Waveguides

COURSE OBJECTIVES

1	To learn the basics of wireless principles, RLC network &Smith Chart
2	To familiarize about MOSFET devices and distributed systems.
3	To study about High Frequency and Low noise amplifier.
4	To study about the voltage and mixers.

COURSE OUTCOMES

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

CO1: Explain the wireless principles, RLC network & smith chart.	Understand
CO2: Explain the MOSFET devices.	Understand
CO3: Examine the performance High frequency amplifier.	Apply
CO4: Estimate the parameters needed for Low noise amplifier design.	Apply
CO5: Explain basic voltage reference circuit and mixers	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	L	S	S	L	L	-	L	-	-	-	L	M	M	-
CO2	S	S	M	M	M	-	M	-	-	-	-	M	S	M	-
CO3	M	M	L	S	M	-	L	M	-	-	-	M	-	M	-
CO4	M	S	S	M	L	S	L	-	-	-	-	M	S	M	-
CO5	L	L	M	M	L	L	S	M	-	-	-	M	M	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO WIRELESS PRINCIPLES, PASSIVE RLC NETWORKS & SMITH CHART

WIRELESS PRINCIPLES: A brief history of wireless systems, Noncellular wireless applications, Shannon, Modulations, Propagation.

PASSIVE RLC NETWORKS: Introduction, Parallel RLC Tank, Series RLC Networks, Other RLC networks, RLC Networks as impedance Transformers.

THE SMITH CHART AND S-PARAMETERS**:** The smith chart, S-parameters, Band Width Estimation Techniques, Open – circuit time constant, Short circuit time constant.

MOS DEVICE PHYSICS & DISTRIBUTED SYSTEMS

Introduction-FETs & MOSFET, MOS device –Operation and characteristics

Distributed Systems: Introduction, Link between lumped and distributed regimes driving-point impedance of iterated structures, Transmission lines, Behavior of Finite – length transmission lines, transmission line equations.

HIGH FREQUENCY AMPLIFIER DESIGN & LOW NOISE AMPLIFIER

HIGH FREQUENCY AMPLIFIER DESIGN: Introduction, Zeros as bandwidth Enhancers, The shunt – series amplifier, Bandwidth Enhancement with fT Doublers, Tuned amplifiers.

LOW NOISE AMPLIFIER **:** Introduction, Derivation of intrinsic MOSFET two-port noise parameters, LNA topologies, Power match versus noise match, Power-constrained noise optimization, large signal performance, Mixer fundamental, Nonlinear systems as linear mixers.

VOLTAGE REFERENCES AND BIASING

Introduction, Review of diode behavior, Diodes and bipolar transistors in CMOS technology, Supply–independent bias circuits, Band gap voltage reference, Noise: Thermal noise, Shot noise, Flicker noise, Popcorn noise, Classical two- port noise theory, Examples of noise calculations, A handy rule of thumb, Typical noise performance.

MULTIPLIER – BASED MIXERS

Multiplier – based mixers, Sub sampling mixers, Diode ring mixers, RF power amplifiers, Introduction, general considerations, Class A, AB, B and C power amplifier, Class D amplifiers, Class E amplifiers Class F amplifiers, Modulation of power amplifiers, RF PA design examples.

TEXT BOOKS:

1. The Design of CMOS Radio-Frequency Integrated Circuits by Thomas H. Lee. Cambridge University Press, 2004.
2. Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.

REFERENCE BOOKS:

1. RF Microelectronics by Behzad Razavi.Prentice Hall, 1997.
2. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Dept	Mail ID
1	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Ms.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in

17ECEC06	MEMS AND SENSORS	Category	L	T	P	Credits
		EC (PS)	3	0	0	3

PREAMBLE

To gain basic knowledge on MEMS (Micro Electro Mechanical System). This enables them to design, analyze, fabricate and test the MEMS based components.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To understand the concepts of basic MEMS structures.
2	To learn about the various MEMS Sensors and its construction.
3	To learn about the micro machining products.
4	To understand the functioning of various optical MEMS Sensors.
5	To study the various applications of MEMS Sensors

Course Outcomes

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

CO1. Understand the basic fabrication of MEMS systems.	Understand
CO2. Design various MEMS sensors for required applications.	Apply
CO3.Apply the different micromachining process in MEMS sensor fabrication.	Apply
CO4. Analyze the light source utilization in MEMS sensors.	Analyze
CO5. Evaluate the various real time applications of MEMS Sensors.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	L	-	-	-	-	-	-	-	-	-	-	-	M	-	-
CO2	S	L	M	-	-	-	-	-	-	-	-	L	S	M	-
CO3	L	S	M	-	L	-	-	-	-	-	-	L	S	S	-
CO4	S	S	S	-	M	-	-	-	-	-	-	L	M	M	-
CO5	S	S	S	-	M	M	M	M	-	-	-	L	S	M	-

S – Strong; M – Medium; L – Low

SYLLABUS

INTRODUCTION

MEMS and Microsystems, Typical products of MEMS and Microsystem products, Micro sensors, Micro actuator, Evolution of Micro fabrication, Microsystems and Microelectronics, MEMS materials.

MICRO SENSORS AND MICROSYSTEMS

Micro sensors- Acoustic wave sensors, Biomedical Sensors and Biosensors, Optical Sensors, Pressure sensors, Micro actuation- Actuation using Thermal Forces, Piezoelectric Crystals, Electrostatic Forces, MEMS with Micro actuators- Micro grippers , Micro motors , Micro valves, Micro accelerometers.

PRINCIPLES OF MICROMACHINING

Introduction, Photolithography, Bulk Micromachining, Thin Film Deposition, Etching, surface Micromachining, LIGA

.

OPTICAL MEMS

Fundamental Principle of MOEMS Technology, Review Properties of Light, Light Modulators, Beam Spliotter, Micro lens, Micro mirrors, Digital Micro mirror Device (DMD),Light Detectors, Grating Light Valve, Optical Switch.

REAL TIME UTILISATION OF MEMS SENSORS

Health Care, Micro fluid Dispenser, Micro needle, Micro pumps, Chem-Lab-On-A-Chip(CLOC), E-Nose, DNA sensors, Surface Acoustic Wave(SAW) Sensors.

TEXT BOOKS:

1. Tai Ran Hsu,” MEMS & Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002. Liu,”MEMS”, Pearson education, 2000.
2. N. P. Mahalik, “MEMS”,Tata McGraw hill, Sixth reprint, 2012.

REFERENCE BOOKS:

1. Stephen Santeria,” Microsystems Design”, Kluwer publishers, 2000.
2. Nadim Maluf,” An introduction to Micro electro mechanical system design”, ArtechHouse, 2000.
3. Mohamed Gad-el-Hak, editor,” The MEMS Handbook”, CRC press Baco Raton, 2000

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in

17ECEC07	RF SYSTEM DESIGN	Category	L	T	P	Credits
		EC (PS)	3	0	0	3

PREAMBLE

Electronics and Communication engineer needs to learn about importance and issues in the design of RF. Student will also study about RF filter, amplifier, active devices, oscillators, mixers, wireless synthesizers and detectors.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To learn the importance and issues in the design of RF
2	To design RF filter and active devices
3	To design RF amplifier design
4	To study about the characteristics of oscillators, mixers, wireless synthesizers and detector

Course Outcomes

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

CO1: Explain the basic RF issues	Understand
CO2: Design and construct the RF filter.	Apply
CO3: Examine the performance of RF diode, BJT and FET's and other active devices.	Apply
CO4: Estimate the parameters needed for RF amplifier design	Apply
CO5: Design oscillator, mixer, wireless synthesizers and detector circuits.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	L	L	S	L	L	-	L	L	-	-	-	M	M	-
CO2	S	L	M	M	M	-	M	-	-	-	-	-	S	S	-
CO3	M	M	L	S	M	-	L	-	-	-	-	-	S	M	-
CO4	M	M	M	M	L	S	L	-	L	-	-	-	S	M	-
CO5	S	L	M	M	L	L	S	M	-	-	-	-	M	M	-

S – Strong; M – Medium; L – Low

SYLLABUS

INTRODUCTION TO RF ISSUES

Importance of RF design- Electromagnetic spectrum, RF behavior of passive components, chip components and circuit board considerations, Examples of Transmission Lines, scattering parameters, smith chart and applications, Network Properties and applications.

RF FILTER DESIGN

Overview, Basic resonator and filter configuration, special filter realizations, smith chart based filter design, coupled filter.

ACTIVE RF COMPONENTS AND MODELLING

RF diodes, BJT, FET'S, High electron mobility transistors, diode models, transistor model, measurement of Active Devices, impedance matching using discrete components, micro strip line matching networks.

RF AMPLIFIER DESIGNS

Characteristics, amplifier power relations, stability considerations, constant gain circles, constant VSWR circles, high power and multistage amplifiers.

OSCILLATORS, MIXERS & APPLICATIONS

Basic oscillator model, High Frequency oscillator configuration, basic characteristic of mixers, wireless synthesizers, detector design.

TEXT BOOKS:

1. Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.
2. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.

REFERENCE BOOKS:

1. Joseph. J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition,2000.
2. Ulrich L. Rohde and David P. NewKirk, RF / Microwave Circuit Design, John Wiley & Sons USA 2000.
3. Roland E. Best, Phase – Locked Loops: Design, simulation and applications, McGraw Hill Publishers 5TH edition 2003

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Dept	Mail ID
1	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in

17ECEC08	MIMO WIRELESS COMMUNICATIONS	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

This course covers the fundamentals of Multiple input multiple output (MIMO) antenna based wireless communication systems. Also it covers important concepts of MIMO communication such as capacity computation, error probability analysis, transmitter and receiver design, multi-user communication, etc.

PREREQUISITE - 17ECCC15-Analog & Digital Communication

COURSE OBJECTIVES

1	To learn the fundamentals of Multiple input multiple output,(MIMO) antenna based wireless communication systems.
2	To Understand the Precoding Design Performance and its applications
3	To analyze the Space–time coding for wireless communications
4	To analyze the concepts in receiver design
5	To apply the concepts in multi user receiver design

COURSE OUTCOMES

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

CO1. Explain the concept of fundamentals of Multiple input multiple outputs, (MIMO) antenna based wireless communication systems.	Understand
CO2. Demonstrate the Precoding Design, Performance and its applications	Apply
CO3. Illustrate Space–time coding for wireless communications	Apply
CO4. Design the receiver systems	Apply
CO5. Illustrate the concepts in multi user receiver design	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION, CAPACITY LIMITS OF MIMO SYSTEMS: MIMO wireless communication, MIMO channel and signal model, A fundamental trade-off, MIMO transceiver design, MIMO in wireless networks, MIMO in wireless standards. Mutual information and Shannon capacity ,Single-user MIMO, Multi-user MIMO, Multi-cell MIMO ,MIMO for ad hoc networks

PRECODING DESIGN: Transmit channel side information, Information-theoretic foundation for exploiting CSIT, A transmitter structure, Precoding design criteria, Linear Precoder designs, Precoder performance results and discussion ,Applications in practical systems.

SPACE–TIME CODING FOR WIRELESS COMMUNICATIONS: Introduction, Background, Space–time coding principles- Space–time code design criteria, Space–time trellis codes (STTC), Space–time block codes (STBC), A new non-linear maximum-diversity quaternionic code, Diversity-embedded space–time codes, Applications, Discussion and future challenges.

FUNDAMENTALS OF RECEIVER DESIGN: Introduction, Reception of uncoded signals, Factor graphs and iterative processing, MIMO receivers for uncoded signals, MIMO receivers for coded signals, Some iterative receivers

MULTI-USER RECEIVER DESIGN: Introduction, Multiple-access MIMO systems, Iterative space–time multi-user detection, Multi-user detection in space–time coded systems, Adaptive linear space–time multi-user detection

TEXT BOOKS:

1. Mimo Wireless Communications,Ezio Biglieri,Robert Calderbank,Anthony Constantinides,Andrea Goldsmith, Arogyaswami Paulraj,H. Vincent Poor, Cambridge University Press 2007

REFERENCE BOOKS:

1. Principles of Mobile Communications by G. Stuber, Springer, Latest ed.

COURSE DESIGNERS

S.No.	Name of the faculty	Designation	Department	E-Mail Id
1	Mr.S.SELVAM	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in
2	Mr.S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in

17ECEC09	RADAR SIGNAL PROCESSING	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

Radar signal processing is gaining importance in various fields including commercial, public safety, defense and weather monitoring. The student should understand the concepts of radar signal processing, detection of radar signals, acquisition of radar signals, measurement and tracking of radar signals and synthetic aperture radar.

PREREQUISITE:- 17ECCC09 - Signal Processing

COURSE OBJECTIVES

1	To introduce the concepts of radar system principles and concept of signal processing in radar systems.
2	To obtain the knowledge of radar signal data acquisition and waveform's
3	To introduce the concepts of Dopplerapplications in radar and radar signal detection principles.
4	To know about different radar signal measurements and tracking
5	To introduce the concept of synthetic aperture imaging and filtering techniques.

COURSE OUTCOMES

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

CO1. Explain the basic principles of radar and signal models.	Understand
CO2. Explain the data acquisition of radar signals; design the radar waveforms and filters of radar systems.	Apply
CO3. Design the pulsed Doppler processing and detections procedures of radar systems.	Apply
CO4. Illustrate the concepts of radar measurements	Apply
CO5 Demonstrate the concepts of synthetic aperture imaging (SAR) and Space-Time Adaptive Processing	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	L	-	-	-	-	-	-	-	-	-	L	S	-	-
CO2	S	S	M	L	L	-	-	-	-	-	-	-	S	S	-
CO3	S	S	L	L	L	-	-	-	L	-	-	-	M	S	-
CO4	S	S	L	M	M	-	-	-	-	-	-	L	M	-	-

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

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to Radar Systems and Signal Processing

History and Applications of Radar, Elements of a Pulsed Radar, Common Threads in Radar Signal Processing, A Preview of Basic Radar Signal Processing, Signal Models, Frequency Models, Spatial Models, Spectral Model

Pulsed Radar Data Acquisition & Radar Waveforms

Pulsed Radar Data Acquisition : Acquiring and Organizing Pulsed Radar Data, Sampling the Doppler Spectrum, Sampling in the Spatial and Angle Dimensions, I/Q Imbalance and Digital I/Q,

Radar Waveforms: The Waveform Matched Filter, Matched Filtering of Moving Targets, The Ambiguity Function, The Pulse Burst Waveform, Frequency-Modulated Pulse Compression Waveforms, Range Sidelobe Control for FM Waveforms, The Stepped Frequency Waveform, The Stepped Chirp Waveform, Phase-Modulated Pulse Compression Waveforms, Costas Frequency Codes, Continuous Wave Radar

Doppler Processing & Detection Fundamentals:

Moving Platform Effects on the Doppler Spectrum, Moving Target Indication, Pulse Doppler Processing, Pulse Pair Processing, Clutter Mapping and the Moving Target Detector, MTI for Moving Platforms: Adaptive Displaced Phase Center Antenna Processing

Radar Detection as Hypothesis Testing, Threshold Detection in Coherent Systems, Threshold Detection of Radar Signals, Binary Integration, Constant False Alarm Rate Detection, system-Level Control of False Alarms

Measurements and Tracking:

Estimators, Range, Doppler, and Angle Estimators, Introduction to Tracking

Introduction to Synthetic Aperture Imaging & Space-Time Adaptive Processing

Introduction to SAR Fundamentals, Stripmap SAR Data Characteristics, Stripmap SAR Image Formation Algorithms, Spotlight SAR Data Characteristics, The Polar Format Image Formation Algorithm, Interferometric SAR,

Spatial Filtering, Space-Time Signal Environment, Space-Time Signal Modeling, Processing the Space-Time Signal, Reduced-Dimension STAP. Advanced STAP Algorithms and Analysis, Limitations to STAP

TEXT BOOK:

1. Fundamentals of Radar Signal Processing, Second Edition, Mark A. Richards, McGraw-Hill, 2014

REFERENCE BOOKS:

1. Merrill I. Skolnik, Introduction to RADAR Systems, Tata McGraw Hill, Third Edition 2001.
2. Steven M.Kay, “Fundamentals of Statistical Signal Processing”, Vol II Detection Theory, Prentice Hall Inc, 1998.

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECEC10	DATA COMPRESSION	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

The course covers the theory of quantization and basic concepts in source coding and applications of the theory and concepts to systems that convert analog or high-rate digital signals into low-rate digital representations with or without loss of fidelity. The concept of source coding is extended to general descriptions of a statistical information source where various data modeling techniques find useful applications.

PREREQUISITE

17ECCC14 - Digital Image Processing

COURSE OBJECTIVES

1	To gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets
2	To select, giving reasons that are sensitive to the specific application and particular circumstance, most appropriate compression techniques for text, audio, image and video information
3	Illustrate the concept of various algorithms for compressing text, audio, image and video information.
4	To know the Image compression standards like GIF, JPEG and JBIG.
5	To acquire the knowledge in audio compression and speech compression like JPEG, MPEG and H.264.

COURSE OUTCOMES

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

CO1. Expose the principle and process of Loss less image compression, Text compression, Audio Compression	Understand
CO2. Determine the Huffman code using various encoding procedure and decoding types in different Applications.	Apply
CO3. Analyze the performance of Binary and Huffman coding in applications of image compression and File Compression with various compression techniques	Analyze
CO4. Characterize the influence of transform coding techniques on image compression	Analyze
CO5.Characterize the influence of transform coding techniques on audio and video compression	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	-
CO2	S	S	S	-	M	-	-	-	-	-	-	M	S	S	-
CO3	S	M	M	M	M	-	-	-	-	-	-	M	S	S	M
CO4	S	S	M	-	M	-	-	-	-	-	-	M	S	M	-
CO5	S	S	S	-	M	-	-	-	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Compression Techniques

Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Loss-less compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

The Huffman coding algorithm

Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Coding

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression- The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move to- front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Image Compression - Facsimile and gray scale compression, GIF, JPEG and JBIG progressive image compression, JBIG2, MH, MR, MMR, Wavelets.

Video Compression and Audio Compression

Motion Compensation, Temporal and Spatial Prediction, MPEG and H.264. Audio Compression - Digital Audio, WAVE Audio Format, ADPCM Audio Compression, Speech Compression, FLAC, MPEG-4 Audio Lossless Coding(ALS), MPEG- 1/2 Audio Layers

TEXT BOOKS:

1. The Data Compression Book – Mark Nelson.
2. Data Compression: The Complete Reference – David Salomon.
3. Khalid Sayood, “Introduction to Data Compression” Fourth Edition, Morgan Kauffmann Publishers, Inc, Newnes, 2012.

REFERENCE BOOK:

1. Introduction to Data Compression – Khalid Sayood, Morgan Kaufmann Publishers.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

17ECEC11	SATELLITE IMAGE ANALYSIS	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

Remote Sensing (RS) refers to the science of identification of earth surface features by measuring portion of reflected or emitted electromagnetic radiation from earth's surface by sensors onboard manmade satellites orbiting around the earth. The output of a remote sensing system is usually an image representing the scene being observed. Many further steps of digital image processing and modeling are required in order to extract useful information from the image. This course deals with various image processing techniques that are applied on satellite images for the purpose of geometric & radiometric correction, enhancement, feature extraction, classification, fusion and compression operations.

PREREQUISITE

17ECCC14 - Digital Image Processing

17ECEC03 - Satellite Communication

COURSE OBJECTIVES

1	To learn the characteristics and statistical analysis of satellite image data.
2	To study the various image enhancement techniques applied for image data for analysis.
3	To learn the different data transformation applied for image analysis.
4	To acquire skills in feature extraction techniques for image analysis.
5	To acquire skills in data fusion and data compression methods for analysis.

COURSE OUTCOMES

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

CO1. Understand the various preprocessing techniques and the nature of the Satellite image using statistical methods.	Understand
CO2. Apply the different Image Enhancement Methods to improve the visual quality of Satellite images for societal benefits.	Apply
CO3. Illustrate the various data transformation techniques.	Apply
CO4. Analyze the performance of Satellite image data using different feature extraction and training Methods using software tools.	Analyze
CO5. Evaluate the Performance of various fusion and Compression Algorithms over Satellite Image	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

Satellite Data
Satellite Image Characteristics, Preprocessing-Geometric Correction, Radiometric Correction Image Statistics - Univariate Statistics, Multivariate Image Statistics and Image Quality statistics.

Satellite Image Enhancement
Radiometric Enhancement-Histogram Based Enhancements, Density Slicing, Stretching, Geometric Enhancement-Neighborhood Operations, Template Operators.

Data Transformation
Spectral Transforms -Multispectral Ratios -Vegetation Indexes, Principal Components, Tasseled-Cap Components, Color-Space Transforms, Spatial Transforms–Convolution, Fourier Transform, Scale Space Transforms.

Image Analysis And Understanding
Feature Extraction-Statistical, Structural, Spectral, Training –Supervised, Unsupervised, Hybrid Training.

Data Fusion
Feature Space fusion, Spatial domain fusion, Scale space fusion, Data Compression- Compression by coding, Fractal Compression, Wavelet Compression.

TEXTBOOKS:

1. Robert A. Schowengerdt, Remote Sensing Models & Methods For Image Processing, III Edition, 2004.
2. J. A. Richards "Remote Sensing Digital Image Analysis: An Introduction", Second Revised Edition, 1993.

REFERENCE BOOKS:

1. Thomas M.Lillesand, Ralph W.Kiefer, "Remote Sensing and Image Interpretation", Fifth Edition, 2004.
2. John R. Jensen, "Remote Sensing Of The Environment –An Earth Resource Perspective", Pearson Education Series, 2003.
3. Rafael C.Gonzalez, Richard E.Woods, "Digital Image Processing" (3rdEdition) Rafael C.Gonzalez, Richard E.Woods, Prentice Hall, 2007.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in
2	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in

17ECEC12	VIDEO PROCESSING	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

The purpose of this course is to provide an insight to the fundamental theory and techniques for efficient representation, processing of video signals and the applications of digital video. This course covers essential topics including motion analysis and video tracking. This provides a formal problem formulation for video tracking and typical challenges that make video tracking difficult. Also it discusses current and emerging applications of video tracking. Also covers video processing applications on such diverse topics as video surveillance, face tracking and recognition from video, motion tracking in medical videos, and using video to assist speech recognition.

PREREQUISITE

17ECCC14 - Digital Image Processing

COURSE OBJECTIVES

1	To learn the basic concepts of video processing
2	To learn about the various methodologies for motion estimation
3	To learn the basic concepts of coding systems
4	To understand about the waveform based video coding techniques
5	To understand about the content dependent and scalable video coding techniques

COURSE OUTCOMES

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

CO1. Express the theory and models in Video Processing.	Understand
CO2. Apply quantitative models of video processing for various engineering applications.	Apply
CO3. Apply video tracking algorithms for intelligent surveillance and medical applications	Apply
CO4. Analyze different background subtraction techniques for different scenario	Analyze
CO5. Analyze to choose sensor based on the 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	M	M	-	-	M	-	-	-	-	-	-	M	S	-	-
CO2	S	M	M	-	M	-	-	-	-	-	-	M	S	-	-
CO3	S	M	M	-	M	-	-	-	-	-	-	M	S	-	-
CO4	S	M	S	M	M	-	-	-	-	-	-	M	S	M	M
CO5	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Video: Analog vs Digital, Analog to Digital, Color models in video- YUV,YIQ,YCbCr,- Types – Component, Composite, S-Video- Analog video – NTSC, PAL, SECAM Interlaced and Progressive Scan, Resolution, Color models in video- YUV,YIQ,YCbCr

Video Compression: Motion Analysis- Motion estimation (Pixel based and block matching based), motion compensation Digital video – Chromo subsampling, CCIR, HDTV- Video Compression Techniques- Basic Video Compression Techniques- Video compression based on motion compensation- MPEG Video Coding I: MPEG 1 and MPEG 2- MPEG Video Coding II: MPEG 4, 7 and 21.

Digital Video Hardware: How cameras work, Refraction, optics, F- Stop, Shutter speed, Depth of field, Digital image sensors- CCD vs CMOS, Manual, auto focus, power requirements, Day and night cameras, Infra red and thermal technologies, Indoor/ Outdoor cameras, Fixed/PTZ/ Moving cameras, CCTV

Motion Segmentation- Background subtraction**,** Identifying region of interest in image sequences, Challenges, background subtraction using color or feature, Pixel level processing, Region level Processing. Frame level processing

Applications – Video Tracking, surveillance- Architecture of Automated video surveillance system- Components o knight multi camera surveillance system medical applications –Robotics and unmanned vehicles **-** Performanc Measures- Sensitivity, Specificity, Precision, Recall- Confusion Matrix

REFERENCE BOOKS:

1. Essential Guide to Video Processing by Al Bovik, Academic Press, 2009
2. Digital Video Surveillance and security by Anthony C Caputo, Elsevier Inc, 2010
3. Video Tracking – Theory and Practice by Emilio Maggio, Andrea Cavallaro, John Wiley and Sons pvt Ltd, 2011
4. Automated Multi camera Video Surveillance Algorithms and Practice, Omar Javed, Mubarak Shah, Springe 2008
5. Intelligent Surveillance Systems by Huihuan Qian, Xinyu Wu, Yangsheng Xu, Springer, 2011

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.D.Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.edu.in

17ECEC13	COMMUNICATION NETWORK SECURITY	Category	L	T	P	Credits
		EC (PS)	3	0	0	3

PREAMBLE

To introduce knowledge about the security issues in network and different algorithms used for digital data communication network.

PREREQUISITE: 17ECCC11 - Data Communication Networks

COURSE OBJECTIVES

1	To understand the basic encryption standards.
2	To understand the advanced encryption methodologies.
3	To understand the knowledge of basic functioning of encryption algorithms.
4	To understand the concept of guided data security.
5	To understand the functioning of wireless data security.

COURSE OUTCOMES

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

CO 1. Understand the basic protocols in data security.	Understand
CO 2. Apply different encryption standards in data security.	Apply
CO 3. Design new algorithms for data security through multiple functions.	Apply
CO 4. Design different security practice for data communication.	Apply
CO 5. Analyze the issues in wireless security.	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	PSO2	PSO3
CO1	M	L	-	-	-	L	-	-	-	-	-	-	M	M	-
CO2	S	S	L	-	-	L	-	-	-	-	-	L	S	M	-
CO3	L	S	S	S	-	L	-	S	L	-	-	M	S	S	-
CO4	M	S	S	-		L	-	S	S	-	-	L	M	-	M
CO5	L	L	M	L	S	L	-	-	L	-	-	S	M	M	-
CO6															

S – Strong; M – Medium; L – Low

SYLLABUS

DATA ENCRYPTION STANDARD

Services – Mechanisms and Attacks – OSI security Architecture – Model for Network Security – Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines– Stenography – Block Ciphers and Data Encryption Standard – Simplified DES – Block Cipher Principles, Data Encryption Standard – Strength of DES – Differential and Linear Crypt Analysis, Block Cipher Design Principles – Block Cipher Modes of Operation

ADVANCED ENCRYPTION STANDARD

Advanced Encryption Standard – Evaluation Criteria for AES, AES Cipher– Contemporary Symmetric Ciphers – Triple DES, Blowfish, RC5 – Characteristics of Advanced Symmetric

Block Ciphers – RC4 Stream Cipher – Confidentiality using Symmetric Encryption – Placement of Encryption Function – Traffic Confidentiality – Key Distribution and Random Number Generation.

PUBLIC KEY ENCRYPTION AND HASH FUNCTIONS

Public Key Cryptography and RSA – Principles of Public Key Cryptosystems – RSA Algorithm – Key Management and other public key cryptosystems – Key Management– Diffie–Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Message Authentication and Hash Functions – Authentication Requirements – Authentication Functions – Message Authentication Codes – Hash Functions and MACs; Hash Algorithms – MD5 Message Digest Algorithm, Secure Hash Algorithm RIPEMD 160, HMAC– Digital Signatures and Authentication Protocols – Digital Signature Standards.

NETWORK SECURITY PRACTICE

Authentication Applications – Kerberos – X.509 Authentication Service– Electronic Mail Security – Pretty Good Privacy – S/MIME– IP Security – IP Security Overview– IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Web Security – Web Security Considerations – Secure Sockets Layer and Transport Layer Security – Secure Electronic Transaction.

WIRELESS NETWORK SECURITY

Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS. WEP for Wi-Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor.

TEXT BOOKS:

1. William Stallings, "Network Security Essentials", 2nd edition, Prentice Hall of India New Delhi, 2004.
2. Charlie Kaufman, "Network Security Private Communication in Public World" 2nd edition, Prentice Hall of India New Delhi, 2004..

REFERENCE BOOKS:

1. William Stallings, "Cryptography and Network Security", 3rd edition, Prentice Hall of India, New Delhi, 2004.
2. R. K. Nichols and P. C. Lekkas ," Wireless Security" Mc Graw Hill 2002.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in

17ECEC14	NETWORK MANAGEMENT	Category	L	T	P	Credits
		EC (PS)	3	0	0	3

PREAMBLE

To understand the principle functioning of network management and challenges pertaining to the management of emerging network technologies.

PREREQUISITE: 17ECCC11 – Data Communication Networks

COURSE OBJECTIVES

1	To understand the need for interoperable network management.
2	To learn to the concepts and architecture behind standards based network management.
3	To understand the concepts and terminology associated with SNMP and TMN.
4	To understand network management as a typical distributed application.
5	To study the current trends in network management technologies.

COURSE OUTCOMES

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

CO1	Acquire the knowledge about network management standards (OSI and TCP/IP)	Understand
CO2	Acquire the knowledge about various network management tools and the skill to use them in monitoring a network	Apply
CO3	Analyze the challenges faced by Network managers	Analyze
CO4	Analyze various commercial network management systems and open network management systems.	Analyze
CO5	Analyze and interpret the data provided by NMS and take suitable actions.	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	PSO2	PSO3
CO1	S	L	-	-	L	-	-	-	-	-	-	M	S	M	M
CO2	M	S	L	-	L	-	-	-	-	-	-	-	M	M	-
CO3	M	S	S	M	M	-	-	M	-	-	-	-	S	S	-
CO4	S	M	S	M	S	-	-	-	-	-	M	L	M	-	-
CO5	S	S	M	S	S	-	-	S	-	L	M	-	M	M	-

S – Strong; M – Medium; L – Low

SYLLABUS

Fundamentals of Computer Network Technology.

Network Topology, LAN, Network node components- Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN Transmission Technology, Communications protocols and standards. Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network

OSI Network Management

OSI Network Management Model-Organizational Model-Information Model, Communication Model. Abstract Syntax Notation - Encoding structure, Macros Functional model CMIP/CMIS

Internet Management (SNMP)
SNMP(V1 and V2)-Organizational model-System Overview, The information model, communication model-Functional model, SNMP proxy server, Management information, protocol remote monitoring, RMON SMI and MIB, RMON1,RMON2 - A Case Study of Internet Traffic Using RMON.

Broadband Network Management
Broadband networks and services, ATM Technology-VP,VC, ATM Packet, Integrated service, ATMLAN emulation, Virtual LAN. ATM Network Management-ATM Network reference model, integrated local management Interface. ATM Management Information base, Role of SNMD and ILMI in ATM Management, M1, M2, M3, M4 Interface. ATM Digital Exchange Interface Management- , TMN conceptual Model- TMN Architecture, TMN Management Service Architecture.

Network Management Applications
Configuration management, Fault management, performance management, Event Correlation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management- Network Management Tools, Network Statistics Measurement Systems – Web Based Management, XML Based Network Management - : Future Directions.

TEXT BOOKS:

1. Mani Subramanian, “Network Management Principles and practice ", Pearson Education, New Delhi, 2012.

REFERENCE BOOKS:

1. Stallings, William, “SNMP, SNMPv2, SNMPv3, and RMON 1 and 2,” Pearson Education, 2012.
2. Morris, “Network management”, 1st Edition, Pearson Education, 2008.
3. Lakshmi G. Raman, “Fundamentals of Telecommunication Network Management ", Eastern Economy Edition IEEE Press, New Delhi, 1999.
4. Mark Burges, “Principles of Network System Administration”, 1st Edition, Wiley Dream Tech, 2008.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in

17ECEC15	HIGH PERFORMANCE COMMUNICATION NETWORKS	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

Electronics and Communication engineer needs to learn about the various types of network model. Student will learn about the congestion and traffic management for developing an efficient communication network. Also the basic principles, laws and different protocols needed for a high performance communication networks.

PREREQUISITE: -17ECCC11 - Data Communication Networks

COURSE OBJECTIVES

1	To understand the basics of High Speed Networks and its working principles. Also its applications
2	To learn about congestion, traffic management algorithms and its management.
3	To impart knowledge on various types of interior and exterior routing protocols.
4	To learn various types of Services and its application.
5	To understand protocols used for QoS Support.

COURSE OUTCOMES

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

CO1: Explain various network models and Demonstrate the ATM Services.	Understand
CO2: Explain the Fiber Channel and Wireless LAN.	Understand
CO3: Apply the concepts of Congestion control and traffic management for effective communication.	Apply
CO4:Analyzing the various protocols and its application in communication	Analyze
CO5: Examine various Integrated and Differentiated Services.	Analyze
CO6: Illustrate different protocols for providing effective QoS.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

HIGH SPEED NETWORKS

Network Models, Categories of Networks, Internetwork, Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs

CONGESTION AND TRAFFIC MANAGEMENT

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

INTERIOR AND EXTERIOR ROUTING PROTOCOL

Interior Routing Protocol-Internet Routing Principles, Distance Vector Protocol, Exterior Routing Protocol -Link state Protocol, Path Vector Protocols-BGP and IDRP, Multicasting.

INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

PROTOCOLS FOR QoS SUPPORT

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TEXT BOOKS:

1. William Stallings, "High Speed Networks and Internet", Pearson Education, Second Edition, 2002.
2. Behrouz A Forouzan, "Data Communications and Networking;, Tata McGraw Hill Private Limited, Fourth Edition.

REFERENCE BOOKS:

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Ms. R. Mohanapriya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in

17ECEC16	WIRELESS AD-HOC AND SENSOR NETWORKS	Category	L	T	P	Credits
		EC (PS)	3	0	0	3

PREAMBLE

To learn the concepts behind Wireless ADHOC, Data transmission in MANET and Sensor Networks.

PREREQUISITE: 17ECCC11 - Data Communication Networks

COURSE OBJECTIVES

1	To understand the concepts of sensor networks.
2	To understand the MAC and transport protocols for ADHOC networks.
3	To learn about Wireless sensor Network and data retrieval in WSN.
4	To understand the security of sensor networks.
5	To understand and learn about Sensor Network Platforms And Tools.

Course Outcomes

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

CO1. Enumerate the basic operating procedure of ADHOC networks.	Understand
CO2. Examine the standards in the established networks and able to redefine the standards for requirements.	Analyze
CO3. Assess the network about its data transmission and retrievals in wireless networks.	Analyze
CO4.Develop new standards for securing the data	Evaluate
CO5. Evaluate the various operating platform for wireless sensor networks	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	S	-	-	-	-	-	-	-	-	-	-	M	-	-
CO2	S	M	S	L	-	-	-	-	-	-	-	L	M	S	-
CO3	L	S	M	-	L	M	L	-	-	-	-	L	-	-	-
CO4	S	S	S	M	M	-	-	-	-	-	-	S	-	S	-
CO5	S	S	S	M	M	-	-	-	-	-	-	S	-	S	-

S – Strong; M – Medium; L – Low

SYLLABUS

INTRODUCTION

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges. Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

DATA TRANSMISSION IN MANET AND STANDARDS FOR WLAN, WPAN

Data Transmission In MANETs-The Broadcast Storm, Multicasting, Geocasting- IEEE 802.11 Standard for Wireless LANs , IEEE 802.15 Working Group for WPANs , IEEE 802.15.3, IEEE 802.15.4 , WLANs versus WPANs..

WIRELESS SENSOR NETWORK

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design issues, Energy consumption, Clustering of Sensors, Applications

Data Retrieval In Sensor Networks: Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

SECURITY IN WSN

Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems. Sensor Network Platforms and Tools: Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Network Hardware. Sensor Network Programming Challenges. Node- Level Software Platforms, Operating System – Tiny0S: Imperative Language: nesC. Dataflow style language: TinyGALS. Node Level Simulators. NS-2 and its sensor network extension. TOSSIM.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks — Theory and Applications, Car/osCorderlo Dharma R Aggarwal, World Scientific Publications /Cambridge University Press, March 2006.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009..

REFERENCE BOOKS:

1. Adhoc Wireless Networks — Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
2. Wireless Sensor Networks — Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010
3. Wireless Ad hoc and Sensor Networks — Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2007, rp 2010.
4. Security in Ad hoc and Sensor Networks, Raheem Beyah, et al., World Scientific Publications / Cambridge University Press, 2010.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mr.C.Arunkumar Madhuvappan	Assistant Professor	ECE	arunkumarmadhuvappan@vmkvec.edu.in

17ECEC17	ELECTROMAGNETIC INTERFERENCE & COMPATIBILITY	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

All systems that generate or consume electrical energy can produce electromagnetic noise that may interfere with the operation of the system itself and/or other systems. Electromagnetic interference (EMI) is a potential threat to the present day electronic devices.

PREREQUISITE

17ECCC08 - Electromagnetics and Transmission Lines & Waveguides

COURSE OBJECTIVES

1	To impart concepts of electromagnetic interference and electromagnetic compatibility
2	To distinguish various electromagnetic interference coupling principles
3	To get familiarize with several electromagnetic interference control techniques
4	To analyze the electromagnetic compatibility issues related to the design of PCBS

COURSE OUTCOMES

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

CO1. Demonstrate the concept of EMI / EMC related to product design & development.	Apply
CO2. Distinguish the different EM coupling principles and its impact on performance of electronic system	Analyze
CO3. Organize the electromagnetic interferences using the concepts of both susceptibility and immunity	Analyze
CO4. Analyze various EM compatibility issues with regard to the design of PCBs and ways to improve the overall system performance	Analyze
CO5. Examine the electromagnetic interference measurements and standards	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

EMI / EMC Concepts

EMI-EMC definitions and Units of parameters; Sources and victim of EMI; Conducted and Radiated EMI Emission and Susceptibility; Transient EMI, ESD; Radiation Hazards.

EMI Coupling Principles

Conducted, radiated and transient coupling; Common ground impedance coupling; Common mode and ground loop coupling; Differential mode coupling; Near field cable to cable coupling, cross talk ; Field to cable coupling ; Power mains and Power supply coupling.

EMI Control Techniques

Shielding- Shielding Material-Shielding integrity at discontinuities, Filtering- Characteristics of Filters-Impedance and Lumped element filters-Telephone line filter, Power line filter design, Filter installation and Evaluation, Grounding- Measurement of Ground resistance-system grounding for EMI/EMC-Cable shielded grounding, Bonding, Isolation transformer, Transient suppressors, Cable routing, Signal control. EMI gaskets

EMC Design of PCBs

EMI Suppression Cables-Absorptive, ribbon cables-Devices-Transient protection hybrid circuits, Component selection and mounting; PCB trace impedance; Routing; Cross talk control- Electromagnetic Pulse-Noise from relays and switches, Power distribution decoupling; Zoning; Grounding; VIAs connection; Terminations.

EMI Measurements and Standards

Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Tx /Rx Antennas, Sensors, Injectors / Couplers, and coupling factors; EMI Rx and spectrum analyzer; Civilian standards-CISPR, FCC, IEC, EN; Military standards-MIL461E/462. Frequency assignment - spectrum conversation. British VDE standards, Euro norms standards in japan - comparisons. EN Emission and Susceptibility standards and Specifications.

REFERENCES:

1. V.P.Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, Newyork, 1996.
2. Henry W.Ott.,"Noise Reduction Techniques in Electronic Systems", A WileyInter Science Publications, John Wiley and Sons, Newyork, 1988.
3. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3rd Ed, Artech house, Norwood, 1986. C.R.Paul,"Introduction to Electromagnetic Compatibility", John Wiley and Sons, Inc, 1992.
4. Don R.J.White Consultant Incorporate, "Handbook of EMI/EMC", Vol I-V,198
5. http://www.nptel.ac.in/courses/117101057/

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.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17CSCC04	COMPUTER ARCHITECTURE	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE:

This course is dedicated to number system, logic design, and memory and processing. This is the only course that is concerned with the hardware of a computer, its logic design and organization. It aims at making the student familiar with digital logic and functional design of arithmetic and logic unit that is capable of performing floating point arithmetic operations.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To learn about the design of the processors.
2	To learn about the data transfer.
3	Understand the functional units of a computers, bus structures and addressing modes.
4	Apply the knowledge of algorithms to solve arithmetic problems.

COURSE OUTCOMES

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

CO1 Explain about computer organization components.	Understand
CO2 Compute simple arithmetic operations for fixed-point and floating-point addition, subtraction, multiplication & division.	Apply
CO3 Design combinational and sequential digital functions.	Analyse
CO4 Construct an instruction set capable of performing a specified set of operations.	Analyze
CO5 Demonstrate a memory system for a given set of specifications	Analyze
CO6 Explain pipelining concepts	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	M	-	-
CO2	M	M	M	M	-	-	-	-	-	-	-	L	M	-	-
CO3	M	M	S	M	-	-	-	-	-	-	-	-	M	-	-
CO4	S	M	M		-	-	-	-	-	-	-	-	M	-	M
CO5	S	-	M	L	-	-	-	-	-	-	-	-	M	-	M
CO6	M	M	M	S	-	-	-	-	-	-	-	L	M	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Computer Organization- Main memory – CPU operation – Interrupt concept – I/ O techniques – Bus concept – Computer performance factors – System performance measurement- High performance techniques – Comparison of Architecture and Organization – Study of Salient features and architectures of Advanced processors (80286, 80386, 80486, Pentium).

PROCESSOR DESIGN AND CONTROL UNIT

Goals – Design process –Data path organization – Main memory interface – Data path for single instructions- Floating point unit data path – Role of control unit – Reset sequence – Interrupt recognition and servicing – Abnormal situation handling – Hardwired control unit – Micro programmed control unit.

MEMORY DESIGN & MEMORY MANAGEMENT

Memory types – Functional and usage modes – Memory allocation- Multiple memory decoding – Memory hierarchy – Instruction pre fetch – Memory interleaving – Write buffer – Cache memory –Virtual memory – Associative memory.

INTRA SYSTEM COMMUNICATION AND I/O

I/O controller & driver- Case study: Hard disk controller in IBM PC – I /O ports and bus concepts – Case study: Keyboard interface – Bus cycle – Asynchronous and Synchronous Transfer – Interrupt handling in PC – I/O techniques in PC – Case Study : RS 232 interface – Modern serial I/O interface – Bus arbitration techniques – Hard disk interface in PC.

ADVANCED ARCHITECTURE

Classification of parallelism – Multiple functional units – Pipelining – Vector computing – array processors –High performance architecture – RISC systems – Super scalar architecture – VLIW architecture – EPIC architecture – Multiprocessor systems – Cache coherence problem – Fault tolerance.

TEXT BOOKS:

1. William Stallings, “Computer Organization And Architecture – Designing For Performance”, Sixth Edition, Pearson Education, 2007.

REFERENCES:

2. Govindarajulu, “Computer Architecture and Organization – Design principles and applications” , Tata McGraw Hill publications, New Delhi.
3. David A. Patterson And John L. Hennessy, “Computer Organization And Design: The Hardware/Software Interface”, Fifth Edition, Morgan Kaufmann, 2013.
4. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 1998.
5. A.K.Ray & K.M.Bhurchandi, “Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing”, McGraw-Hill Education (India), 2013 reprint.

COURSE DESIGNERS

S. No.	Name of the faculty	Designation	Department	Mail Id
1.	Mr. G. Seenivasan	Assistant. Professor	CSE	seenivasan@vmkvec.edu.in
2.	Mrs. S.Leelavathy	Assistant. Professors (GII)	CSE	leelavathy@avit.ac.in

17ECEC18	SDR & COGNITIVE RADIO	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

To enable the student to understand the emerging technologies of Software Defined Radio (SDR) and Cognitive radio

PREREQUISITE – 17ECCC15 – Analog & Digital Communication

COURSE OBJECTIVES

1	To learn about the basics of SDR
2	To understand the basics of Cognitive Radio
3	To discuss about the implementation and design issues in SDR
4	To analyze and design issues in Cognitive Radio

COURSE OUTCOMES

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

CO1. Understand the characteristics, benefits and design of SDR	Understand
CO2. Demonstrate the profile and radio resource management of SDRs	Apply
CO3. Apply the concept of Cognitive radio and analyze the spectrum issues	Apply
CO4.Illustrate the cognitive radio communication techniques and algorithms	Apply
CO5. Demonstrate about the Cognitive Radio Network theory	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	S	L	M	M	-	L	-	L	L	-	S	-
CO2	S	S	L	L	L	M	M	-	L	-	L	L	-	S	-
CO3	S	S	M	S	L	M	M	-	M	-	L	L	M	S	-
CO4	S	S	L	L	M	M	L	-	M	-	L	L	M	M	-
CO5	S	S	L	S	M	M	L	-	M	-	L	L	-	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO SDR'S

The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End

Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

SDR - PROFILE AND RADIO RESOURCE MANAGEMENT:
Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile , Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure, XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Classmarks, Dynamic Classmarks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data

COGNITIVE RADIO COMMUNICATION: SPECTRUM ISSUES
Radio frequency spectrum &regulation: Spectrum Nature's Communication Highway- Regulatory History & Successes-Emerging Regulatory Challenges & Actions-Regulatory Issues of Cognitive Access-Spectrum Measurements and Usage-Applications for Spectrum Occupancy Data.

COGNITIVE RADIO COMMUNICATION TECHNIQUES & ALGORITHMS
Agile transmission techniques: Wireless Transmission for Dynamic Spectrum Access-Noncontiguous Orthogonal Frequency Division Multiplexing- NCOFDM based Cognitive Radio: Challenges and Solutions
Reconfiguration, Adaptation & Optimization: Adaptation Engine-Operating Parameters-Operating Parameters- Cognitive Adaptation Engines.

COGNITIVE RADIO NETWORK THEORY
Cognitive Radio Network Architectures-Topology-Aware CRN Architectures-Publish-Subscribe CRN Architecture

TEXTBOOKS:

1. Markus Dillinger, Kambiz Madani, "Software Defined Radio Architecture System and Functions", WILEY 2003.
2. Walter Tuttle Bee, "Software Defined Radio: Enabling Technologies", 2002, Wiley Publications.
3. Alexander M. Wyglinski, Maziar Nekovee, Y. Thomas Hou,"Cognitive Radio Communications and Networks Principles and Practice", Academic Press ,Elsevier Inc.,2010.

REFERENCE BOOKS:

1. Jeffrey H. Reed, "Software Radio: A Modern Approach to Radio Engineering", 2002, PEA Publication.
2. Paul Burns, "Software Defined Radio for 3G", 2002, Artech House.
3. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio: Architectures, Systems and Functions", 2003, Wiley.
4. Walter Tuttlebee, "Software Defined Radio: Enabling Technologies", John Wiley & Sons, Ltd, 2002.
5. Bruce A. Fette, "Cognitive Radio Technology", Newnes, Elsevier Inc., 2006.
6. Kwang-Cheng Chen, Ramjee Prasad, "Cognitive Radio Networks", John Wiley and Sons,

2009.
7. Huseyin Arslan (Ed.), “Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems", Springer, Khattab-Cheng Chen,Perkins,Dmitri,Bayoumi,Magdy, “Cognitive Radio Networks-From Theory to Practice", Springer Series:Analog Circuits & Signal processing,2009.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Dept	Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
3	Ms.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in
4	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in

17ECEC19	ISDN	Category	L	T	P	Credit
		EC (PS)	3	0	0	3

PREAMBLE

Electronics and Communication engineer needs to learn about the basic OSI model. Student will also study about ISDN standard and services. Student will learn about the congestion and traffic management for developing an efficient communication network. Also the different protocols needed for ISDN and Broadband ISDN.

PREREQUISITE: 17ECCC15 - Analog & Digital Communication

COURSE OBJECTIVES

1	To learn about the basic ISDN Standards and Services
2	To Study the ISDN architecture and signaling
3	To familiarize study the Broadband ISDN
4	To study about network traffic Management
5	To analyze network performance modeling and estimation.

COURSE OUTCOMES

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

CO1: Explain the basic ISDN standards. And services	Understand
CO2: Explain the ISDN architecture and signaling.	Understand
CO3: Apply the concepts of Congestion control and traffic management for effective communication.	Apply
CO4: Examine the ATM network traffic and its management to get efficient service.	Analyze
CO5: Explain various Queuing Analysis.	Apply
CO6: Calculate the parameters of network.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

ISDN – STANDARDS AND SERVICES

Switching technologies and OSI Model, ISDN channels, access interfaces, functional devices and standards, ISDN services and attribute.

ISDN PROTOCOL ARCHITECTURE AND SIGNALING

Physical layer protocol, D-channel data link layer and layer 3 protocols, Network signaling systems, SS7 protocol –architecture and services, ISDN products, Switches, Multiplexers, Terminal adapters, ISDN chip sets.

BROAD BAND ISDN

Frame Relay – concepts, protocols, applications and products, asynchronous transfer mode – concepts, protocols, application and products, switched multi-megabit data service, Internet protocol over ISDN frame relay and ATM.

NETWORK TRAFFIC MANAGEMENT

ATM traffic and congestion control, Traffic management framework, control mechanism and attributes, ABR traffic management, GFR traffic management.

NETWORK PERFORMANCE MODELING AND ESTIMATION

Queuing analysis, single server and multi-server queues, Networks of Queues, Estimating model parameters, Self-similar traffic – performance implication, modeling and estimation

TEXT BOOKS

1. Gary C. Kesslar and Peter Southwick, "ISDN – concepts, facilities and services", McGraw Hill, 3rd Edition, 1997.
2. Behrouz A Forouzan,"Data Communications and Networking; ,Tata McGraw Hill Private Limited, Fourth Edition,2012

REFERENCE BOOKS

1. Balaji Kumar, "Broad Band Communications" McGraw-Hill, 1995.
2. William Stallings, "High Speed Networks and Internet", Pearson Education, Second Edition, 2002.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Dept	Mail ID
1	Dr. D. Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
3	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
4	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

17ECEC20	ROBOTICS AND AUTOMATION	Category	L	T	P	Credit
		EC(PS)	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 - Nil

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. Demonstrate 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. Exhibit the static force and dynamic model of two degrees of freedom planar robot arm	Apply
CO4. Organize a trajectory in joint space using polynomial and trigonometric functions with given kinematic constraints of multi-degree of freedom (DOF) manipulator	Analyze
CO5. Experiment a offline robot 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	S	-	-	-	-	-	-	-	M	-	-	M	S	M	-
CO2	S	M	M	-	-	-	-	-	M	-	-	M	S	M	-
CO3	S	M	M	-	-	-	-	-	M	-	-	M	S	M	-
CO4	S	M	M	-	M	-	-	-	M	-	-	M	S	M	-
CO5	S	M	M	-	M	-	-	-	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, manoeuvrability 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 two DOF planar 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.

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.

Robot Programming- Manual Programming – Teach Pendant, Offline programming - VAL programming, Online Programming. Case Studies.

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. 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

17ECEC21	ADVANCED ROBOTICS	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE Advanced Robotics will explore in great depth areas relevant to not only industrial robotics but service robots (i.e. robots outside a factory environment particularly mobile robots) and the application of this technology to real world environments e.g. driverless vehicles, unmanned aerial vehicles and tele-robots. Students will also master robot kinematics and dynamics.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To gain knowledge in robotic elements
2	To explore the kinematics of serial and parallel robotics
3	To know the motion of robot in various coordinates and surfaces

COURSE OUTCOMES

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

CO1. Illustrate the kinematics of parallel robotics	Apply
CO2. Examine about the kinematics of serial robot such as the direct and inverse kinematic problems	Apply
CO3. Discriminate various robotic elements like sensors and actuators	Analyze
CO4. Investigate the motion of robot in various coordinates	Analyze
CO5. Explore the motion of robot in several surfaces like flat surface, uneven terrain	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	S	-	-
CO2	S	M	-	-	-	-	-	-	-	-	-	M	S	-	-
CO3	S	S	S	-	-	-	-	M	-	-	-	M	S	-	-
CO4	S	S	S	-	-	-	-	M	-	-	-	M	S	M	-
CO5	S	S	S	-	-	-	-	M	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Elements of robots -- joints, links, actuators, and sensors

Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge based force-torque sensors, proximity and distance measuring sensors, and vision.

Kinematics of serial robots

Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Tractrix based approach for fixed and free robots and multi-body systems, simulations and experiments, Solution procedures using theory of elimination, Inverse kinematics solution for the general 6R serial manipulator.

Kinematics of parallel robots

Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Closed-from and numerical solution, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

Motion planning and control

Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.

Modeling and analysis of wheeled mobile robots

Introduction and some well known wheeled mobile robots (WMR), two and three-wheeled WMR on flat surfaces, Slip and its modeling, WMR on uneven terrain, Design of slip-free motion on uneven terrain, Kinematics, dynamics and static stability of a three-wheeled WMR's on uneven terrain, Simulations using Matlab and ADAMS.

Reference Books

1. Ghosal, A., Robotics: Fundamental Concepts and Analysis, Oxford University Press, 2nd reprint, 2008.
2. Fu, K., Gonzalez, R. and Lee, C.S. G., Robotics: Control, Sensing, Vision and Intelligence¸McGraw- Hill, 1987.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.L.K.Hema	Professor	ECE	hemalk@avit.ac.in
2	N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in
3	G.Murali	Assistant Professor	ECE	muraligvmkvec@vmkvec.edu.in

17ECEC22	INNOVATIVE PROJECT	Category	L	T	P	Credit
		EC(PS)	0	0	6	3

PREAMBLE

This course is an introductory course on Project. It focuses on providing you with the knowledge and fundamental understanding of Creativity, Innovation, and some contemporary approaches to innovation including design thinking.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To Develop Creativity and Innovation
2	To Recognize the significance of innovation
3	To Examine the approaches of innovation practiced by various organizations

COURSE OUTCOMES

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

CO1. Discuss both individual and contextual factors that are linked to creativity	Analyze
CO2. Discuss key concepts and principles that guide innovative practices	Analyze
CO3. Discuss the need for and significance of adopting a design thinking mindset	Analyze
CO4. Explain design thinking practices and their applications	Create
CO5. Develop the design thinking principles and process	Evaluate

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

S- Strong; M-Medium; L-Low

Norms

1.Group Case Studies/Assignments

a. Overall understanding of the case/assignment

b. Highlighting innovations and various approaches adopted

c. Clarity and coherence of presentation

2.Group Project

a. Overall, application of Innovation and Design thinking process

b. Originality of ideas from the modernization

c. Quality and relevance of final prototype

d. Preparation of Project Report

e. Preparation and Submission of Projects to funding agencies.(Optional)

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Dept	Mail ID
1	Dr.T.Muthumanickam	Professor	ECE	muthumanickam@vmkvec.edu.in
2	Dr. L. K. Hema	Professor	ECE	hemalk@avit.ac.ins
3	Mr. S. Selvaraj	Professor	ECE	selvaraju@vmkvec.edu.in
4	Dr. D. Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in

17ECEC23	MACHINE VISION	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

In the current automated world, Machine Vision plays a major role in several significant applications such as imaging-based automatic inspection and analysis, Intelligent transportation system, Logistics, Robot guidance, Packaging industries and many. It provides an detailed view of the various process involved.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	To understand the Image filtering operations, Morphological operationsThreholding Images.
2	To determine the concepts of Binary shape & Boundary Pattern analysis, Detection & Pattern matching techniques.
3	To examine the concepts of 3-D Vision, Image Transformations & Motion.
4	To illustrate the automated visual inception, in vehicle vision systems, inspection of cereal grains & surveillance.

COURSE OUTCOMES

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

CO1.Intrepret the Low Level Vision techniques and methods of Machine Vision	Understand
CO2.Demonstrate the Intermediate Level Vision techniques.	Apply
CO3.Paraphase the 3-D Vision and Motion procedures.	Apply
CO4.Infer the various Real-Time Pattern Recognition systems.	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	M	L	-	-	-	-	-	-	-	-	S	M	-
CO2	S	S	M	L	-	-	-	-	-	-	-	-	S	M	-
CO3	S	S	M	L	-	-	-	-	-	-	-	-	S	M	-
CO4	S	S	S	M	-	-	-	-	-	-	-	-	S	S	-

S- Strong; M-Medium; L-Low

SYLLABUS:

LOW-LEVEL VISION

Images and Imaging Operations, Basic Image Filtering Operations, Thresholding Techniques, Edge Detection, Corner and Interest Point Detection, Mathematical Morphology, Texture

INTERMEDIATE-LEVEL VISION

Binary Shape Analysis, Boundary Pattern Analysis , Line Detection, Circle and Ellipse Detection, The Hough Transform and Its Nature, Pattern Matching Techniques

3-D VISION AND MOTION

The Three-Dimensional World, Tackling the Perspective n-point Problem, Invariants and Perspective, Image Transformations and Camera Calibration, Motion

REAL-TIME PATTERN RECOGNITION SYSTEMS

Automated Visual Inspection, Inspection of Cereal Grains, Surveillance, In-Vehicle Vision Systems, Statistical Pattern Recognition, Image Acquisition, Real-Time Hardware and Systems Design Considerations

TEXT BOOK

1. Computer and Machine Vision: Theory, Algorithms, Practicalities,E.R.Davies,Fourth Edition,2012,Academic Press, Elsevier

REFERENCE BOOKS

1. Computer Vision: Algorithms and Applications, Richard Szeliski,Springer,2010
2. Machine Vision Algorithms and Applications, C Steger, M Ulrich Christian Wiedemann, Wiley-VCH, 2007, ISBN: 3527407340.
3. Hands-On Algorithms for Computer Vision, Amin Ahmadi Tazehkandi, Packt, 2018, ISBN:9781789130942

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Dr. D. Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in
2	Mr. P. Subramanian	Associate Professor	ECE	subramanian@avit.ac.in
3	Dr.T.Muthumanickam	Professor	ECE	muthumanickam@vmkvec.edu.in

17ECSE01	ADVANCED PROCESSORS	Category	L	T	P	Credit
		EC (SE)	3	0	0	3

PREAMBLE

Microcontroller is used as the main controller in most of the embedded systems nowadays. Due to the development in VLSI technology, microcontrollers evolve which function similar to microprocessors but they have most of the peripherals built on-chip. This course makes the students to be familiar with the architecture and programming of Microcontrollers. This course also introduces the architecture and hardware features of PIC 16F877 and ARM7 (LPC2148) microcontrollers.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To learn the concepts of Microprocessor & Microcontrollers
2	To be familiarize with interrupt processing & interfacing memory
3	To understand the interfacing peripherals & applications.
4	To analyze the 32-bit Intel Microprocessors.
5	To understand the ARM family of processors.

COURSE OUTCOMES

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

CO1. Explain the concept of Microprocessor & Microcontrollers	Understand
CO2. Examine the interrupt processing & interfacing memory	Apply
CO3. Illustrate the interfacing peripherals & applications.	Apply
CO4. Illustrate the ARM family of processors.	Apply
CO5. Analyze the 32-bit Intel Microprocessors.	Analyze

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Introduction to microprocessors and microcontrollers, system bus organization, 8085 architecture Introduction to 8085 instructions, addressing modes, stacks and subroutines. Introduction to 16-bit and 32-bit microprocessors – 80x86 family. Assembly language programming for 8086/8088.

INTERRUPT PROCESSING & INTERFACING MEMORY: Hardware and software Interrupts in 8085, 8086/8088. DMA, SRAM/DRAM, cache memory Memory layout for 8086/8088. Virtual mode operation.

INTERFACING PERIPHERALS AND APPLICATIONS: 8254 software programmable timer/counter, 8259A priority interrupt controller Digital interfacing – keyboards, displays Analog interfacing – sensors, transducers

32-BIT INTEL MICROPROCESSORS: The Intel 80286, 80386, 80486, Pentium and RISC based intel MMX architecture. Real mode of 80386, Protected mode of 80386, Virtual 8086 mode.

ARM FAMILY OF PROCESSORS: Overview of ARM architecture, Android-ARM hardware- software interface- ARM7 (LPC2148) microcontroller – Architecture and applications- PIC 16F877 microcontroller.

TEXT BOOKS:

1. Michael J. Flynn and Wayne Luk, "Computer System Design System-on-Chip", Wiley India Pvt. Ltd.
2. Steve Furber, "ARM System on Chip Architecture ", 2nd Edition, 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Ricardo Reis, "Design of System on a Chip: Devices and Components", Latest Edition, 2004, Springer
2. Jason Andrews, "Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology)", Newnes, BK and CDROM.
3. Prakash Rashinkar, Peter Paterson and Leena Singh L, "System on Chip Verification – Methodologies and Techniques", 2001, Kluwer Academic Publishers.

COURSE DESIGNERS

S.No.	Name of the faculty	Designation	Department	E-Mail Id
1	Mr.S.SELVAM	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in
2	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

17ECSE02	EMBEDDED CONTROL SYSTEMS	Category	L	T	P	Credits
		EC (SE)	3	0	0	3

PREAMBLE

To introduce the basic concepts of control systems and its embedded implementation.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To learn the basics of control systems.
2	To learn control theory as used in embedded systems.
3	To learn application of control systems.
4	To learn I/O devices used in control systems.

COURSE OUTCOMES

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

CO1. Understand the basic mathematical model for the function	Understand
CO2. Develop new testing procedures for embedded systems.	Apply
CO3. Know about the output device requirement of embedded systems.	Apply
CO4. Implement the basic control algorithms for embedded system	Analyze
CO5. .Analyze the various input devices appropriate embedded system.	Analyze
CO6. Analyze the required components for the embedded systems	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	PSO2	PSO3
CO1	S	S	M	L	M	-	-	-	-	-	-	-	S	S	-
CO2	S	M	L	-	-	-	-	-	-	-	-	-	M	S	-
CO3	M	S	S	-	-	L	-	-	-	-	-	-	S	M	-
CO4	S	S	S	M	M	-	-	-	-	-	-	L	M	-	-
CO5	S	S	M	-	L	L	-	-	-	-	-	L	M	S	-
CO6	S	S	S	S	L	-	-	M	-	-	-	L	S	S	-

S – Strong; M – Medium; L – Low

SYLLABUS

CONTROL SYSTEM BASICS

Z-transforms – performance requirements - block diagrams - analysis and design - sampling theory – difference equations.

CONTROL SYSTEM IMPLEMENTATION

Discretization method – Fixed point mathematics – Nonlinear controller elements – Gain scheduling – Controller implementation and testing in Embedded Systems. - A case study of robotic control system.

CONTROL SYSTEM TESTING

Software implications - Controller implementation and testing in embedded systems - Measuring frequency response.

INPUT DEVICES

Keyboard basics - Keyboard scanning algorithm - Character LCD modules - LCD module display Configuration - Time-of-day clock - Timer manager - Interrupts - Interrupt service routines - Interrupt-driven pulse width modulation. Triangle waves analog vs. digital values - Auto port detect - Capturing analog information in the timer interrupt service routine - Automatic, multiple channel analog to digital data acquisition..

OUTPUT DEVICES AND SENSORS

H Bridge – relay drives - DC/ Stepper Motor control – optical devices. Linear and angular displacement sensors: resistance sensor – induction displacement sensor – digital optical displacement sensor – pneumatic sensors. Speed and flow rate sensors : electromagnetic sensors – fluid flow sensor – thermal flow sensor. Force sensors: piezoelectric sensors – strain gauge sensor – magnetic flux sensor – inductive pressure sensor – capacitive pressure sensor. Temperature sensors: electrical – thermal expansion – optical Case Study- Examples for sensor, actuator, control circuits with applications..

TEXT BOOKS:

1. Jim Ledin, "Embedded control systems in C/C++", CMP Books, 2004.
2. Tim Wiscott, "Applied control for embedded systems", Elsevier Publications, 2006.

REFERENCE BOOKS:

1. Jean J. Labrosse, "Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C", The publisher, Paul Temme, 2011.
2. Ball S.R., "Embedded microprocessor Systems - Real World Design", Prentice Hall, 2002.
3. Lewin A.R.W. Edwards, "Open source robotics and process control cookbook", Elsevier Publications, 2005.

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	e-Mail ID
1	Mr. P. subramanian	Associate Professor	ECE	subramanian@avit.ac.in
2	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
3	Dr. P. M. Murali	Associate Professor	ECE	muralipm@vmkvec.edu.in
4	S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in

17ECSE03	EMBEDDED SYSTEMS ARCHITECTURE	Category	L	T	P	Credit
		EC (SE)	3	0	0	3

PREAMBLE

To understand the components that make up embedded systems architecture and to reap the benefits of architectural modeling in embedded design.

PREREQUISITE:-

COURSE OBJECTIVES

1	To introduce students to the embedded systems, its hardware and software.
2	To introduce devices and buses used for embedded networking.
3	To explain programming concepts and embedded programming in C and C++
4	To introduce the software development tools in embedded systems.
5	To introduce the concepts of Real Time Operating System

COURSE OUTCOMES

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

CO1. Introduce the concepts of embedded system design and design process	Understand
CO2.Suggest the networking of different devices and communication between two nodes	Apply
CO3. Illustrate the Programming concepts and embedded programming	Apply
CO4. Explain the Real time operating system concepts and basic design	Apply
CO5. Interpret software development tools for embedded system.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

Introduction to Embedded System Architecture

Embedded Systems – Processor embedded into a system – Embedded hardware units and devices in a system – Embedded Software in a system – Embedded System on Chip – Design process in embedded system – Introduction to embedded system architecture – Embedded Systems model – Standards and Networking

Embedded Hardware

Embedded Board and the von Neumann Model - Powering the Hardware - Basic Hardware Materials - Common Passive Components on Boards and in Chips - Semiconductors and the Active Building Blocks of Processors and Memory

Embedded Processors

ISA Architecture Models - Internal Processor Design - Processor Performance - Reading a Processor's Datasheet – Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and Performance

Board I/O, Buses and Device Drivers

Managing Data: Serial versus Parallel I/O, Interfacing the I/O Components, I/O and Performance,

Board Buses - Bus Arbitration and Timing, Integrating the Bus with Other Board Components, Bus Performance

Device Drivers for Interrupt handling – Memory Device Drivers – On board device drivers

Device Drivers and Embedded Operating Systems

Embedded Operating Systems – Process – Multi tasking and Process Management – Memory Management – I/O and File System Management – OS Performance Guideliines – Middleware and Application Software

Implementation and Testing : Implementing the Design, Quality Assurance and Testing of the Design

TEXT BOOKS:

1. "Embedded Systems Architecture – A comprehensive Guide for Engineers and Programmers", 2nd Edition, Tammy Noergaard, Elsevier, 2012,
2. "Embedded Systems- Architecture, Programming and Design", 2nd Edition, Rajkamal, TataMcGrawhill, 2008,

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Mr.S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in

17ECSE04	EMBEDDED SYSTEM DESIGN	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

Ability to understand comprehensively the technologies and techniques underlying in building an embedded solution to a wearable, mobile and portable system

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To understand the Embedded concepts and Embedded system Architecture
2	To learn the architecture and programming of ARM Cortex Microcontroller
3	To select a proper Microcontroller for an application
4	To understand the usage of the development and debugging tools
5	To learn and apply the knowledge of Memory systems and Peripherals

COURSE OUTCOMES

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

CO1. Define an embedded system and compare with general purpose System.	Understand
CO2. Appreciate the methods adapted for the development of a typical Embedded system	Apply
CO3. Get introduced to RTOS and related mechanisms like an ability to design a system, component, or process to meet desired needs within realistic constraints	Analyze
CO4. Identify, formulate, and solve engineering problems	Analyze
CO5. Use the techniques, skills, and modern engineering tools necessary for engineering practice	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	-	-	-	-	-	-	L	S	-	-
CO2	S	S	S	M	M	-	-	-	-	-	-	M	S	M	-
CO3	S	M	M	-	L	-	-	-	-	-	-	M	S	M	-
CO4	S	S	S	M	M	-	-	-	-	-	-	M	S	-	M
CO5	S	S	S	-	M	-	-	-	-	-	-	M	S	-	M

S- Strong; M-Medium; L-Low

SYLLABUS
INTRODUCTION TO EMBEDDED SYSTEM

Embedded system processor, hardware unit, soft wareembedded into a system, Example of an embedded system, Embedded Design life cycle,Embedded System modeling [flow graphs, FSM, Petri nets], Layers of Embedded Systems.

PROCESSOR AND MEMORY ORGANIZATION
Bus Organization, Memory Devices and their Characteristics, Instruction Set Architecture [RISC, CISC], Basic Embedded Processor/Microcontroller Architecture [8051, ARM, DSP, PIC], memory system architecture [cache, virtual, MMU and address translation], DMA, Co-processors and Hardware Accelerators, pipelining.

I/O DEVICES AND NETWORKS

I/O Devices[Timers, Counters, Interrupt Controllers, DMA Controllers, A/D and D/A Converters, Displays, Keyboards, Infrared devices], Memory Interfacing, I/O Device Interfacing [GPIB, FIREWIRE, USB, IRDA], Networks for Embedded systems(CAN, I2C, SPI, USB, RS485, RS 232), Wireless Applications [Bluetooth, Zigbee].

OPERATING SYSTEMS

Basic Features of an Operating System, Kernel Features [polled loop system, interrupt driven 113 system, multi rate system], Processes and Threads, Context Switching, Scheduling[RMA, EDF, fault tolerant scheduling], Inter-process Communication, real Time memory management [process stack management, dynamic allocation], I/O[synchronous and asynchronous I/O, Interrupts Handling, Device drivers], RTOS [VxWorks, RT-LINUX].

EMBEDDED SYSTEM DEVELOPMENT

Design Methodologies [UML as Design tool, UML notation, Requirement Analysis and Use case Modeling],Design Examples[Telephone PBX, Inkjet Printer, PDA ,Elevator Control System, ATM System], Fault-toleranceTechniques, Reliability Evaluation Techniques.

REFERENCE BOOKS:
1.Wayne Wolf "Computers as components: Principles of Embedded Computing System design" The Morgan Kaufmann Series in Computer Architecture and Design, 2012.
2.Jane W. S., Liu, "Real time systems", Pearson Education, 2004.
3.Raj Kamal, "Embedded systems Architecture, Programming and design", Second Edition, 2008.
5.Steve Heath , "Embedded Systems Design", EDN Series,2003.

COURSE DESIGNERS

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

17ECSE05	REAL TIME OPERATING SYSTEMS	Category	L	T	P	Credit
		EC (SE)	3	0	0	3

PREAMBLE

The use of real time operating system has become necessity to build complex embedded systems. To make the student learn fundamentals of operating systems, implementation aspects of real time concept and few applications on RTOS.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To understand the basics of an operating system
2	To understand the concept of real time operating systems and applications
3	To understand real time models and applications

COURSE OUTCOMES

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

CO1.To Know the basic of operating systems, design and implementation of an operating system	Understand
CO2.To explain the concept of Real Time Operating Systems	Understand
CO3. To apply the components of an real time models and languages	Apply
CO4.Analyze the design issues with case studies	Analyze
CO5. Analyze different RTOS application domains	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	PO1 1	PO1 2	PSO 1	PS O2	PS O3
CO 1	S	S	S	S	L	M	L	-	-	-	L	M	S	S	-
CO 2	M	L	S	L	M	L	M	-	-	-	M	M	S	M	-
CO 3	M	M	S	L	M	L	S	-	-	-	M	M	M	M	-
CO 4	M	M	S	M	M	L	M	-	-	-	M	S	M	M	-
CO 5	L	M	M	L	M	L	L	-	-	-	L	S	L	L	-

S- Strong; M-Medium; L-Low

SYLLABUS:

REVIEWOFOPERATINGSYSTEMS

Basic Principles- Operating System structures–System Calls–Files–Processes– Design and Implementation of processes– Communication between processes–Introduction to Distributed operating system–Distributed scheduling.

OVERVIEWOFRTOS
RTOS Task and Task state-Process Synchronisation-Message queues–Mailboxes- pipes–Critical section–Semaphores– Classical synchronization problem– Deadlocks-

REALTIMEMODELSANDLANGUAGES
Event Based–Process Based and Graph based Models–Real Time Languages–RTOS Tasks–RTscheduling-Interrupt processing– Synchronization– Control Blocks–Memory Requirements.

REALTIMEKERNEL
Principles–Design issues–Polled Loop Systems–RTOS Porting to a Target–Comparison and study of various RTOS like QNX– VX works–PSOS– CExecutive– Case studies.

RTOSAPPLICATIONDOMAINS
RTOS for Image Processing–Embedded RTOS for voice over IP–RTOS for fault Tolerant Applications – RTOS for Control systems

TEXT BOOKS:

1. RajKamal,“EmbeddedSystems-Architecture,ProgrammingandDesign”TataMcGrawHill,2006.
2. HermaK.,“RealTimeSystems–DesignfordistributedEmbeddedApplications”,KluwerAcademic,1997.
3. CharlesCrowley,“OperatingSystems-ADesignOrientedapproach”McGrawHill 1997.

REFERENCE BOOKS:

1. C.M.Krishna,Kang,G.Shin,“RealTimeSystems”,McGrawHill,1997.
2. Raymond J.A.Bhur,Donald L.Bailey,“An Introduction to RealTimeSystems”,PHI1999.
3. MukeshSighalandNGShi“AdvancedConceptsinOperatingSystem”,McGrawHill,2000.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Ms. R. MohanaPriya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandrang@vmkvec.edu.in

17ECSE06	SYSTEM ON CHIP	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

With technological advances that allow us to integrate complete multi-processor systems on a single die, Systems-on-Chip (SoCs) are at the core of most embedded computing and consumer devices, such as cell phones, media players and automotive, aerospace or medical electronics. This course will provide an understanding of the concepts, issues, and process of designing highly integrated SoCs following systematic hardware/software co-design & co-verification principles

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To learn the concepts of processor architecture, memory, addressing & interconnections.
2	To study the Different Processors.
3	To study the memory design for SOC(internal, external)
4	To study the interconnect customization & Configuration
5	To study the applications of SOC

COURSE OUTCOMES

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

CO1. Explain the concept of processor architecture, memory, interconnections	Understand
CO2. Review the different types of processors.	Apply
CO3. Design and implement the memory for both internal and external	Analyze
CO4. Interpret the concept of interconnect customization & Configuration	Understand
CO5. Demonstrate the applications of system on chip.	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	S	M	S	-	M	-	-	-	-	-	-	M	M	-	-
CO2	L	L	S	-	M	-	-	-	-	-	-	M	-	-	-
CO3	M	M	S	-	L	M	-	-	-	-	-	M	S	M	-
CO4	L	M	L	S	L	S	-	-	-	-	-	M	S	M	-
CO5	M	M	S	-	M	L	-	-	-	-	-	M	M	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO THE SYSTEM APPROACH: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

PROCESSORS: Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector

Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

MEMORY DESIGN FOR SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

CUSTOMIZATION AND CONFIGURATION: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism.

APPLICATION STUDIES / CASE STUDIES: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

1. Michael J. Flynn and Wayne Luk, "Computer System Design System-on-Chip", Wiley India Pvt. Ltd.
2. Steve Furber, "ARM System on Chip Architecture ", 2nd Edition, 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Ricardo Reis, "Design of System on a Chip: Devices and Components", 1st Edition, 2004, Springer
2. Jason Andrews, "Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology)", Newnes, BK and CDROM.
3. Prakash Rashinkar, Peter Paterson and Leena Singh L, "System on Chip Verification – Methodologies and Techniques", 2001, Kluwer Academic Publishers.

COURSE DESIGNERS:

Name of the faculty	**Designation**	**Department**	**E-Mail Id**
Mr.S.SELVAM	Assistant Professor (Gr-II)	Electronics & Communication Engineering	selvam@avit.ac.in
Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in

17ECSE07	SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEM	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

The subject introduces the students to the modern technologies used in developing embedded software for better software quality. The introduction is both theoretical and practical. The subject shows why modern embedded software systems are complex, it lists the consequences of complexity, and details how we handle complexity in this context, and how we define and increase software quality. The subject then iterate through the modern solutions available to keep control over the software development process, and how we can increase software quality.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To learn the concepts of software architecture, analysis, design & maintenance.
2	To study the Data representation.
3	To familiarize about the mixing C and assembly
4	To know about input and output programming
5	To study the memory management

COURSE OUTCOMES

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

CO1. Explain the concept of software architecture, analysis, design & maintenance.	Understand
CO2. Explain the different Data representation.	Understand
CO3. Illustrate the concept of input and output programming	Apply
CO4. Examine the memory management	Apply
CO5. Analyze and implement the mixing C and assembly language programming	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	M	L	-	M	-	-	-	L	-	-	M	M	-	-
CO2	M	M	L	-	M	-	-	-	L	-	-	M	M	S	-
CO3	S	M	L	-	L	M	-	-	M	-	-	M	S	M	-
CO4	S	M	L	-	L	S	M	-	L	-	-	M	-	S	-
CO5	S	S	S	-	M	L	M	-	M	-	-	M	S	-	

S- Strong; M-Medium; L-Low

SYLLABUS

SOFTWARE TECHNOLOGY: Software Architectures, Software development Tools, Software Development Process Life Cycle and its Model, Software Analysis, Design and Maintenance.

INTRODUCTION TO DATA REPRESENTATION: Data representation ,Two’s complement, Fixed point and Floating Point Number Formats ,Manipulating Bits in -Memory, I/O Ports, Low level programming in C ,Primitive data types , Arrays, Functions ,Recursive Functions, Pointers, Structures & Unions ,Dynamic Memory Allocation ,File handling ,Linked lists, Queues, Stacks.

MIXING C AND ASSEMBLY: C and assembly, Programming in assembly ,Register Usage

Conventions ,Typical use of Addressing Options, Instruction Sequencing , Procedure Call and Return , Parameter passing ,Retrieving Parameters , Everything in pass by value ,Temporary variables

INPUT/ OUTPUT PROGRAMMING: I/O Instructions, Synchronization, Transfer Rate & Latency, Polled Waiting Loops, Interrupt – Driven I/O, Writing ISR in Assembly and C, Non Maskable and Software Interrupts

MEMORY MANAGEMENT: Direct Memory Access, Local and Global Scope, Automatic and Static Allocation, Distinguishing Static from Automatic Object Creation, Initialization and Destruction, Dynamic Allocation

TEXT BOOKS:

1. Daniel W.Lewis, "Fundamentals of embedded software where C and assembly meet", Pearson Education.
2. Hassan Gomma, "Designing concurrent, distributed, and real time applications with UML", Pearson Education, 2000

REFERENCE BOOKS:

1. C.M. Krishna, Kang G. Shin, "Real Time Systems", McGraw - Hill International Editions, 1997
2. By Albert M. K. Cheng , "Real-time systems: scheduling, analysis, and verification" wiley.

COURSE DESIGNERS				
S.No.	**Name of the Faculty**	**Designation**	**Dept**	**Mail ID**
1	Mr.S.SELVAM	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in

17ECSE08	ADVANCED PROCESSORS LAB	Category	L	T	P	Credit
		EC(SE)	0	0	4	2

PREAMBLE

This course makes the students to be familiar with the architecture and programming of Microcontrollers. This course also introduces the architecture and hardware features of PIC 16F877 and ARM7 (LPC2148) microcontrollers.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To enable the student to write basic assembly programming of 8085 processor.
2	The student will be able to write program to do logical operations.
3	To gain practical knowledge how to write 32 bit program.
4	To write real time application programs.
5	To learn various interfacing techniques.

COURSE OUTCOMES

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

CO1. Understand the basic operations of 8085.	Understand
CO2. Apply the programming knowledge to do mathematical operations.	Apply
CO3. Analyze the programming knowledge to do logical operations.	Analyze
CO4. Analyze the know-how to carry out interfacing.	Analyze
CO5. Analyze mixed language programming.	Analyze

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

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

1. Use of programming tools (Debug/TASM/MASM/8086kit) to perform basic arithmetic operations on 8bit/16 bit data
2. Assembly programming for 16-bit addition, subtraction, multiplication and division (menu based)
3. Assembly program to display the contents of the flag register.
4. Program for device driver (printer/mouse/keyboard)
5. Program based on 32 bit architecture (e.g. Switching from real mode to protected mode using DPMI driver, 32bit multiplication)
6. Program and interfacing using 8255/ 8253
7. Program and interfacing of ADC/ DAC/ Stepper motor
8. Mixed Language program to increment, decrement the size of the cursor and also to disable it.
9. Assembly program to sort numbers in ascending/ descending order

COURSE DESIGNERS:

S.No.	Name of the faculty	Designation	Department	E-Mail Id
1	Mr.S.SELVAM	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in
2	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in

17ECSE09	EMBEDDED SYSTEMS LAB	Category	L	T	P	Credit
		EC (SE)	0	0	4	2

PREAMBLE

To understand, design and program Embedded Systems using different embedded processors

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To understand and implement basic programming using ARM processors
2	To program for elementary operations , input-output control
3	To understand serial communication programming
4	To program for Waveform Generation

COURSE OUTCOMES

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

CO1. Program using ARM processors	Apply
CO2. Program for basic elementary operations	Apply
CO3. Program for serial communication	Apply
CO4. Program for Waveform generation	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	S	L	-	-	-	M	L	M	S	S	-
CO2	S	M	M	S	M	L	-	-	-	M	L	M	M	S	-
CO3	S	M	M	M	L	M	-	-	-	M	L	M	M	M	-
CO4	S	M	L	L	L	M	-	-	-	M	L	M	L	M	-

S- Strong; M-Medium; L-Low

List of Experiments:

1) Program for Elementary Operations - Multi precision Addition, Subtraction, and Multiplication.
2) Input / Output Control Programming – Controlling external logic switching, Clock generation
3) Programming for Analog to Digital Converters and Digital to Analog Converters
4) Programming using Built-in-Timers
5) Capture Control and its application examples
6) Waveform Generation using PWM methods – Sine Wave Generation, FSK Generation
7) USART and its programming
8) SPI Bus and its programming

COURSE DESIGNERS				
S.No	**Name of the Faculty**	**Designation**	**Dept**	**Mail ID**
1	Ms. R. MohanaPriya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Mr.S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in

17ECSE10	EMBEDDED SYSTEMS DESIGN LAB	Category	L	T	P	Credit
		EC (SE)	0	0	4	2

PREAMBLE

The purpose of this course is to give hands on training to the students in understanding the working of ARM processor & PIC microcontroller. This course also makes the student to use the ARM processor for various applications. The student can develop a mini project using embedded system

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To Learn the working of ARM processor & PIC Microcontroller
2	To Understand the Building Blocks of Embedded Systems
3	To Learn the concept of memory map and memory interface
4	To Know the characteristics of Real Time Systems
5	To Write programs to interface memory, I/Os with processor
6	Study the interrupt performance

COURSE OUTCOMES

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

CO1:Demonstrate programs in ARM for a specific Application	Apply
CO2:Interface memory and Write programs related to memory operations	Analyze
CO3:Develop a A/D and D/A convertors with ARM system	Analyze
CO4:Analyze the performance of interrupt	Analyze
CO5: Develop programs for interfacing keyboard, display, motor and sensor.	Analyze
CO6:Formulate a mini project using embedded system	Create

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	PSO1	PSO2	PSO 3
CO 1	L	M	L	-	-	-	-	-	-	L	-	-	-	M	-
CO 2	S	L	M	-	M	-	-	-	M	-	M	M	M	M	-
CO 3	M	S	S	-	M	-	-	-	L	M	-	M	S	S	-
CO 4	S	M	S	-	M	-	-	-	M	M	L	M	M	M	-
CO 5	S	S	M	-	L	-	-	-	L	L	-	S	S	M	-
CO 6	M	S	M	-	L	-	-	-	L	M	M	L	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

1. Study of ARM evaluation system & PIC Microcontroller
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept	Mail ID
1	Ms. R. Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	Mr.G.Murali	Assistant Professor	ECE	muralig@vmkvec.edu.in

17ECSE11	RTOS LAB	Category	L	T	P	Credits
		EC(SE)	0	0	4	2

PREAMBLE

To give knowledge in real time operating system (RTOS) and its memory Management.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To acquire knowledge about concepts related to OS such as Scheduling techniques, threads, inter-thread communications and memory management.
2	To Perform Multithreaded Programming in RTOS Platform.
3	To Acquire the Knowledge on working of Interrupts and Writing ISRs.

COURSE OUTCOMES

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

CO1.Do the basic programming for the real time operating systems scheduling.	Understand
CO2.Program in C on RTOS win32 scheduling.	Analyze
CO3.Demonstrate task management and inter task communication.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S – Strong; M – Medium; L – Low

SYLLABUS

1. Study of serial data Communication between two computers.
2. Write the pseudo code in Linux using C/C++ to perform FCFS scheduling
3. Write the pseudo code in Linux using C/C++ to perform Round Robin scheduling
4. Write the pseudo code in Linux using C/C++ to perform Priority Based scheduling
5. Write the pseudo code in Linux using C/C++ to perform Print parent process ID & child process ID using Fork()
6. Study of POSIX thread & Write appropriate the pseudo code in Linux using C/C++
7. Study of Semaphore & Write appropriate the pseudo code in Linux using C/C++
8. Study of Raspberry pi & Write appropriate the pseudo code for blinking of LED and keypad in Linux

using python

9. Write appropriate the pseudo code for Pipe in Linux.

10. Study of Dining Table philosophy problem and write appropriate pseudo code for the same

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	e-Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in

17BMCC04	BIOMEDICAL INSTRUMENTATION & MEASUREMENTS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The variety of diagnostic, control, and monitoring equipment used for medical purposes comprises an array of biomedical instrumentation. These electronic systems can be used in a physician's office, a medical laboratory, or be implanted into a patient. This course is designed to acquire knowledge about the different components of various biomedical equipment and its working principle and to measure various physiological parameters.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To know about bioelectric signals, electrodes and its types.
2	To know the various Bio potential amplifiers.
3	To study about various Physiological measurements.
4	To study the recording of various cardiac signals.
5	To study about clinical laboratory instruments and blood cell counters.

COURSE OUTCOMES

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

CO1. Explain the acquisition of various bio signals using various types of Electrodes.	Understand
CO2. Examine the different blood types of cell and usage of clinical laboratory instruments.	Apply
CO5. Use bio-amplifiers in medical applications.	Apply
CO3. Record and analyze various physiological signals.	Analyze
CO4. Classify various cardiac function measurements.	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	--	--	--	--	--	M	M	--	--
CO2	S	M	M	S	--	M	--	L	M	--	--	M	--	--	--
CO3	S	M	M	S	--	M	M	L	M	--	--	M	M	--	--
CO4	S	M	S	M	--	M	S	M	S	--	--	S	S	M	--
CO5	S	M	S	M	--	M	S	M	S	--	--	S	S	M	--

S- Strong; M-Medium; L-Low

SYLLABUS

BIOELECTRIC SIGNALS AND ELECTRODES
Basic medical instrumentation system, Origin of Bioelectric Potential – Resting and action potential, Nernst equation, Goldman equation. Recording electrodes – Electrodes: Tissue interface, Electrolyte – skin interface, Polarization, Skin contact impedance, motion artefacts. Electrodes – Silver – silver chloride electrodes, electrodes for ECG, electrodes for EEG, electrodes for EMG, Electrical conductivity of electrode jellies and creams, Types of electrodes.

BIO AMPLIFIERS
Bio amplifier, Need for Bio amplifier, Operational amplifier characteristics, Different modes of operation of differential amplifier, Basic operational amplifier circuits – Inverting, Non inverting, differential amplifier, Instrumentation amplifier. Chopper amplifier, Isolation Amplifier.

BIO SIGNALS RECORDING
ECG- Anatomy and Electrical conducting system of heart, Genesis of ECG, Einthoven triangle, Lead system, Segments and intervals of ECG, Normal and abnormal ECG wave forms, ECG Machine, Recording set up of EMG and EEG. Heart sounds and PCG, ERG, EOG.

CARDIAC FUNCTION MEASUREMENTS
Blood pressure measurement – direct and indirect method, Respiration rate measurement, Measurement of heart rate and pulse rate, Plethysmography technique. Blood flow measurement – electromagnetic, ultrasonic. Cardiac output measurement – Indication dilution method and dye dilution method

CLINICAL LABORATORY INSTRUMENTS AND BLOOD CELL COUNTERS
Spectrophotometer, colorimeter, flame photometer, auto-analyser. Types of blood cells, Methods of cell counting, coulter counters, automatic recognition and differential counting.

TEXT BOOKS:

1. Khandpur R.S, **“Hand-book of Biomedical Instrumentation”**, Tata McGraw Hill, 2nd Edition, 2003.
2. Leslie Cromwell, Fred Weibell J, Erich Pfeiffer. A, **“Biomedical Instrumentation and Measurements”**, Prentice-Hall India, 2nd Edition, 1997.
3. Arumugam, M, **“Biomedical Instrumentation”**, Anuradha publications, 2008.

REFERENCES:

1. John G. Webster, **“Medical Instrumentation Application and Design”**, John Wiley, 3rd Edition, 1997.
2. Carr, Joseph J, Brown, John.M **“Introduction to Biomedical Equipment Technology”**, John Wiley and sons, New York, 4th Edition, 1997.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. N.Babu	Professor	BME	babu@vmkvec.edu.in
2	Ms.R.Sandhiya	Assistant Professor (Gr-I)	BME	sandhiya@avit.ac.in
3	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in

17BMCC03	BIOSENSORS AND TRANSDUCERS	Category	L	T	P	Credit
		CC	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

COURSE OBJECTIVES

1	To use the basic concepts of transducers, electrodes and its classification.
2	To discuss the various types of electrodes.
3	To determine the recording of biological components.
4	To employ the knowledge in electrochemical and optical biosensors.
5	To outline the various biological components using biosensors.

COURSE OUTCOMES

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

CO1.	Describe the working principles of transducers.	Understand
CO2.	Explain the various types of electrodes.	Understand
CO3.	Utilize various FET sensors for recording of biological components.	Apply
CO4.	Distinguish various biosensors like electrochemical and optical biosensors.	Analyze
CO5.	Analyze the biological components using biosensors in various 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	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	S	--	--
CO4	S	S	L	S	--	S	M	M	S	--	--	M	S	--	M
CO5	S	S	L	S	--	S	M	M	S	--	--	S	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

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

TRANSDUCERS:

Temperature transducers, piezoelectric transducers, Piezo resistive transducers, photoelectric transducers.

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

BIOSENSORS:
Biological elements, Immobilization of biological components, Chemical Biosensor-ISFET, IMFET, electrochemical sensor, chemical fibro sensors.

APPLICATIONS OF BIOSENSORS:
Bananatrode, blood glucose sensors, non invasive blood gas monitoring, UREASE biosensor, Fermentation process control, Environmental monitoring, Medical applications.

TEXT BOOKS:

1. H.S. Kalsi, **"Electronic Instrumentation & Measurement"**, Tata McGraw HILL, 1995.
2. Brain R Eggins, **"Biosensors: An Introduction",** John Wiley Publication, 1997.
3. Shakthi chatterjee, **"Biomedical Instrumentation"**, Cengage Learning, 2013.
4. John G Webster, **"Medical Instrumentation: Application and design"**, John Wiley Publications, 2001.

REFERENCES:

1. K.Sawhney, **"A course in Electronic Measurements and Instruments"**, Dhapat Rai & sons, 1991.
2. John P Bentley, **"Principles of Measurement Systems"**, 3rd Edition, Pearson Education Asia, (2000 Indian reprint).
3. Geddes and Baker, **"Principles of Applied Biomedical Instrumentation"**, 3rd Edition, John Wiley Publications, 2008.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in
2	Mr.V.Prabhakaran	Assistant Professor (Gr-II)	BME	prabhakaran@avit.ac.in
3	Dr.N.Babu	Professor	BME	babu@vmkvec.edu.in

17BMEC02	BIOTELEMETRY	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

To study the overall concept of a Biotelemetry system and the concept of signal transmission.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To study the basic concepts and the principles used in a Telemetry system.
2	To study the building blocks used to make a electrical telemetry system.
3	To study the basic components of transmitting and receiving techniques.
4	To know about how optical fibers are used in signal transmission.
5	To understand the real time application in biotelemetry.

COURSE OUTCOMES

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

CO1. Discuss about the basic information about Telemetry system.	Understand
CO2. Describe the knowledge about design of Electrical Telemetry Systems.	Understand
CO3. Demonstrate the different types of modulation techniques.	Apply
CO4. Analyze the implementation of optical fibers in telemetry system.	Analyze
CO5. Validate the healthcare system using Telemetry system.	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	--	M	M	--	--
CO2	M	--	--	--	--	--	--	--	--	L	--	M	M	--	--
CO3	S	--	L	L	--	L	--	--	M	M	--	S	M	M	--
CO4	S	M	L	L	M	M	L	M	M	S	--	S	S	M	--
CO5	S	S	M	L	M	S	M	M	S	S	--	S	M	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Fundamental concepts – Significance, Principle, functional blocks of Telemetry and Telecontrol system- Methods of telemetry – Electrical, Pneumatic, Hydraulic and Optical Telemetry – State of the art-Telemetry standards.

ELECTRICAL TELEMETRY

Electrical Telemetry – Current Systems – Voltage Systems – Synchro Systems – Frequency systems – Position and Pulse systems – Example of a landline telemetry system.

RADIO TELEMETRY SYSTEM

Block diagram of a Radio Telemetry system – Transmitting and receiving techniques – AM, FM, PM, Multiplexing and demultiplexing – Transmitting and receiving techniques – Digital coding methods – Advantages of PCM, PWM, PM, FSK – Delta modulation – coding and decoding equipment – Example of a radiotelemetry system.

OPTICAL TELEMETRY SYSTEM

Optical fibers for signal transmission – Sources for fiber optic transmission – Optical detectors – trends in fiber– optic device development – Example of an optical telemetry System.

APPLICATION OF BIOTELEMETRY

Use of computers in distance mode of healthcare delivery, Web technology, Satellite communication systems; hypertext, voice & image transfer protocols, Medical image scanning, Data compression and Transfer, Capturing of medical signals, Analog to digital conversion, Video conferencing, Remote sensing, Rural primary setups, Referral and Super specialty centers, Societal medico legal aspects, Networking (local, national & global).

TEXT BOOKS

1. D.Patranabis, **"Telemetry principles"**, Tata Mcgraw Hill Publishers.
2. Marilyn J. Field, **"Telemedicine: A Guide to Assessing Telecommunications for Health Care"**, National Academic Press, 1996.

REFERENCE

1. Charles J. Amlaner, David W. Macdonald, **"A Handbook on Biotelemetry and Radio Tracking"**, Pergamon Press; 1st Edition (January 1, 1980).

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in
2	Ms.R.Sandhiya	Assistant Professor (Gr-I)	BME	sandhiya@avit.ac.in

17BMEC12	HOSPITAL MANAGEMENT	Category	L	T	P	Credit
		EC-PS	**3**	**0**	**0**	**3**

PREAMBLE
To provide the knowledge of planning, designing and safety management in hospital services.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To obtain the knowledge about the basic planning and organization of hospitals.
2	To study about the clinical and administrative services.
3	To impart knowledge on designing of hospital services.
4	To study and analyze the safety management in hospitals.
5	To study and analyze the infection control in hospitals.

COURSE OUTCOMES

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

CO1. Summarize the importance of hospital in healthcare and planning of hospital design.	Understand
CO2. Examine the various clinical services needed in the hospital.	Apply
CO5. Outline the implementation of various infection control techniques.	Analyze
CO4. Recommend the supporting services needed to build the hospital and safety guidelines.	Evaluate
CO3. Build the idea about the hospital services design.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PLANNING AND ORGANIZATION OF THE HOSPITALS
Roles of hospital in healthcare – hospital planning and design-outpatient services the nursing unit – intensive care Unit – nursing services – effective hospital management – directing and leading – controlling – financial management.

CLINICAL AND ADMINISTRATIVE SERVICES
Radiology and imaging services – laboratory services – operation theatre suite pharmacy – central sterile supply department – hospital infection – materials management – evaluation of hospital services.

DESIGNING OF HOSPITAL SERVICES
Engineering department – maintenance management – clinical engineering electrical system – air conditioning system – water supply and sanitary system centralized medical gas system – communication system – solid waste management and transportation.

DESIGNING SUPPORT SERVICES AND SAFETY MANAGEMENT
Admitting department – medical records department – food service department laundry and linen service housekeeping – Volunteer department – safety in hospital fire safety – Alarm system – disaster management.

HOSPITAL INFECTION CONTROL
Importance of infection control – hand hygiene – aseptic techniques – isolation precautions – disinfection and Sterilization – clinical laboratory standards to infection control – health care workers safety.

TEXT BOOKS:

1. Kunders G D, **"Biomechanics: Hospitals, facilities planning and management"**, Tata Mcgraw Hill, 2008.
2. Sakharkar B M, **"Principles of hospital administration and planning"**, Jaypee Brothers Medical Publishers Pvt. Limited, 2nd Edition, 2009.

REFERENCE:

1. Sanjiv Singh, Sakthikumar Gupta, Sunil Kant, "**Hospital infection control guidelines, principles and practice"**, Jaypee Brothers Medical Publishers Pvt Limited, 1st Edition, 2012.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in
2	Mr. R.Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in
3	Ms.S.Mythrehi	Assistant Professor (G-I)	BME	mythrehi@avit.ac.in

17ECSE12	MEDICAL ELECTRONICS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

The course is designed to make the student acquire conceptual knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The relation between electronic concepts and biological concepts is highlighted. The principles of electronic instrumentation that are currently deployed in the clinical side are introduced.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To learn the concept of Medical Sensors
2	To understand human body and parameters
3	To study the working of biomedical instruments
4	To study the imaging techniques
5	To understand the working of assist devices

COURSE OUTCOMES

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

CO1. Explain the human physiology.	Understand
CO2. Illustrate the working of biomedical equipments.	Apply
CO3. Apply Electronic Principles for recording and Monitoring Bio Signals	Apply
CO4. Distinguish diagnostic equipments from therapeutic equipments	Analyze
CO5. Examine the internal organs through imaging	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PHYSIOLOGY AND TRANSDUCERS:

Cell and its structure, Resting and Action Potential, Nervous system: Functional organization of the nervous system, Structure of nervous system, Neurons – Synapse, Transmitters and Neural Communication, Cardiovascular system, respiratory system, Basic components of a bio-medical system , Transducers - Ultrasonic transducers, Temperature measurements - Fiber optic temperature sensors.

ELECTRO – PHYSIOLOGICAL MEASUREMENTS:

Electrodes, Limb electrodes, Floating electrodes, pregelled disposable electrodes, Micro, needle and surface electrodes, Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers, Isolation amplifier, ECG, EEG, EMG, ERG, Lead systems and recording methods, Typical waveforms.

NON –ELECTRICAL PARAMETER MEASUREMENTS:

Measurement of blood pressure, Cardiac output, Heart rate, Heart sound, Pulmonary function measurements, Spirometer, Photo Plethysmography, Body Plethysmography, Blood Gas analyzers: pH of blood, Measurement of blood pCO_2, pO_2, finger-tip oxymeter, ESR, GSR measurements.

MEDICAL IMAGING AND DIAGNOSTICS:

Radio graphic and fluoroscopic techniques, Computer tomography, MRI, Ultrasonography, Endoscopy, Thermography, Different types of biotelemetry systems and patient monitoring, Introduction to Biometric systems.

ASSISTING AND THERAPEUTIC EQUIPMENTS:

Pacemakers, Defibrillators, Ventilators, Nerve and muscle stimulators, Diathermy, Heart –Lung machine, Lasers, Audio meters, Dialysers, Lithotripsy, Electro Surgery.

TEXT BOOKS:

1. R.S.Khandpur, Hand Book of Bio-Medical instrumentation, Tata McGraw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, Bio-Medical Instrumentation and Measurements, II edition, Pearson Education, 2002.

REFERENCE BOOKS:

1. Joseph J. Carr, John M. Brown, Introduction to Biomedical Equipment Technology, Fourth Edition, Pearson.
2. Shakti Chatterjee, Aubert Miller, Bio-Medical Instrumentation Systems, Cengage Learning, 2010.
3. C.Rajarao and S.K. Guha, Principles of Medical Electronics and Bio-medical Instrumentation, Universities press (India) Ltd, Orient Longman ltd, 2000

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in
2	N.Manikanda Devarajan	Assistant Professor	ECE	manikandadevarajan@vmkvec.edu.in

17BMCC10	MEDICAL IMAGE PROCESSING AND ANALYSIS	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

To learn the fundamental concepts of medical image acquisition and understand how to apply the image processing techniques for various medical images.

PREREQUISITE: 17BMCC08 - BIOMEDICAL SIGNAL PROCESSING

COURSE OBJECTIVES

1	To learn the image fundamentals and mathematical transforms necessary for image processing.
2	To study the various image enhancement techniques.
3	To study about the various segmentation techniques applied to Medical Images.
4	To gain knowledge about the basic concepts of image compression procedures.
5	To apply various image restoration procedures in Medical images.

COURSE OUTCOMES

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

CO1. Summarize the general terminology of digital image processing.	Understanding
CO2. Examine the need for image transforms and their types both in spatial and frequency domain.	Apply
CO3. Classify different types of image segmentation and apply restoration techniques.	Analyze
CO4. Analyze the image compression models and image compression techniques.	Analyze
CO5. Illustrate various methodologies for image segmentation in medical imaging.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

DIGITAL IMAGE FUNDAMENTALS
Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.

IMAGE ENHANCEMENT
Basic gray level transformation, Histogram processing, Smoothening by spatial filters – Sharpening by spatial filters, Smoothening- frequency domain filters, Sharpening - frequency domain filters, Color image Processing- color models – Pseudo color image processing – Color Image Transformation – Smoothening – Sharpening.

IMAGE SEGMENTATION AND OBJECT RECOGNITION
Edge detection- Marr Hidreth edge detector - Canny edge detector, Thresholding foundation – Basic global thresholding – Basic Adaptive thresholding, Region Based segmentation, Watershed segmentation algorithm, Patterns and pattern classes, Recognition based on decision theoretic methods – matching, Optimum statistical classifiers.

IMAGE COMPRESSION
Introduction – Principle of compression – Types of compression – Run length Encoding – Huffman Coding – Modified Huffman Coding – Modified READ – LZW – Arithmetic Coding – JPEG – Other State-of-the-Art Image Compression – Image Compression Standard File Formats.

IMAGE RESTORATION AND RECONSTRUCTION OF MEDICAL IMAGES
Image degradation models, Algebraic approach to restoration, inverse filtering, Least mean square filter, Image reconstruction from projections – Radon transforms - Filter back projection algorithm – Fourier reconstruction of MRI Images.

TEXT BOOKS:
1. Rafael C, Gonzalez and Richard E Woods, **"Digital Image Processing"**, Pearson Education Asia, 3rd Edition, 2007.
2. Anil K Jain, **"Fundamentals of Digital Image Processing"**, Prentice Hall of India, 2nd Edition, 1997.

REFERENCES:
1. William K Pratt, **"Digital Image Processing"**, John Wiley, 4th Edition, 2007.
2. Albert Macouski, **"Medical Imaging systems"**, Prentice Hall, New Jersey, 2nd Edition, 1997.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr. R. Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in
2	Dr. D.Vinodkumar	Professor	BME	vinodkumar@vmkvec.edu.in
3	Ms.Santhoshini Arulvallal	Assistant Professor (Gr-I)	BME	santhoshiniarulvallal@avit.ac.in

17BMSE16	WEARABLE TECHNOLOGY	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE
This course makes the students to understand the fundamentals and applications of the wearable technology.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the fundamentals of sensors and wearable technology.
2	To ascertain the design and integration of the smart textiles.
3	To understand the electronic textiles.
4	T endeavor various sensor in sports wearable application.
5	To understand the cloud storage of wearable devices.

COURSE OUTCOMES

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

CO1. Discuss the fundamentals of sensor and wearable technology.	Understand
CO2. Illustrate the electronic textiles and its applications.	Apply
CO3. Analyze the sensor for different wearable applications.	Analyze
CO4. Compare the various data storage of wearable systems.	Evaluate
CO5. Design of smart clothing.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS OF SENSORS AND WEARABLE TECHNOLOGY
Introduction to sensors – Sensor Physical Properties – Electric (Resistive, Capacitive and Inductive) – Piezoelectric – Optic – Photo elastic - Thermoelectric – Electrochemical.
Wearable computers – Wearable Electronics – Intelligent Clothing – Industry on wearable technology – Current Trends – Market Forecast.

SMART CLOTHING
Introduction – Design of Smart Cloths – 2D Design for smart wearables – Textile Development – 3D Design for smart wearables – Construction of smart wearables – Integration – Prototype Development.

ELECTRONIC TEXTILES
Conductive Fibers for textiles – Conductive for Polymers textiles – Carbon Nanotubes yarns – Textile and Electronics Integration - Embroidered Antenna – Electronic textiles for Military Applications.

SENSOR FOR WEARABLE APPLICATIONS
Load and Pressure Measurement sensor – Sports Applications – Inertial Sensor – Sports Application – Optical Sensor – Sports Application – Angle & Displacement Sensor – Sports Application.

DATA STORAGE FOR WEARABLE TECHNOLOGY
Introduction – Storage in Consumer wearable - Cloud storage – Remote Cloud – Sensor Cloud – Cloudlet - Cloud storage Architecture – Confidential disk and Cloud storage with encryption – Two-layer confidential storage.

TEXT BOOKS:

1. Patrick F. Dunn, **"Fundamentals of Sensors for Engineering and Science"**, CRC Press, Taylor & Francis.
2. Jane McCann, David Bryson, **"Smart Clothes and Wearable Technology"**, CRC Press, Woodhead Publishing Ltd.

REFERENCES:

1. Daniel A. James, Nicola Petrone, **"Sensors and Wearable Technologies in Sport: Technologies, Trends and Approaches for Implementation"**.
2. Marrington, Andrew, Kerr, Don, **"Management Association, Information Resources Managing Security Issues and the Hidden Dangers of Wearable Technologies"**.
3. Tilak Dias, **"Electronic Textiles: Smart Fabrics and Wearable Technology"**, Elsevier, Woodhead Publishing.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. M.Ravindiran	Professor & Head	BME	ravindiran@avit.ac.in
2	Mr.R.Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in
3	Mrs.S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in

17BMCC82	BIOMEDICAL INSTRUMENTATION LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The curriculum of biomedical instrumentation lab is concerned to enable the students to know and operate the various biomedical instruments for measuring and diagnosing biological signals.

PRERQUISITE : NIL

COURSE OBJECTIVES

1	Design of amplifiers for biological signals.
2	Recording and analysis of bio signals.
3	Measurement of PH.
4	Study and measurement of blood pressure.
5	Measurement of galvanic skin resistance.

COURSE OUTCOMES

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

CO1. Design operational amplifier for inverting and non-inverting mode.	Create
CO2. Record and analyze EEG, ECG, EMG signals.	Analyze
CO3. Measure of PH value of a given solution.	Evaluate
CO4. Measure blood pressure non-invasively.	Evaluate
CO5. Design Filters for bio signals.	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	S	S	--	M	--	--	S	--	--	S	S	--	--
CO2	S	S	M	M	S	M	--	--	S	--	--	S	M	M	--
CO3	S	S	S	M	--	M	--	--	S	--	--	S	--	--	M
CO4	S	S	S	M	--	M	--	--	S	--	--	S	M	--	M
CO5	S	S	S	S	--	M	--	--	S	--	--	S	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

List of Experiments

1. Blood pressure measurement using sphygmomanometer
2. Design of instrumentation amplifier
3. Measurement PH using PH meter
4. Galvanic Skin resistance measurement
5. Recording of ECG using ECG simulator
6. Recording of EEG using EEG simulator
7. Recording of EMG using EMG simulator
8. Optical Isolation Amplifier
9. Study of Phono Cardiogram (PCG)
10. Study of Types of electrodes

REFERENCES:

Department Lab Manual

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. N.Babu	Professor	BME	babu@vmkvec.edu.in
2	Ms.B.Farhana Ansoor	Assistant Professor (G-I)	BME	farhanaansoor@avit.ac.in

17ECSE13	BIOMEDICAL IMAGE PROCESSING LAB	Category	L	T	P	Credit
		EC(SE)	0	0	4	2

PREAMBLE

The purpose of learning this course on medical image processing Lab for biomedical engineering students is to acquire the fundamental concepts of image acquisition and understand how to apply the image processing techniques for various medical images.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	Understand the image fundamentals and mathematical transforms necessary for image processing.
2	Describe the various image enhancement and image restoration techniques.
3	Apply various image segmentation methods and analysis in medical images.
4	Illustrate the basic concepts of wavelets and image compression techniques.
5	Explain the different types of reconstruction techniques applied to various medical Images.

COURSE OUTCOMES

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

CO1.Illustrate the basic issues and the scope (or principal applications) of image processing, and the roles of image processing and systems in a variety of applications	Apply
CO2. Apply image enhancement techniques.	Apply
CO3. Examine Image segmentation and image compression techniques.	Apply
CO4. Outline the image processing tasks with a high level of proficiency via software and hardware systems	Analyze
CO5. Develop and analyze Image processing algorithms in practical applications/case studies.	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	--	--	--	--	--	--	--	M	S	M	--
CO2	S	M	L	L	M	--	--	--	M	--	--	M	S	S	--
CO3	S	M	L	L	M	--	--	--	M	--	--	M	S	S	--
CO4	S	S	M	M	S	--	--	--	S	--	--	S	S	S	--
CO5	S	S	M	M	S	--	--	--	S	--	--	S	S	S	--

S- Strong; M-Medium; L-Low

SYLLABUS

LIST OF EXPERIMENTS

1. Basic operations on images
2. Gray level transformation and histogram processing
3. Image smoothening and image sharpening using suitable filters
4. Edge detection techniques
5. Histogram Processing and Basic Thresholding functions
6. Image segmentation using morphological operations
7. Image Linear Filtering and Transforms
8. Image Restoration techniques
9. Image compression techniques

REFERENCES:

1. Albert Macouski, "Medical Imaging systems", Prentice Hall, New Jersey, 2nd Edition, 1997.
2. Medical image processing lab manual.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
2	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECSE14	BIOMEDICAL SIGNAL PROCESSING LAB	Category	L	T	P	Credit
		EC(SE)	0	0	4	2

PREAMBLE

This laboratory introduces the different signal processing techniques used for analyzing Biomedical signals using MATLAB

PRERQUISITE – Nil

COURSE OBJECTIVES

1	Developing advanced signal processing and estimation methods for analyzing and understanding biomedical signals.
2	Advancing our knowledge of pathophysiology through the investigation of behavior that manifests in physiologic signals.
3	Providing opportunities for student participation in rigorous research methodology and the dissemination of knowledge.
4	The students will be motivated to apply signal processing to various areas such as image processing, biomedical signal processing, array signal processing etc.
5	Contributing to regional and national biomedical research.

COURSE OUTCOMES

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

CO1. Examine the most important bioelectrical measurement methods: The ECG, the EEG and the EMG, in relation to normal and pathological conditions.	Apply
CO2. Apply and evaluate different methods for signal processing of the ECG, the EEG and the EMG, with respect to time- and frequency domain analysis.	Apply
CO3. Illustrate the artifact removal & signal extraction.	Apply
CO4. Outline bioelectricity in the heart and in the central and in peripheral nervous system.	Analyze
CO5. Analyze and evaluate physical, electrical and mathematical models for the origin of bioelectrical signals in the cell, and their conduction in nerves and in tissue	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

LIST OF EXPERIMENTS

1. Representation of basic signals.
2. Convolution & Correlation
3. To write and execute programs for image arithmetic operations.
4. To understand various image noise models and to write programs for image restoration
5. Analysis of EEG waveform
6. Analysis of EMG Signal
7. Processing of bio-signals using adaptive filters
8. Image processing for contrast enhancement and sharpening the edges
9. Data Compressions of bio-signals (ECG, EEG, EMG etc.) using DCT and wavelet transforms.
10. To write and execute program for FFT & IFFT.

REFERENCES:

1. Kayvan Najarian, Robert Splinter, "Biomedical Signal and Image Processing", CRC Press, Second Edition, 2012.
2. Biomedical signal processing lab manual.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr. R. Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Dr.T.Sheela	Associate Professor	ECE	sheela@vmkvec.edu.in

17ECSE15	DATA ACQUISITION LAB	Category	L	T	P	Credit
		EC (SE)	0	0	4	2

PREAMBLE

The data acquisition plays a significant role all the fields of Engineering and Technology. This course will introduce students about computer based instrumentation techniques and an exposure to real time applications.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To enable the student to do measurements of various real time parameters
2	The student is enabled with the capacity to handle various guages
3	The student is enabled to produce pulse and measure its parameters
4	To handle the counters of various types
5	The student is exposed to hardware of various gauges

COURSE OUTCOMES

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

CO1. Understand the working of Guages	Understand
CO2. Apply the knowledge of gauges to take measurements	Apply
CO3. Analyze the pulse characteristics	Analyze
CO4. Analyze the various types of measurements	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

1. Measuring Temperature with RTDs
2. Measuring Pressure with Strain Gauges
3. Generating a Single Square Pulse
4. Generating a Pulse Train (A) Generating a Continuous Pulse Train (B) Generating a Finite Pulse Train
5. Measuring a Pulse Width
6. Connecting Counters to Measure Frequency and Period

7. Measuring the Frequency and Period of Low Frequency Signals
8. Measuring the Frequency and Period of High Frequency Signals
9. Counting Events or Elapsed Time

REFERENCE

1. Data Acquisition Lab Manual

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Dept	Mail ID
1	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in
2	S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in

17ECSE16	FIBRE OPTIC SENSORS AND APPLICATIONS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

A fiber optic sensor is a sensor that uses optical fiber either as the sensing element or as a means of relaying signals from a remote sensor to the electronics that process the signals. Fibers have many uses in remote sensing,depending on the application, fiber may be used because of its small size, and no electrical power is needed at the remote location. Many sensors can be multiplexed along the length of a fiber by using light wavelength shift for each sensor, or by sensing the time delay as light passes along the fiber through each sensor

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To familiarize about fiber optic sensor technology.
2	To study about Optical resonators.
3	To acquire knowledge about magnetic sensors.
4	To know about Chemical and Biosensors.
5	To gain knowledge about smart structures.

COURSE OUTCOMES

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

CO1. Recognize and classify the structures of Optical fiber and types	Understand
CO2. Describe the performance of sensors based on relative movement of opposed Grating	Understand
CO3. Recognize the sensor types for measuring various effects due to magnetic Fields	Understand
CO4. Interface hardware with relevant sensor for measuring pH level, Hydrogen, CO2, Ammonia, chloride and Oxygen etc	Apply
CO5. Develop a Architecture with proper sensors foe various Application like Temperature, Pressure, fluid level, rotation and Current -voltage measurements.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

SENSOR TECHNOLOGY

The Emergence of Fiber Optic Sensor Technology-Optical Fibers-Light Sources-Optical Detectors- Optical Modulators- Intensity-Based and Interferometric Sensors-Fabry perot, Mach Zender, Michelson and Sagnac

GRATING SENSORS

Multimode Grating and Polarization Sensors-Sensors Based on Relative Movement of Opposed Gratings-Grating Period Modulation-Sensors Based on the Photo-elastic Effect-Retardation Plates- Fiber Grating Sensors

DISTRIBUTED AND MAGNETIC SENSORS

Fiber Optic Distributed and Magnetic Sensor-Distributed Sensing- Basic Principles of Sensor Multiplexing- Inter ferometric Sensor Multiplexing- Faraday effect sensors-Magneto strictive – Lorentz force sensors-Evanescent Field Absorption Sensors

CHEMICAL AND BIOSENSOR

Fiber Optic Chemical and Biosensor: Reagent Mediated sensor-Humidity sensor – pH sensor – Hydrogen sensor – CO_2 sensor – Ammonia sensor – Chloride sensor – Glucose sensor – Oxygen sensor – Surface Plasmonic Resonance based sensor

APPLICATIONS

Industrial Applications of Fiber Optic Sensors : Temperature – Pressure – fluid level – flow – position – vibration – rotation measurements – Current -voltage measurement – Chemical analysis. Introduction to smart structures – Applications –skins.

TEXT BOOKS:

1. Eric Udd, William B. Spillman, Jr., “Fiber Optic Sensors: An Introduction for Engineers and Scientists”, John Wiley & Sons 2011
2. Bhagavānadāsa Gupta, Banshi Das Gupta, “Fiber Optic Sensors: Principles and Applications”, New India Publishing 2006
3. David A. Krohn, “Fiber optic sensors: fundamentals and applications”, ISA Publishing 2000

REFERENCE BOOKS:

4. Francis T.S. Yu, Shizhuo Yin, Paul B. Ruffin, “Fiber Optic Sensors”, CRC Press Publisher 2010
5. B.Culshaw and J.Daykin, “Optic fiber Sensors Systems and Applications”, Artech House 1989
6. KTV Grattan & BT Meggit, “Optical fiber sensor technology & Applications”, Kluwer Academic 2000

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
2	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in

17ECSE17	IOT IN AUTOMOTIVE SYSTEMS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

To explore the interconnection and integration of the physical devices with the internet to make vehicle automation for various parameters.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To recognize the building blocks of Internet of Things and characteristics.
2	To understand the basic architecture of IOT.
3	To know the fundamental technologies used in IOT.
4	To recognize the application areas of IOT.
5	To acquire knowledge about the design constraints in IOT.

COURSE OUTCOMES

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

CO1. Describe the physical design and logical design of IOT with machine to machine communication models	Understand
CO2. Apply main design procedure to construct a appropriate architecture	Apply
CO3. Analysis the MAC protocol and routing protocol for sensors deployment in need of data aggregation and dissemination	Analyze
CO4. Derive a architecture with relevant IoT devices for vehicles automation and surveillance	Create
CO5. Develop a communication module by considering design constraints for IOT based automation	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	L	-	-	-	-	-	-	-	-	-	-	S	-	-
CO2	S	M	-	L	L	-	-	-	-	-	-	L	S	M	-
CO3	S	S	M	M	L	L	-	-	-	-	-	L	S	M	M
CO4	S	S	M	M	M	M	-	-	-	-	-	M	S	M	M
CO5	S	M	M	L	L	L	-	-	-	-	-	L	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to IoT

Defining IoT - Characteristics of IoT - Physical design of IoT - Logical design of IoT - Functional blocks of IoT - Communication models - Machine to Machine - Difference between IoT and M2M

Architectural Overview

Building an architecture - Main design principles and needed capabilities - IoT architecture outline standards-considerations.

IoT Technology Fundamentals

Wireless medium access issues - MAC protocol survey - Survey routing protocols - Sensor deployment & Nodediscovery - Data aggregation and dissemination

Applications of IoT

IOT devices and sensors for vehicle Automation – GPS, GSM, Bluetooth. Sensors: level sensor,motion sensor, position sensor and object sensor. Surveillance applications –CCTV - Other IoT applications

Real-World Design Constraints

Introduction - Technical Design constraints - Data representation and visualization - Interaction and remotecontrol.

TEXT BOOKS:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1st Edition, OrientBlackswan Private Limited, 2015.

REFERENCE BOOKS:

1. Peter Waher, "Learning Internet of Things", Packt publishing, 2015

2. David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.S.Selvaraju	Associate Professor	ECE	selvaraju@vmkvec.edu.in
2	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17ECSE18	IOT FOR INDUSTRIAL SYSTEMS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

The objectives of this course are to provide in-depth understanding of the underlying concepts of Internet of things, building blocks, domain-specific IoTs , and Design methodology for IOT. Also the course provides knowledge on Python coding to embed the coding in various open source hardware such as Raspberry Pi and Arduino. Eventually the course extends the students‟ knowledge upto the level of building cost effective IOT system for real world scenario with the open source hardware and software tool chains

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To assess the vision and introduction of IoT
2	To Understand IoT Market perspective.
3	To Implement Data and Knowledge Management and use of Devices in IoT Technology
4	To Understand State of the Art -IoT Architecture.
5	To classify Real World IoT Design Constraints, Industrial Automation in IoT

COURSE OUTCOMES

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

CO1. Recollect the terms and definitions of embedded system and networking	Remember
CO2. Understand the details and functionality of architecture of IOT	Understand
CO3. Identify different hardware and software tools for the IOT implementation	Understand
CO4. Design an IOT system for the given scenario and able to evaluate the constraints of the system	Apply
CO5 Choose the suitable hardware and software tools chains for the given real world scenario to fulfill the IOT requirements	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

INTRODUCTION TO IOT:
Introduction, Characteristics, Physical design, Protocols, logical design, Enabling technologies and IoT Levels. Domain Specific IoTs. IoT vs M2M.
DESIGN METHODOLOGY:
IoT systems management with NETCONF-YANG. IoT Design Methodology. IOT design Specifications, Model, Level and view Specifications, Device & Component Integration and Application Development.
LOGICAL DESIGN& PHYSICAL DEVICES:
Python packages of interest for loT, Cloud for loT, python web application framework. Basic building blocks of an loT Device.
OPEN SOURCE HARDWARE:
Raspberry PI physical devices, Raspberry Pi Interfaces, Programming, APIs / Packages. Web services. Intel Galileo-Arduino-Interfaces, Arduino Programming with IOT APIs.
CASE STUDIES: Real time applications of IoT-Connecting IoT to cloud..

TEXTBOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things –A hands-on approach", Universities Press, 2015
2. Peter Waher "Learning Internet of Things", Packt Publishing,UK, 2015.
3. Miguel de Sousa",Internet of Things with Intel Galileo"", Packt Publishing,UK, 2015

REFERENCE BOOKS:

1. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014
2. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things",Wiley Publishing,2015
3. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014)

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.L.K.Hema	Professor	ECE	hemalk@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandrang@vmkvec.edu.in
3	Mr.R.Ramani	Assistant Professor	ECE	ramani@vmkvec.edu.in
4	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in

17ECSE19	RFID AND FLEXIBLE SENSORS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

The integration of sensor and radio frequency device (e.g., RFID tags) data into IT applications. This framework is applied to the area of healthcare applications because data quality is important to improving patient care while reducing overall costs. Real-time, high quality data are critical for emergency medical applications, telemedicine, and preventive care, which sensor based applications can provide. Methods This is a theory-based approach, illustrated with examples from the healthcare industry. A sensor design framework is presented that links the requirements of the application with the capabilities of the many types of sensors available for healthcare.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To Understand the RFID used in IT applications and indicate their advantages and limitations.
2	To apply the programming the RFID devices and modes of operation.
3	To apply flexible Sensors
4	To design Sensor Principles in resistance and capacitance.
5	To apply and develop Sensor Interfacing and Sensor various type of systems.

COURSE OUTCOMES

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

CO1. Explain the type of sensors and RFID its principles	Understand
CO2. Quantify the specification and characteristics of sensors	Understand
CO3. Execute the measurements and error calculations	Apply
CO4. Demonstrate the functionality of sensors in instruments	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	-	-	-	-	-	L	-	S	-	-
CO2	L	L	L	S	S	-	-	-	-	-	L	-	S	M	-
CO3	M	M	L	S	S	-	M	M	M	-	M	-	S	-	M
CO4	M	M	M	S	S	S	S	S	S	-	S	-	S	-	M

S- Strong; M-Medium; L-Low

SYLLABUS

History and Practice of RFID: RFID Systems and Terminology, Types of RFID, Frequency Bands for RFID, Tags-Passive, Semi passive, and Active Tags. Radio Basics for UHF RFID -Signal Voltage and Power, Information, Modulation, and Multiplexing, Backscatter Radio Links, Link Budgets, Effect of Antenna Gain and Polarization on Range, Propagation in the Real World.

Introduction to Sensors: Sensor signals and systems, classification and measurement units. Sensor Characteristics: Transfer function, measuring parameters.

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

Sensor Interfacing: op-amp and Instrumentation amplifier, Excitation circuits, A/D and D/A converters and bridge circuits. Noises in sensor circuits.

Sensor systems: force, strain, Inductive, capacitive, magnetic, level, Flow, pressure, acoustic, humidity, moisture, temperature, ultrasonic, chemical, image and bio sensors. Position, displacement, motion, velocity, acceleration sensors based system.

Smart sensors: Piezo, Shape memory alloys, MR and ER fluids, optical, IOT and MEMS sensors

TEXT BOOKS:

1.Daniel M. Dobkin-The RF in RFID: UHF RFID in Practice–Elsevier/Newness, U.S./India –2012(2ndEdition) –ISBN: 97801239458

2. Jacob Fraden,"Hand book of modern sensors: Physics design and applications", Springer, 2003, 3rdedition, AIP press

REFERENCE BOOKS:

1.Ian R. Sinclair, "Sensors and transducers", Newness, Oxford, 2001, 3rdedition.

2.Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, Tata McGraw-HillEducation Pvt. Ltd., 2011.

3.John P. Bently, " Principle of measurement systems", Pearson education, Prentice Hall publication, 2004, 4thedition.

4.S.Renganathan, "Transducer Engineering", Allied publishers,New Delhi 2003.

5.Neubert, H.K.P., "Instrument Transducers –An Introduction to their Performance and Design", Oxford University Press, Cambridge, 2003

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	S.Kannan	Assistant Professor	ECE	kannan@vmkvec.edu.in
2	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

17ECSE20	SMART IOT APPLICATIONS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

This course providing a basic understanding of Internet of Things, amplifying the application areas where Internet of Things can be applied and enables designing prototypes of Internet-connected products using appropriate tools.

PREREQUISITE:- Nil

COURSE OBJECTIVES

1	To learn ability on basic concept, and challenges in the Internet.
2	To predict the varies components and the protocols in Internet.
3	To build skills on embedded system with the internet.
4	To Redundant the various modes of communications with Internet.
5	To Recognize on knowledge to manage the resources in the Internet.

COURSE OUTCOMES

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

CO1.	Interpret the significance of IoT,WoT and Cloud of Things.	Understand
CO2.	Describe the general IoT architecture and connected domains.	Understand
CO3.	Predict consequence the requirement to figure out the suitable communication technology and protocols required for an IOT application.	Analyze
CO4.	Explain the challenges in wearable computing, components of wearable technology and types of wearable.	Apply
CO5.	Relate the knowledge on communication with the cloud through Wi-Fi / Bluetooth &advance in various system	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	-	S	-	M	-	-	-	-	-	-	-	S	M	-
CO2	L	-	S	M	-	-	-	-	-	-	-	-	S	M	-
CO3	M	S	M	L	-	L	M	-	-	L	-	L	-	S	-
CO4	S	-	M	-	L	-	L	-	-	-	-	L	M	S	-
CO5	S	M	S	-	L	M	M	L	-	S	-	L	M	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO IOT

Overview and Introduction, Internet of Things (IoT), Web of Things (WoT), Cloud of Things, Need for IoT on Cloud, Services in the Cloud for the Internet of Things, Applications of IoT –Detailed Domain Model.

IOTARCHITECTURE

IoT Architecture,Sensor Layer, Gateway and Network Layer, Management Service Layer, Application Layer,IoT Enabling Technologies, Addressing Schemes, Data Storage and Analytics, Visualization. Connected Domains – Connected Home, Connected Worker, Connected Automobile, Connected Industry.

PROTOCOLS SUPPORTING IOT
Wireless Protocol for IoT,Communication Technologies -NFC, Bluetooth, Bluetooth LE, ANT, Wi-Fi, ZigBee, Z-wave, KNX Wireless, HART, 6LoWPAN, WiMAX, 2.5–4G Protocols in Different Layers, Architecture, Features & Functions of CoAP, MQTT, OAuth2, XMPP, CoAP vs HTTP, CoAP Structure Model, Security Protocol and Application for CoAP.

WEARABLE TECHNOLOGY
History of wearable computing, Challenges of wearable computing, Fundamental components of wearable technology, Design for Excellence, Touch Point Analysis, Types of Wearables -DigitalEyewear, Ring, Band, Frameworks for wearable, Android Wear, Qualcomm Vuforia, Virtual Continuum, Augment Reality, Augmented Virtuality, Virtual Reality, Mixed Reality in Wearables.

IOT PLATFORMS DESIGN METHODOLOGY
IoT Systems –Intel IoT Framework, Qualcomm IoT Framework, Microsoft IoT Framework, ARM IoT Framework, Logical Design, Programming IoT platform (eg: Python, Mono C# , Objective-C, Ruby), Program for Firmware – Case Studies

TEXT BOOKS:
1.Olivier Hersent,David Boswarthick andOmar Elloumi, The Internet of Things: Key Applications and Protocols, Second Edition, Wiley Publisher, 2012
2.Uckelmann, Dieter, Mark Harrison, and Florian Michahelles,Architecting the Internet of Things. Springer Science & Business Media, 2011.
3.Jean-Philippe Vasseur, Adam Dunkels, Interconnecting Smart Objects with IP: The Next Internet, Morgan Kuffmann, 2010
4.Jonathan L. Zittrain, The Future of the Internet, Yale University Press & Penguin UK 2008.
5.Samuel Greengard, The Internet of ThingsThe Internet of Things (The MIT Press Essential Knowledge series), MIT Press, 2015

REFERENCE BOOKS:
1.Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands on Approach, 2014
2.Doukas, Charalampos,Building internet of things with the Arduino, CreateSpace Independent Publishing Platform, 2012.
3. Lu, Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning. The Internet of Things: From RFID to the Next-Generation Pervasive Networked Systems, CRC Press
4. Massimo Banzi, Getting Started with Arduino (Make: Projects). O'Reilly Media. 2008.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Dr.P.M.Murali	Assistant Professor	ECE	muralipm@vmkvec.edu.in
2	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17ECSE21	WIRELESS SENSOR NETWORKS AND IOT	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

To understand the fundamental concepts of wireless sensor networks and Internet of Things, have an enhanced knowledge of the various protocols with Internet of Things in the real world scenario.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To understand the various sensor network concepts
2	To Know the physical layer issues and analyze Medium Access Control Protocols
3	To identify with the IoT Reference Architecture and Real World Design Constraints
4	To recognize the various IoT Protocols (Datalink, Network, Transport, Session, Service)
5	To Understand IoT value chain structure (device, data cloud), application areas and technologies involved

COURSE OUTCOMES

CO1. Describe and explain radio standards and communication protocols for wireless sensor networks	Understand
CO2. Explain the function of the node architecture and use of sensors for various applications.	Understand
CO3. Expose the architectures, functions and performance of wireless sensor networks Systems and platforms.	Understand
CO4. Describe the basic concepts in IoT.	Understand
CO5. Develop web services to access/control IoT devices	Apply
CO6. Deploy an IoT application using Raspberry Pi.	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	-	-	-	-	-	-	L	S	M	-
CO2	S	S	S	-	M	-	-	-	-	-	-	M	S	M	-
CO3	S	M	M	-	L	-	-	-	-	-	-	L	S	S	-
CO4	S	S	S	-	M	M	-	-	-	-	-	M	S	S	-
CO5	S	M	M	-	M	M	-	-	-	-	-	M	S	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO WIRELESS SENSOR NETWORKS

Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors Network Architecture: Traditional layered stack, Cross-layer designs, Sensor Network Architecture Hardware Platforms: Motes, Hardware parameters

INTRODUCTION TO NS-3

Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.

MEDIUM ACCESS CONTROL PROTOCOL DESIGN

Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled Introduction to Markov Chain: Discrete time Markov Chain definition, properties, classification and analysis MAC Protocol Analysis: Asynchronous duty-cycled. X-MAC Analysis (Markov Chain)

FUNDAMENTALS OF IOT

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies –IoT Levels – Domain Specific IoT – IoT vs. M2M.

IOT DESIGN METHODOLOGY & BUILDING IOT WITH RASPBERRY PI

IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.
Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services

TEXT BOOKS:

1. W. Dargie and C. Poellabauer (2010). Fundamentals of Wireless Sensor Networks –Theory and Practice. Wiley.
2. Arshdeep Bahga, Vijay Madisetti (2015). Internet of Things – A hands-on approach. Universities Press.

REFERENCE BOOKS:

1. KazemSohraby, Daniel Minoli and TaiebZnati (2007). Wireless sensor networks - Technology, Protocols, and Applications. Wiley Inter science.
2. Manoel Carlos Ramon (2014). Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers.
3. Takahiro Hara,Vladimir I. Zadorozhny, and Erik Buchmann (2010). Wireless Sensor Network Technologies for the Information Explosion Era. Springer.
4. Marco Schwartz (2014). Internet of Things with the Arduino Yun. Packet Publishing

COURSE DESIGNERS

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

17ECSE22	WIRELESS TECHNOLOGIES FOR IOT	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

PREAMBLE

The course follows the evolution of mobile and wireless security, and the underlying principles. The course is designed to educate the purpose of defending systems from unauthorized wireless attacks. This course also discovers the latest security standards and practices in mobile and wireless network.

PREREQUISITE – Nil

COURSE OBJECTIVES

1	Understand the wireless technologies, wireless network standards.
2	Gain the knowledge on wireless networks, denial of service attacks and client-side threats.
3	Build an understanding of mobile data network standards.
4	To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)
5	To classify Real World IoT Design Constraints, Industrial Automation in IoT.

COURSE OUTCOMES

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

CO1. Knowledge on various wireless technologies, wireless network standards and their threats.	Understand
CO2. Show how hackers and auditors alike test wireless networks for vulnerabilities such as rogue access points, denial of service (DoS) attacks and client-side threats	Apply
CO3.Demonstrate the mobile data network standards and its challenges.	Apply
CO4Summarize the vulnerabilities and mis-configurations at wireless transport layer.	Evaluate
CO5. Invent how an attacker might attempt to subvert and bypass Wireless security measures in Bluetooth and WiFi.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

MOBILE & WIRELESS TECHNOLOGIES:

Introduction to wireless technologies-Mobile cellular networks -Personal Area Networks -Transmission Media –WLAN standards, controllers -Securing WLAN -Countermeasures -Wired Equivalence Protocol(WEP).Wireless threats:Kinds of security breaches-Eavesdropping -Communication Jamming -RF interference -Covert wireless channels -DOS attack –Spoofing -Theft of services -Traffic Analysis-Cryptographic threats -Wireless security Standards.

MOBILE NETWORKS SECURITY:

Wireless Device security issues -CDPD security (Cellular Digital Packet Data)-GPRS security (General Packet Radio Service) -GSM (Global System for Mobile Communication) security –IP security -3G / 4G security.

WIRELESS TRANSPORT LAYER SECURITY:

Secure Socket Layer -Wireless Transport Layer Security -WAP Security Architecture -WAP Gateway -Wireless Intrusion Detection and Prevention Systems (WIDS/WIPS)

BLUETOOTH & WIFI SECURITY:

Basic specifications -Pico nets –Scatter nets -Bluetooth security architecture –Security at the baseband layer and link layer –Frequency hopping –Security manager –Authentication –Encryption -WiFi Hot spot architecture -Wireless honey pots -Security in IEEE 802.11.

WIRELESS SENSOR NETWORK SECURITY

Attacks on wireless sensor network and Preventive mechanisms: authentication and traffic analysis, Case study: centralized and passive intruder detection Case studies:Public safety wireless networks, Case study 2 –Satellite communications systems , Case study 3 –Wide Area Wireless Data Services (CDPD, GPRS, etc.), Case study 4–Wireless LANs (802.11, etc.), Case study 5 –Wireless Metropolitan Area Networks (e.g., 802.16)

Text Books

1.Wireless Security-Models, Threats and Solutions,Nichols and Lekka, Tata McGraw –Hill, New Delhi, 2006.
2.Wireless Security, Merritt Maxim and David Pollino, Osborne/McGraw Hill, New Delhi, 2005.

Reference Books

1.Wireless and Mobile Network Security-Security basics, Security in On-the-shelf and emerging technologies,Hakima Chaouchi, Maryline Maknavicius, ISBN: 9781848211179,2010.
2.Mobile and Wireless Network Security and Privacy, Springer, ISBN: 0387710574, edition 2007.
3.Wireless Network Security: Theories and Applications, Springer,ISBN:978-3642365102, 2013

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.R.Karthikeyan	Assistant Professor (Gr-II)	ECE	rrmdkarthikeyan@avit.ac.in
2	Mrs.A.Malarvizhi	Assistant Professor	ECE	malarvizhi@vmkvec.edu.in

17ECSE23	CHEMICAL SENSOR LAB	Category	L	T	P	Credit
		EC(SE)	0	0	4	2

PREAMBLE

A chemical sensor is a device that transforms chemical information (composition, presence of a particular element or ion, concentration, chemical activity, partial pressure.

PRERQUISITE:- Nil

COURSE OBJECTIVES

1	The course focuses on sensors for physical, chemical and biological properties.
2	The terminologies of electrochemical sensors and their applications in industry
3	Locate different type of sensors used in real life applications and paraphrase their importance

COURSE OUTCOMES

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

CO1. knowledge of principle based different types of sensors	Understand
CO2. Design an integrated sensor system with different types of sensors.	Apply
CO3. Predict advance in the expected performance of various sensors.	Analyze
CO4. Evaluate the technological and physical limitations of a specific sensor.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

1. Sensor classification and characteristics.
2. Physical principles of sensing.
3. Working principles and applications of different types of sensors:
4. Presence, displacement and level.
5. Velocity and acceleration.
6. Force and strain.
7. Pressure and flow.
8. Acoustic.
9. Humidity and moisture.
10. Light and radiation.
11. Temperature.
12. Chemical and biological.
13. Sensor materials and technologies.
14. ORP(Oxidation-Reduction Potential) Sensor
15. O2 Gas Sensor
16. Ethanol Sensor
17. Blood Pressure Sensor

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr.P.M.Murali	Assistant Professor	ECE	muralipm@vmkvec.edu.in
2.	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17ECSE24	SENSOR SYSTEMS LAB	Category	L	T	P	Credit
		EC(SE)	0	0	4	2

PREAMBLE

The IoT is an environment where smart devices sense, anticipate, and respond to our needs as we manage them remotely. These smart devices often act as the gateway between our digital and physical world.

PRERQUISITE:- Nil

COURSE OBJECTIVES

1	To provide adequate knowledge in sensors
2	The IoT touches many aspects of life including transportation, health care, safety, environment, energy, and more.

COURSE OUTCOMES

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

CO1. Understand the characteristics of sensors	Understand
CO2. Demonstrate the working of various Sensors	Apply
CO3.Aanalyze and understand various sensors based on its classification and working principle	Analyze
CO4. Identify the various sensors system 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	M	M	M	M	L	-	M	-	-	-	-	M	M	S	L
CO2	S	M	M	L	M	-	-	-	-	-	-	M	M	-	-
CO3	S	S	S	S	L	-	M	-	-	-	L	M	S	S	L
CO4	S	S	S	L	L	-	-	-			-	M	M	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

1. Read Temperature and Relative Humidity value from the sensor.
2.Read Light intensity value from light sensor
3 Read atmospheric pressure value from pressure sensor
4. Proximity detection with IR LED.
5. Generation of alarm through Buzzer
6. Plot the characteristics curve of Thermocouple, Thermistor and RTD.
7.Verify the characteristics of Load cell
8. Verify the characteristics of Opto-coupler
9. Plot the characteristics of Electrodes
10. Verify the characteristics of strain gauge

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1.	Dr.L.K.Hema	Professor	ECE	hemalk@avit.ac.in
2.	Dr.P.M.Murali	Assistant Professor	ECE	muralipm@vmkvec.edu.in

17ECSE25	WIRELESS SENSOR NETWORKS LAB	Category	L	T	P	Credit
		EC(SE)	0	0	4	2

PREAMBLE

The Wireless Sensor Network Lab hosts a state-of-the art experimental research facility for WS&AN. The test-bed facility is used for the prototyping and evaluation of developed protocol solutions and serves as a basis for the development of novel mobile context aware services and applications.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To learn the wireless sensor network and its applications.
2	To analyze the TCL script for transmission between nodes.
3	To examine the TCL script for UDP and CBR traffic in WSN Nodes.
4	To analyze the implementation of routing protocol in NS2.

COURSE OUTCOMES

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

CO1. Explain the techniques used for Wireless Sensor Network and its Applications in Engineering.	Understand
CO2. Demonstrate the installation procedure of Network Simulator, Communication established between mobile nodes and sensor nodes.	Apply
CO3. Illustrate the TCL script used for transmission between mobile nodes and sensor nodes.	Apply
CO4. Analyze the TCL script for UDP and CBR traffic in WSN.	Analyze
CO5. Evaluate the routing protocol in NS2 for AODV, DSR, and TORA.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

1. Introduction of Wireless sensor network applications and its Simulation.

2. Network Simulator installation of wireless sensor network.

3. Write TCL script for transmission between mobile nodes.

4. Write TCL script for sensor nodes with different parameters.

5. Generate tcl script for udp and CBR traffic in WSN nodes.

6. Generate tcl script for TCP and CBR traffic in WSN nodes.

7. Implementation of routing protocol in NS2 for AODV protocol.

8. Implementation of routing protocol in NS2 for DSR protocol.

9. Implementation of routing protocol in NS2 for TORA protocol.

10. Study other wireless sensor network simulators

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.S.Valarmathy	Associate Professor	ECE	valarmathy@vmkvec.edu.in
2	Mr.P.Subramanian	Associate Professor	ECE	subramanian@avit.ac.in

17EECC15	ELECTRICAL TECHNOLOGY	Category	L	T	P	Credit
		FC	3	0	0	3

PREAMBLE

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

PREREQUISITE

Nil

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 DC machines
4	To gain knowledge about construction, principle of operation and performance of induction machines.
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	Analyze the performance of different types of DC machines	Analyze
CO3	Explain the fundamentals and operation of Transformer	Understand
CO4	Analyze the performance of different types of Transformer	Analyze
CO5	Explain the construction, operation of AC machines and special machines	Understand

MAPPING WITH 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	M	M	-	L	-	-	-	M	M	L	S	-	-
CO2	M	S	-	L	L	-	-	L	L	-	S	-	S	M	-
CO3	M	M	M	S	-	-	-	-	-	L	-	L	S	M	M

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

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/VMKVEC	sathish@vmkvec.edu.in

17EEEC21	NON CONVENTIONAL ENERGY SOURCES	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Non Conventional sources of energy are generally renewable sources of energy. This type of energy sources include anything, which provides power that can be replenished with increasing demand for energy and with fast depleting conventional sources of energy such as coal, petroleum, "natural gas etc. The non- conventional sources of energy such as energy from sun, wind, biomass, tidal energy, geo thermal energy and even energy from waste material are gaining importance. This energy is abundant, renewable, pollution free and eco-friendly. It can also be more conveniently supplied to urban, rural and even remote areas. Thus, it is also capable of solving the twin problems of energy supply in a decentralized manner and helping in sustaining cleaner environment. It concerned with development of the national grid system will focus on those resources that have established themselves commercially and are cost effective for on grid applications

PREREQUISITE

- NIL

COURSE OBJECTIVES

1	To impart the knowledge of basics of different non conventional types of power generation & power plants
	To understand the need and role of Non-Conventional Energy sources.
2	To learn economical and environmental merits of solar energy for variety applications.
3	To learn modern wind turbine control & monitoring.
4	To learn various power converters in the field of renewable energy technologies.
5	To study and analyse different types of Power converters for Renewable energy conversion

COURSE OUTCOMES

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

CO1	Identify the different non conventional sources and the power generation techniques to generate electrical energy.	Understand
CO2	Explore the Solar Radiation, different Methods of Solar Energy Storage and its Applications.	Analyse
CO3	Familiarize the Winds energy as alternate form of energy and to know how it can be tapped	Understand

CO4	Explore the Geothermal Energy Resources and its methods.	Understand
CO5	Identify the Bio mass and Bio gas resources and its tapping technique	Analyze
CO6	Investigate the Tidal, Wave and OTEC Energy, Concepts of Thermo-Electric Generators and MHD Generators	Analyse

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Statistics on conventional energy sources, Classification of Energy Resources, Definition Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES. - Solar, Wind, Geothermal, Bio-mass, Ocean Energy Sources, comparison of these energy sources

SOLAR ENERGY CONCEPT

Introduction to Solar Energy - Radiation and its measurement, Solar Energy conversion and its types - Introduction to Solar Energy Collectors and Storage, Applications of Solar Energy: Solar Thermal Electric Conversion Systems, Solar Electric power Generation, Solar Photo-Voltaic, Solar Cell Principle, Semiconductor Junctions, Conversion efficiency and power output, Basic Photo Voltaic System for Power Generation, Stand-alone, Grid connected solar power satellite

WIND ENERGY CONCEPT

Introduction - Basic Principles of Wind energy conversion-The nature of wind- The power in the wind (No derivations) - Forces on the Blades (No derivations)-Site Selection considerations-Basic components of a wind energy conversion system (WECS)-Advantages & Limitations of WECS-Wind turbines (Wind mill)-Horizontal Axis wind mill-Vertical Axis wind mill-performance of wind mills-Environmental aspects - Determination of torque coefficient, Induction type generators

GEOTHERMAL AND BIOMASS ENERGY

Geothermal Sources - Hydro thermal Sources - a. Vapor dominated systems b. Liquid dominated systems -Prime movers for geothermal energy conversion - Biomass Introduction - Biomass conversion techniques-Biogas Generation-Factors affecting biogas Generation-Types of biogas plants- Advantages and disadvantages of biogas plants-urban waste to energy conversion - MSW incineration plant.

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TIDAL AND OTEC ENERGY

Tidal Energy-Basic Principles of Tidal Power-Components of Tidal Power Plants- Schematic Layout of Tidal Power house-Advantages & Limitations of Tidal, Wave, OTEC energy - Difference between tidal and wave power generation, OTEC power plants, Design of 5 Mw OTEC pro-commercial plant, Economics of OTEC, Environmental impacts of OTEC.

TEXT BOOK

1. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi, 2003
2. K M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, New Delhi, 2003.
3. Non Conventional Energy Resources, Shobh Nath. Singh, Pearson Education India, 2016, e – ISBN : 978933255906 - 6

REFERENCES

1. Ramesh R & Kumar K U, Renewable Energy Technologies, Narosa Publishing House, New Delhi, 2004
2. Wakil MM, Power Plant Technology, Mc Graw Hill Book Co, New Delhi, 2004.
3. Non – Conventional Energy Sources. Rai.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	e-Mail ID
1	P. LOGANATHAN	Assistant Professor	EEE / VMKVEC	loganathan@vmkvec.edu.in

17EEEC22	SCADA	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

Communication tool to analyze the power system date in real time applications.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the fundamentals of SCADA.
2	To analyze the SCADA Components.
3	To apprise the communication in SCADA.
4	To learn the Concept of Monitoring and Control unit of SCADA.
5	To analyze the application of SCADA in power System.

COURSE OUTCOMES

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

CO1. Estimate the system components of SCADA.	Evaluate
CO2. Outline the fundamentals of SCADA.	Analyze
CO3. Compare the various SCADA communication protocol.	Analyze
CO4. Illustrate the SCADA communication.	Apply
CO5. Explain the monitoring and control unit of SCADA.	Understand
CO6. Describe the applications of SCADA in power system .	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	L	L	L	M	M	--	--	--	--	--	--	--	L	M
CO2	M	--	--	--	M	M	--	--	--	--	--	--	--	L	L
CO3	L	M	--	--	M	M	--	L	--	S	--	L	L	L	L
CO4	L	M	--	--	M	M	--	--	--	S	--	L	L	M	M
CO5	L	--	--	--	L	M	--	--	--	--	--	L	--	L	L
CO6	S	S	--	--	L	M	--	--	--	--	--	L	L	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO SCADA

Evolution of SCADA, SCADA definitions, SCADA Functional requirements and Components, SCADA Hierarchical concept, SCADA architecture, General features, SCADA Applications, Benefits.

SCADA SYSTEM COMPONENTS

Remote Terminal Unit (RTU), Interface units, Human- Machine Interface Units (HMI), Display Monitors/Data Logger Systems, Intelligent Electronic Devices (IED), Communication Network, SCADA Server, SCADA Control systems and Control panels.

SCADA COMMUNICATION

SCADA Communication requirements, Communication protocols: Past, Present and Future, Structure of a SCADA Communications Protocol, Comparison of various communication protocols, IEC61850 based communication architecture, Communication media like Fiber optic, PLCC etc. Interface provisions and communication extensions, synchronization with NCC, DCC.

SCADA MONITORING AND CONTROL

Online monitoring the event and alarm system, trends and reports, Blocking list, Event disturbance recording. Control function: Station control, bay control, breaker control and disconnector control.

SCADA APPLICATIONS IN POWER SYSTEM

Applications in Generation, Transmission and Distribution sector, Substation SCADA system Functional description, System specification, System selection such as Substation configuration, IEC61850 ring configuration, SAS cubicle concepts, gateway interoperability list, signal naming concept. System Installation, Testing and Commissioning

TEXT BOOKS:

1. Stuart A. Boyer: SCADA-Supervisory Control and Data Acquisition, Instrument Society of America Publications,USA,2004
2. Gordon Clarke, Deon Reynders: Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems, Newnes Publications, Oxford, UK,2004.
3.

REFERENCES:

1. William T. Shaw, Cybersecurity for SCADA systems, PennWell Books, 2006
2. David Bailey, Edwin Wright, Practical SCADA for industry, Newnes, 2003
3. Michael Wiebe, A guide to utility automation: AMR, SCADA, and IT systems for electric Power, PennWell 1999.
4. Dieter K. Hammer, Lonnie R.Welch, Dieter K. Hammer, “Engineering of Distributed Control Systems”, Nova Science Publishers, USA, 1st Edition, 2001

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	V.MANJULA	Assistant Professor	EEE/VMKVEC	manjula@vmkvec.edu.in
2	L.CHITRA	Associate Professor	EEE/AVIT	chitra@avit.ac.in

17EECC16	POWER ELECTRONICS AND DRIVES	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

Power electronics deals with the processing and control of ‘raw’ electrical power from an electrical source such as an AC mains supply, a battery bank, a photovoltaic array, or a wind turbine into a form and quality suitable for a particular electrical load. It is an enabling technology with a very wide range of applications, such as a cell phone charger, a personal computer, a microwave oven, an MRI system, a hybrid electric car, or even the electrical grid. As can be noted, the power levels handled can vary from a few watts to several hundreds of megawatts. In this course, we will study the basic principles behind the power electronic circuits used in most such power processing applications. These circuits include power converters for DC to DC, DC to AC and AC to DC applications.

PREREQUISITE-NIL

COURSE OBJECTIVES

1	To get an overview of different types of power semiconductor devices and their switching characteristics.
2	To understand the operation, characteristics and performance parameters of controlled rectifiers.
3	To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
4	To learn the different modulation techniques inverters and to understand harmonic reduction methods.
5	To study the operation of AC voltage controller.

COURSE OUTCOMES

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

CO1:Thebasic semiconductor physics to the properties of real power semiconductor devices and differentiate from low power devices.	Remember
CO2:Theconcepts of operation of AC-DC converters in steady state and transient state of both continuous and discontinuous modes.	Understand
CO3: Classify and design choppers for simple electrical application	Apply
CO4: Identify the proper gating sequence and control circuit in operating the single phase and three phase inverter circuits.	Analyze
CO5:Analyze the performance parameter, various techniques for analysis and design of AC voltage controller and also list the various control schemes in cycloconverter.	Analyze
CO6:Describe the concepts of electric machines.	Understand
CO7: Implement the power electronics concepts to AC & DC drives to made the effective control	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

CO7	M	M	M	S	M	M	-	-	-	-	-	-	M	M	-

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

POWER SEMI-CONDUCTOR DEVICES

Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT, MOSFET – Computer simulation of PE circuits.

RECTIFIERS & CHOPPERS

Introduction-2 pulse / 3 pulse and 6 pulse converters – Dual converters. Basic Principles of Choppers - Stepdown and stepup chopper – Time ratio control and current limit control – Buck, Boost, Buck-Boost converters.

INVERTERS & AC - AC CONVERTERS

Single phase and three phase [120º& 180º mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM.

Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverter.

ELECTRICAL DRIVES

Type of Electrical Drives – Selection & factors influencing the selection – heating and cooling curves – loading condition and classes of duty – determination of power rating – simple problems.

SOLID STATE DRIVES (QUALITATIVE TREATMENT ONLY)

Advantages of solid state drives – D.C. motor control using rectifiers and choppers – control of induction motor by V, V/f and slip power recovery scheme using inverters and A.C. power regulators.

Total Hours : 45

TEXT BOOKS:

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.
2. G.K. Dubey “Fundamental Electrical Drives” second edition 2002, Narosa Publications, Second edition, 2002.

REFERENCES:

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004Edition.
4. N.K.De.,P.K.Sen “Electric Drives”, Prentice Hall, First edition 1999.
5. Pillai, S.K., “ A First course on Electrical Drives”, Wiley Eastern Ltd., New Delhi, 1982

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.A.Balamurugan	Assistant Professor	EEE/VMKVEC	balamurugan@vmkvec.edu.in
2	Mr.N.P.Gopinath	Assistant Professor (Gr-II)	EEE/AVIT	Gopinathnp@avit.ac.in

17MECC12	COMPUTER INTEGRATED MANUFACTURING	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

The students completing this course are expected to understand the nature and role of computers in Design, manufacturing & Business aspects.

Prerequisite: Nil

Course Objective

1	To understand the concepts involved in CAD , CAM and CIM
2	To apply geometric modelling techniques and various graphics standards in CAD
3	To apply Modelling Techniques & graphic standard while designing.
4	To make use of GT and CAPP concepts in processing components.
5	To identify the components of FMS and SFC

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

CO1	Discuss the basic concepts of Computer Aided Design and Manufacturing	Understand
CO2	Apply the concept of Modeling techniques for designing the components	Apply
CO3	Develop CNC programs for various mechanical components with different operations.	Apply
CO4	Apply the concepts of Group technology and Computer aided process planning techniques in Manufacturing	Apply
CO5	Identify the functions of various components of Shop Floor Control and Flexible Manufacturing Systems.	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	M	M	-	-	L	-	-	-	-	-	-	-	L	-	-
CO2	S	S	S	S	S	-	-	-	M	M	M	-	M	L	-
CO3	S	S	L	S	S	-	-	-	M	M	-	-	M	L	-
CO4	M	L	M	M	S	-	-	-	M	-	M	-	L	L	-
CO5	M	L	S	L	-	-	-	-	-	-	-	-	L	L	-

S- Strong; M-Medium; L-Low

Syllabus		
INTRODUCTION TO CAD/CAM		
The design process - Morphology of design, Product cycle - Computer Aided Design, Benefits of CAD. Role of computers - principles of computer graphics - Current trends in manufacturing engineering - Design for Manufacturing and Assembly - Sequential and concurrent engineering - Rapid prototyping.		
SOLID MODELING		
Graphic software: coordinate representation- graphic functions, software standards. Graphical Kernel system (GKS) - Initial graphics exchange system (IGES) - Graphic packages. Geometric Modeling - Wire frame, Surface and Solid models - Constructive Solid Geometry (CSG) and Boundary Representation (B-REP) Techniques - Features of Solid Modeling Packages.		
FUNDAMENTALS OF CNC MACHINES		
CNC Technology - Functions of CNC Control in Machine Tools - Classification of CNC systems - Contouring System - Interpolators, open loop and closed loop CNC systems - CNC Controllers, Direct Numerical Control (DNC Systems). - Work holding devices and tool holding devices- Automatic Tool changers. Feedback devices - Principles of Operation-Machining Centers - Tooling for CNC machines Numerical control codes - Standards - Manual Programming - Canned cycles and subroutines - Computer Assisted Programming, CAD / CAM approach to NC part programming - APT language, machining from 3D models.		
GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING		
Introduction to CIM and its related activities-History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. - benefits of G.T. - cellular manufacturing. Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning - variant approach and generative approaches - CAPP and CMPP process planning systems.		
SHOP FLOOR CONTROL AND INTRODUCTION OF FMS		
Shop floor control-phases-factory data collection system -automatic identification methods- Bar code technology-automated data collection system. FMS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout -computer control systems-application and benefits.		
Text Books		
1	Mikell.P.Groover "Automation, Production Systems and Computer Integrated manufacturing", Pearson Education 2016.	
2	Radhakrishnan P, Subramanyan.S. and Raju V., "CAD/CAM/CIM", New Age International (P) Ltd., New Delhi.	
Reference Books		
1	Yorem koren, "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 india pvt. Ltd.			
Course Designers				
S.No	**Faculty Name**	**Designation**	**Department / College**	**Email id**
1	J.Sathees babu	Associate Professor	Mech / VMKVEC	satheesbabu@vmkvec.edu.in
2	L.Prabhu	Assoc.Prof	Mech / AVIT	prabhu@avit.ac.in

17MESE32	COMPOSITE MATERIALS	Category	L	T	P	C
		EC(SE)	3	0	0	3

PREAMBLE

This course reviews the various composite materials their processing techniques and their behaviors , and to develop models and their applications in aerospace, automotive and medical fields

PREREQUISITE - NIL

COURSE OBJECTIVES

1	Understand about Fibre reinforced Plastics
2	Understand the manufacturing processes of the composite materials
3	Analyse about macro mechanical behavior of FRP
4	Analyse about micromechanical behavior of composite materials
5	Understand about material models of composites

COURSE OUTCOMES

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

CO1 .Understand the types of reinforcements and fibers used in composite materials	Understand
CO2. Understand various manufacturing techniques in composite manufacturing	Understand
CO3. Analyse the macro mechanical behavior of Fiber Reinforced Plastics	Analyze
CO4. Analyse the Micro mechanical behavior of Fiber reinforced plastics	Analyze
CO5. Apply models for solving the composite material manufacturing	Apply

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

S- Strong M-Medium L- Low

Syllabus

FIBRE REINFORCED PLASTICS (FRP)

Definition; Types; General properties and characteristics; Reinforcing materials – particles, fibers,

whiskers; Properties of reinforcing materials; Matrix materials; Additives; Properties of FRP materials; Applications
MANUFACTURING PROCESSES
Open mold processes – Hand layup, Spray up, Vacuum bag, Pressure bag & autoclave, Centrifugal casting,Filament winding; Closed mold processes – Compression molding, Resin transfer molding (RTM), Injection molding, Pultrusion; SMC & DMC products, etc.
MACROMECHANICAL BEHAVIOR OF FIBRE REINFORCED PLASTICS
Design variables; Selection of fiber-matrix and manufacturing process; Effects of mechanical, thermal, electrical and environmental properties, Fiber orientation, Symmetric and asymmetric structure; Effects of unidirectional continuous and short fibers; Lamination theory; Failure theories.
MICROMECHANICAL BEHAVIOR OF FIBRE REINFORCED PLASTICS
Strengthening methods, Elasticity of fibre composites, Plasticity and fracture of composites, Crack propagation in fibre composites, Failure under compressive loads.
MATERIAL MODELS
Law of Mixtures, Shear lag model,Laminated plate model, Eshelby's models, Other models.
Text Books:
1. Haslehurst.S.E., "Manufacturing Technology ", ELBS, London. 2. Krishnan K. Chawle. "Composite Material: Science and Engineering" Second Edition, Springer.
Reference:
1.. T.W.Clyne, P.J. Withers, "An Introduction to metal matrix composites", Cambridge University Press. 2. F.C. Campbell "Structural Composite Materials", Materials Park,ASM International,2010
Course Designers

S. No.	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	**Dr.D.Bubesh Kumar**	**Associate Professor**	**Mechanical/ AVIT**	**bubeshkumarmech@gmail.com**
2.	**J.Santhosh**	**Assistant Professor**	**Mechanical/VMKVEC**	santhosh@vmkvec.edu.in

17MESE17	MODERN MANUFACTURING METHODS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

Preamble

This course aims to teach the various advanced manufacturing processes used in industries for making products. The students will get complete knowledge of the unconventional processes in terms of aspects stated above.

Prerequisite – Nil

Course Objective

1	To discuss the basic concepts of various unconventional machining processes
2	To Demonstrate the Mechanical energy based unconventional machining processes.
3	To Demonstrate the Electrical energy based unconventional machining processes.
4	To Demonstrate the Chemical & Electro-Chemical energy based unconventional 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 of various unconventional machining processes	Understand
CO2.	Explain the Mechanical energy based unconventional machining processes	Apply
CO3.	Illustrate the Electrical energy based unconventional machining processes	Apply
CO4.	Explain the Chemical & Electro-Chemical energy based unconventional machining processes	Apply
CO5.	Illustrate 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	S	-	-	-	L	-	-	-	-	-	-	-	M	-	-
CO2	S	-	-	M	M	-	-	-	-	-	-	-	M	-	-
CO3	S	-	-	M	M	-	-	-	-	-	-	-	M	-	-
CO4	S	-	-	M	M	-	-	-	-	-	-	-	M	-	-
CO5	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"

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	M SARAVANAN	Asst Prof	Mech / VMKVEC	saravananm@vmkvec.edu.in

17MESE22	AUTOMOTIVE INFOTRONICS	Category	L	T	P	Credit
		EC(SE)	3	0	0	3

Preamble

To study Instrument Clusters, Telematics Systems, Power train, Electronic Control Units and Cockpit Electronics products for vehicles.

Prerequisite NIL

Course Objective

1	To Learn the various driver assistant system in a Vehicle.
2	To Learn the Global positioning and navigation system.
3	To known the collision warning and detection system.
4	To study about the adaptive control system and comfort systems in automobiles
5	To study about the security and smart card system.

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

CO1.	Known the vehicle motion control and stabilization system.	Understand
CO2.	Gain the knowledge of Safety and comfort system.	Understand
CO3.	Known the various safety systems used in vehicles.	Understand
CO4.	Describe the basics of vehicle collision and its effects.	Understand
CO5.	Apply the importance of Driver assistance, security and warning system.	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS				
DRIVER ASSISTANCE SYSTEMS				
Driver information, driver perception, driver convenience, driver monitoring, general vehicle control, longitudinal and lateral control, collision avoidance and vehicle monitoring.				
TELEMATICS				
Global positioning system, geographical information systems, navigation system, architecture, automotive vision system and road recognition.				
COLLISION WARNING AND AVOIDANCE				
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.				
ADAPTIVE CONTROL SYSTEMS AND COMFORT SYSTEMS				
Adaptive cruise control system, adaptive noise control, active suspension system, power steering, collapsible and tilt able steering column and power windows, Adaptive lighting system.				
SECURITY SYSTEMS				
Antitheft technologies–mechanical, electromechanical and electronic immobilizers, alarm system, stolen vehicle tracking system, remote keyless entry, smart card system and number plate coding.				
Text Books				
1	Ljubo Vlacic, Michel Parent and Fumio Harashima, “Intelligent Vehicle Technologies”, Butterworth-Heinemann publications, Oxford, 2001.			
2	Robert Bosch, “Automotive Hand Book”, 5th Edition, SAE, 2000.			
3	Ronald K Jurgen, “Navigation and Intelligent Transportation Systems – Progress in Technology”, Automotive Electronics Series, SAE, USA, 1998			
Reference Books				
1	William B Riddens, “Understanding Automotive Electronics”, 5th edition, Butter worth Heinemann Woburn, 1998.			
2	Bechhold, “Understanding Automotive Electronics”, SAE, 1998.			
3	Allan W M B, “Automotive Computer Controlled Systems”, Elsevier Butterworth-Heinemann, 2011.			
Course Designers				
S.No	**Faculty Name**	**Designation**	**Department/Name of the College**	**Email id**
1	M. SARAVANA KUMAR	ASST. PROF GRII	MECH./ AVIT	saravanakumar@avit.ac.in
2	R. CHANDRASEKAR	Assistant Professor	MECH / VMKVEC	chandrasekar@vmkvec.edu.in

17MEEC04	AGRICULTURAL ENGINEERING EQUIPMENTS	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

Preamble

This course provides about the fundamental knowledge and working principles of agricultural machinery and equipments

Prerequisite

NIL

Course Objective

1	To Understand the different systems and working principles of tractor, power tiller, makes of tractors and power tillers.
2	To Understand the students to the working principles of farm equipments, tillage implements
3	To Understand the students to farm mechanization benefits and constraints
4	To Apply the concepts of wedding and plant protection equipments for the farm.
5	To apply and understand the basic concepts in post harvesting

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

CO1.	Understand the various equipment s and mechanization used in the farm	Understand
CO2.	Understand earth moving machineries, tractor classification and implements	Understand
CO3.	Understand the mechanization and various equipment used in the farm for different field operations	Understand
CO4.	Apply the concepts of wedding and plant protection equipments for the farm processes..	Apply
CO5.	Apply the various post harvesting losses and to evaluate the moisture content of various cereals and pulses	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	M	S	M	L	-	-	-	-	-	-	-	-	L	-	-
CO2	M	M	M	M	-	-	-	-	-	-	-	-	L	-	-
CO3	M	M	M	M	-	-	-	-	-	-	-	-	L	-	-
CO4	M	M	M	L	-	-	-	-	-	-	-	-	L	-	-
CO5	M	M	M	M	-	-	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

TRACTORS

Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft – firing order combustion chambers.

POWER TILLER, BULLDOZER AND TRACTOR TESTING

Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism, components – operations performed by bulldozers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers.

SOWING AND FERTILIZING EQUIPMENT

Crop planting - methods - row crop planting systems - Devices for metering seeds – furrow openers – furrow closers- types – Types of seed drills and planters – calibration-fertilizer metering devices - seed cum fertilizer drills – paddy transplanters – nursery tray machines

WEEDING AND PLANT PROTECTION EQUIPMENT

Weeding equipment – hand hoe – long handled weeding tools – dryland star weeder – wetland conoweeder and rotary weeder – Engine operated and tractor weeders

Sprayers –types-classification – methods of atomization, spray application rate, droplet size determination – volume median diameter, numerical median diameter – drift control

HARVESTING MACHINERY

Principles of cutting crop, types of harvesting machinery, vertical conveyor reaper and binder combine harvesters, balers, threshers, tractor on top combine harvester, combine losses

Text Books

1	Jain, S.C. and C.R. Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi, 1999
2	Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6.,2010
3	Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005

Reference Books

1	Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.
2	Domkundwar A.V. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi,1999.
3	Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.
4	Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	Dr.D.Bubesh kumar	Associate Professor	Mech/AVIT	bubeshkumar@avit.ac.in
2	G.Nagarajan	Professor	Mech/VMKVEC	nagarajan@vmkvec.edu.in

17MEEC11	INDUSTRIAL ROBOTICS	Category	L	T	P	Credit
		EC(PS)	3	0	0	3

PREAMBLE

To study the application of industrial robots and enhance the knowledge of students in industrial applications

PREREQUISITE - NIL

COURSE OBJECTIVES

1	To understand the Robotics and Robot drive system.
2	To Identify the controlling of Robots and devices system.
3	The Evaluate the latest technology of sensors used in robotics.
4	To classify the robot kinematics system.
5	To justify Application of robotics in industry.

COURSE OUTCOMES

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

CO1.	Understand the basics of Robot and its drive system.	Understand
CO2.	To Identify the steps involved in controlling system	Apply
CO3.	Demonstrate the various kinematics system used in robots.	Apply
CO4.	Demonstrate the various sensors used in robots.	Apply
CO5.	Apply the robot in day to day applications	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION :

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems Hydraulic, Pneumatic and Electric system Functions – Need for Robots – Different Applications.

END EFFECTORS AND ROBOT CONTROLS:

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint-Control actions, Adaptive control.

ROBOT KINEMATICS:

Forward kinematics – Inverse kinematics – Differences: Forward kinematics and Reverse kinematics of manipulators with two and three degrees of freedom (In 2 dimensional), four degrees of freedom (In 3 dimensional) – Deviations and problems.

ROBOT SENSORS:

Sensor -principles and applications of the following types of sensors – Position of sensors (Piezo electric sensor, LVDT, Resolvers, Optical encoders, Pneumatic position sensors) – Range sensors (Triangulation principle, Structured, Lighting approach, Time of flight range finders, Laser range meters) – Proximity sensors (Inductive, Hall effect, Capacitive, Ultrasonic and Optical proximity sensors) – Touch sensors (Binary sensors, Analog sensors) – Wrist Sensors – Compliance Sensors – Slip Sensors.

INDUSTRIAL APPLICATIONS :

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments.

TEXT BOOKS:

1	K.S. Fu, R.C. Gonzalez, C.S.G. Lee, “Robotics – Control Sensing, Vision and Intelligence”, Tata McGraw-Hill Education.
2	Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012

REFERENCES:

1	Kozyrey, Yu. “Industrial Robotics” MIR Publishers Moscow.
2	Richard D.Klafter, Thomas A. Chmielewski and Michael Negin, “Robotic Engineering-An Integrated Approach”,Prentice Hall Inc,Englewoods Cliffs,NJ,USA

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department / Name of the College	Mail ID
1	G.ANTONY CASMIR	Asst. Prof. - II	Mechanical, AVIT	antonycasmir@avit.ac.in
2	J.SANTHOSH	Assistant Professor	Mechanical/V MKVEC	santhosh@vmkvec.edu.in

17MEEC13	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 including the safety aspects and various laws associated with industrial safety.

Prerequisite

NIL

Course Objective

1	To understand about safety management and understand all the safety aspects thoroughly.
2	To understand the various safety procedures and precaution to be followed during the operation of different types of machines.
3	To apply thoroughly equipped with sufficient knowledge of handling the different types of equipments and materials used for industrial safety.
4	To analyze the sufficient knowledge and sharing of expertise for emergency situations arising due to accidents and monitoring of health aspects.
5	To analysis 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.	Explain the safety concepts and role of safety management.	Understand
CO2.	Discuss various safety aspects associated with operational safety of equipments like boilers, pressure vessels and other machineries used in workshop.	Understand
CO3.	Apply various safety measures to be undertaken with respect to industrial safety.	Apply
CO4.	Illustrate the various strategies to prevent accidents and implementation.	Analyze
CO5.	Outline the implementation of safety standards and the various laws related to safety, health and welfare of personnel.	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	L	-	-	-	-	-	-	-	-	L	-	-
CO2	S	L	L	L	-	-	-	-	-	-	-	-	L	-	-
CO3	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
CO4	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-
CO5	S	M	M	L	-	-	-	-	-	-	-	-	L	-	-

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	Handlin.W, “Industrial Hand Book”, McGraw-Hill, 2000.

Reference Books

1	Heinrich.H.W, “Industrial Accident Prevention”, McGraw-Hill, 1980.
2	Rudenko.N, “Material Handling Equipments”, Mir Publishers, Moscow, 1981.
3	Lees.F.P, “Loss “Prevention in Process Industries”, Butterworths, New Delhi, 1986.
4	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
2	C.Thygarajan	AP II	Mech/AVIT	Thygararajan@avit.ac.in

17MECC16	INDUSTRIAL AUTOMATION	Category	L	T	P	Credit
		CC	3	0	0	3

Preamble

To introduce the need, evolution, and motivation for Industrial Automation. Familiarization with basic concepts and different automation strategies being used in practice worldwide.

Prerequisite NIL

Course Objective

1	To explain the factory automation and integration
2	To Illustrate about hydraulics and pneumatics circuits
3	To Design the various design of pneumatic and electro-pneumatic circuits
4	To design about PLC and its applications
5	To illustrate the automation in transfer machines & assembly.

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

CO1.	Explain the factory automation, production system and integration technologies in manufacturing sector	Understand
CO2.	Explain the various Hydraulics and Pneumatics Elements used for the industrial applications	Understand
CO3.	Develop the pneumatic and electro-pneumatic circuits for the given applications using standard procedures.	Apply
CO4.	Develop PLC for modern manufacturing applications using standard procedures	Apply
CO5.	Construct the automatic transfer machines & assembly automation	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS
INTRODUCTION TO FACTORY AUTOMATION AND INTEGRATION
Basic concepts and scope of industrial automation, socio-economic considerations, modern developments in automation in manufacturing and its effect on global competitiveness.-Need and implications of automation in manufacturing- Different types of production systems and automation-Hard/fixed automation
INTRODUCTION TO HYRDAULICS AND PNEUMATICS
Basic elements of hydraulics and pneumatics, electro-pneumatic controls and devices, electro-pneumatic systems, fluid power control elements and standard graphical symbols for them, construction and performance of fluid power generators, hydraulic and pneumatic actuators, their design and control devices-Sequence operation of hydraulic and pneumatic actuators-Applications in manufacturing-Hydraulic
DESIGN OF PNEUMATIC AND ELECTRO-PNEUMATIC LOGIC CIRCUITS
Logic circuits to be designed for a given time displacement diagram or sequence of operation-Pneumatic safety and control circuits and their applications to clamping, traversing and releasing operations.
PROGRAMMABLE LOGIC CONTROLLERS (PLC)
PLC for design demonstration, programming and interface the hardware with software for modern manufacturing applications.
AUTOMATIC TRANSFER MACHINES & ASSEMBLY AUTOMATION
Classifications, analysis of automated transfer lines, without and with buffer storage, group technology and flexible manufacturing system- Types of assembly systems, assembly line balancing, performance and economics of assembly system.

Text Books	
1	Esposito, A., 2000. *Fluid power with applications*. Upper Saddle River: Prentice-Hall International.
2	Majumdar, S.R., 1996. *Pneumatic systems: principles and maintenance*. Tata McGraw-Hill Education.
3	Bolton, W., 2003. *Mechatronics: electronic control systems in mechanical and electrical engineering*. Pearson Education.
Reference Books	
1	Auslander, D.M. and Kempf, C.J., 1996. *Mechatronics: mechanical systems interfacing*. Prentice Hall.
2	Deppert, W. and Stoll, K., 1975. *Pneumatic Control*. Vogel.
3	Merritt, H.E., 1991. *Hydraulic control systems*. John Wiley & Sons.
Course Designers	

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	M.SARAVANAN	ASST. PROF	MECH./ AVIT	saravanan@avit.ac.in
2	S.NATARAJAN	Assoc.Prof	MECH/VMKVEC	natarajans@vmkvec.edu.in

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

Preamble

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

Prerequisite

Nil

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

BATTERIES

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

STARTING SYSTEM

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

CHARGING SYSTEM & LIGHTING SYSTEM

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

FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS

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

SENSORS AND ACTUATORS

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

TEXT BOOK:

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

REFERENCES:

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

Course Designers:

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

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

Preamble

To study and purpose is to understand automotive pollution control.

Prerequisite

NIL

Course Objectives

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

Course Outcomes:

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Introduction pollution control act- norms and standards. Vehicle population assessment in metropolitan cities and contribution to pollution, effects on human health and environment, global warming, types of emission, transient operational effects on pollution
POLLUTANT FORMATION IN SI ENGINES
Pollutant formation in SI Engines, mechanism of HC and CO formation in four stroke and two stroke SI engines, NOx formation in SI engines, effects of design and operating variables on emission formation, control of evaporative emission. Two stroke engine pollution
POLLUTANT FORMATION IN CI ENGINES
Pollutant formation in CI engines, smoke and particulate emissions in CI engines, effects of design and operating variables on CI engine emissions. Nox and Sox formation and control. Noise pollution from automobiles, measurement and standards.
CONTROL OF EMISSIONS FROM SI AND CI ENGINES
Design of engine, optimum selection of operating variables for control of emissions, EGR, Thermal reactors, secondary air injection, catalytic converters, catalysts, fuel modifications, fuel cells, Two stroke engine pollution control.
MEASUREMENT TECHNIQUES - EMISSION STANDARDS
NDIR, FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles – USA, Japan, Euro and India. Test procedures – ECE, FTP Tests. SHED Test – chassis dynamometers, dilution tunnels

TEXT BOOK:

1. Paul Degobert – Automobiles and Pollution – SAE International ISBN-1-56091-563-3, 1991.
2. Ganesan, V- “Internal Combustion Engines”- Tata McGraw-Hill Co.- 2013.
3. SAE Transactions- “Vehicle Emission”- 1982 (3 volumes).

REFERENCES:

1. Obert.E.F.- “Internal Combustion Engines”- 1988.
2. Marco Nute- “Emissions from two stroke engines, SAE Publication – 1998

Course Designers:

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

17ATEC13	COMPUTER SIMULATION OF IC ENGINE PROCESSES	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

This course includes the study of adiabatic flame temperature, analysis of actual and ideal cycles and simulation of S.I, and C.I engine performance

Prerequisite

Nil

Course Objectives

1	To describe the methods of measurement of HRR and calculation of adiabatic flame temperature of IC engines.
2	To explain the methods of simulation of IC Engines.
3	To learn the simulation of IC engines with gas exchange processes and engine performance simulation
4	To know the Simulation of S.I engine with intake and exhaust charging
5	To study the simulation of C.I engine performance

Course Outcomes:

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

CO1.	Summarize the measurement of HRR and calculation of Adiabatic flame temperature	Understand
CO2.	Apply the I.C engine simulation with Adiabatic combustion	Apply
CO3.	Apply the simulation of IC engines with gas exchange processes and engine performance simulation	Apply
CO4.	Examine Simulation of S.I engine with intake and exhaust charging	Analyze
CO5.	Analyze Simulation of C.I engine performance	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION
Introduction – Heat of reaction – Measurement of URP – Measurement of HRR – Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature – Isentropic changes
ENGINE SIMULATION WITH AIR AS WORKING MEDIUM
Deviation between actual and ideal cycle – problems, SI engine simulation with adiabatic combustion, temperature drop due to fuel vaporization, full throttle operation – efficiency calculation, part – throttle operation, super charged operation.
PROGRESSIVE COMBUSTION
SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.
SIMULATION OF SI ENGINE
Intake – Exhaust - Charging and Combustion Simulation for two stroke and four stroke spark ignition Engine
DIESEL ENGINE SIMULATION
Zero, one and multi zone model for combustion, different heat release and heat transfer models, equilibrium calculations, simulation of engine performance.

TEXT BOOK:

1. Ganesan. V - "InternalCombustion Engines" - Tata McGraw-Hill, 2013.
2. Ganesan.V. – Computer Simulation of compression ignition engines – Orcent

REFERENCES:

1. Ramoss A.L. Modeling of Internal Combustion Engines process, McGraw Hill Publishing Co., 1992
2. Ashley Cambel, Thermodynamics analysis of combustion engines, John Wiley & Son, New York, 1986.
3. Benson, R.S., Whitehouse, N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

CourseDesigners:

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

gma

17ATEC14	COMPUTER CONTROLLED VEHICLE SYSTEMS	Category	L	T	P	C
		EC(PS)	3	0	0	3

Preamble

This course introduces the role of sensors and actuators for controlling the engine, drive line. It also provide knowledge about the transportation and safety devices controlled by computer

Prerequisite

Nil

Course Objectives

1	To explain the concepts of speed control, suspension for autonomous vehicles .
2	To detail on the advanced methods of control of management systems towards adaptive cruise control automotive vehicles.
3	To describe about intelligent transportation system.
4	To detail on the smart safety devices for automotive vehicles.

Course Outcomes:

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

CO1.	Apply the concepts of control systems of vehicles towards autonomous driving.	Apply
CO2.	Apply the different components for developing an adaptive cruise control.	Apply
CO3.	Appraise on the intelligent transportation system.	Apply
CO4.	Recommend smart safety devices for automotive vehicles	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

INTRODUCTION

Understanding autonomy – Review of the role of control in autonomy (speed control, suspension control & integrated vehicle dynamics) - Role of sensors and actuators. Examples of autonomy cruise control

ENGINE CONTROL SYSTEM

Fuel control-Ignition control in SI engines- Lambda control- idle speed control- Knock control- cylinder balancing

DRIVE LINE CONTROL SYSTEM

Speed control – gear shifting control – traction /braking- steering- suspension – vehicle handling and ride characteristics of road vehicles- adaptive cruise control

INTELLIGENT TRANSPORTATION SYSTEM

Overview – control architecture – collision avoidance, pitch, yaw, bounce control – traffic routing system- automated high way systems- lane warning system- driver information system- data

SAFETY IMPACTING DEVICES

Vision enhancement- driver conditioning warming- anti-lock braking systems – route guidance and navigation systems – in-vehicle computing – commercial vehicle diagnostic/ prognostics – hybrid/ electric and future cars- case study.

TEXT BOOK:

1. Automotive control systems, U.Kienckeand L. Nielson, SAE and springer-Verlag, 2000

REFERENCES:

1. Crouse, W.H. & Anglin, D.L., Automotive Mechanics, Intl. Student edition, TMH, New Delhi.
2. Artamonov, M.D., Harionov, V.A. & Morin, M.M. Motor Vehicle, Mir Publishers, Moscow 1978.,
3. Heitner, J., Automotive Mechanics, CBS Publishers, New Delhi 1987.
4. Stockel Martin W and Stocker Martin T., Auto Mechanics Fundamentals, Goodheart Wilcox,

CourseDesigners:

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

17CSCC16	CLOUD COMPUTING	Category	L	T	P	Credit
		CC	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	-	-
CO2	M	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO3	M	M	S	M	-	-	-	-	-	-	-	-	M	M	M
CO4	S	M	M	M	-	-	-	-	-	-	-	-	M		M
CO5	S	M	M	M	-	-	-	-	-	-	-	-	S	M	M

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

COURSE DESIGNERS				
S. No.	**Name of the**	**Designation**	**Department**	**Mail ID**

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.

	Faculty			
1.	Dr.R.Jaichandran	Professor	CSE	rjaichandran@avit.ac.in
2.	T.GEETHA	Assistant professor	CSE	geetha_kcs@yahoo.com

17CSCC09	JAVA PROGRAMMING	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This course of study builds on the skills gained by students in Java Fundamentals and helps to advance Java programming skills. Students will design object-oriented applications with Java and will create Java programs using hands-on, engaging activities.

PREREQUISITE

NIL

COURSE OBJECTIVES

1.	Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2.	Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3.	Be aware of the important topics and principles of software development.
4.	Understand Event Handling and Swing Components.
5.	Understand Generic Programming.

COURSE OUTCOMES

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

CO1.Knowledge of the structure and model of the Java programming language	Understand
CO2.Use the Java programming language for various programming technologies	Understand
CO3. Develop software in the Java programming language	Apply
CO4.Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements	Analyze
CO5.Choose an engineering approach to solving problems, Starting from the acquired knowledge of programming and knowledge of operating systems.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS OF JAVA

Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism.- Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method.

ARRAYS, STRINGS &OBJECTS

Arrays – Strings - Packages – Java-Doc comments –- Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes - The Object class – Reflection – interfaces – object cloning – inner classes – proxies.

EVENTS & GRAPHICS PROGRAMMING

I/O Streams - Filter and pipe streams – Byte Code interpretation - Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – Graphics programming – Frame – Components – working with 2D shapes.

SWING & GENERIC PROGRAMMING

Introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions - Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics.

THREADS & SOCKET PROGRAMMING

Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers – Socket Programming – UDP Datagram – Introduction to Java Beans.

TEXT BOOKS:

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.
2. Elliotte Rusty Harold, " Java Network Programming", O"Reilly publishers, 2000.
3. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.

REFERENCES:

1. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
3. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1.	Mrs. R. Shobana	Assistant Professor (GII)	CSE	shobana@avit.ac.in
2.	Dr.K.Sasikala	Associate Professor	CSE	sasikalak@vmkvec.edu.in

17CSPI10	MOBILE APPLICATION DEVELOPMENT	Category	L	T	P	Credit
		PI	3	0	0	3

PREAMBLE

In this modern era almost every hands has a handheld devices. Each handheld device have the computing capability to meet the half the needs of user such as banking, browsing, education and emergency etc. It is a must for a computer engineer to have some basic knowledge about the handheld devices platform and its supporting software development. This course will give adequate knowledge in developing a mobile applications for different such as Android, iOS, Windows.

PRE REQUISITE – NIL

COURSE OBJECTIVES

1.	Understand system requirements for mobile applications
2.	Generate suitable design using specific mobile development frameworks
3.	Generate mobile application design
4.	Implement the design using specific mobile development frameworks
5.	Deploy the mobile applications in marketplace for distribution

COURSE OUTCOMES

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

CO1. Expose to technology and business trends impacting mobile applications	Understand
CO2.Understand enterprise scale requirements of mobile applications	Understand
CO3. Familiarize in the Graphics used for Android application development	Apply
CO4. Competent with the characterization and architecture of mobile applications	Apply
CO5. Competent with designing and developing mobile applications using one application development framework.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT I INTRODUCTION

Introduction to mobile applications –Embedded systems -Market and business drivers for mobile applications – Publishing and delivery of mobile applications –Requirements gathering and validation for mobile applications

UNIT II BASIC DESIGN

Introduction –Basics of embedded systems design –Embedded OS -Design constraints for mobile applications, both hardware and software related –Architecting mobile applications –User interfaces for mobile applications –touch events and gestures –Achieving quality constraints –performance, usability, security, availability and modifiability.

UNIT III ADVANCED DESIGN

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV TECHNOLOGY I – ANDROID

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI –Persisting data using SQLite–Packaging and deployment –Interaction with server side applications –Using Google Maps, GPS and Wifi –Integration with social media applications.

UNIT V TECHNOLOGY II –IOS

Introduction to Objective C –iOS features –UI implementation –Touch frameworks –Data persistence using Core Data and SQLite –Location aware applications using Core Location and Map Kit –Integrating calendar and address book with social media application –Using Wifi -iPhone marketplace.

TEXT BOOKS

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.

REFERENCES

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012.

2. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012.

3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013

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

-17CSEC34	WEB DESIGN AND MANAGEMENT	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

To understand and learn the scripting languages with design of web applications. and maintenance and evaluation of web design management.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To introduce the student to the tools and facilities of web design
2	To understand and learn the scripting languages with design of web applications
3	To learn the maintenance and evaluation of Web design/development process, with Macromedia Dreamweaver as the primary Web development tool
4	Topics covered include basic and enhanced site structure, local and remote site management, and optimization of Web graphics

COURSE OUTCOMES

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

CO1: Apply an Information Architecture document for a web site.	Apply
CO2: Construct a web site that conforms to the web standards of today and includes e-commerce and web marketing	Analyze
CO3: Perform regular web site maintenance (test, repair and change).	Analyze
CO4: Understand the principles of various process of Project management	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	-	-	-	-	-	-	-	S	M	M
CO2	S	M	M	-	L	-	-	-	-	-	S	M	M	M	M
CO3	S	M	M	-	M	-	-	-	-	-	M	M	M	-	-
CO4	S	M	S	-	M	-	-	M	-	-	S	M	-	M	-

S- Strong; M-Medium; L-Low

SYLLABUS

SITE ORGANIZATION AND NAVIGATION

User Centered Design–Web Medium–Web Design Process–Basics of Web Design –Introduction to Software used for Web Design – ADOBE IMAGE READY, DREAM WEAVER, FLASH – Evaluating Process – Site Types and Architectures – Navigation Theory – Basic Navigation Practices – Search – Sitemaps.

ELEMENTS OF PAGEDESIGN

Browser Compatible Design Issues-Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia – GUI Widgets and Forms – Web Design Patterns – STATIC pages: Slice– URL in ADOBE IMAGE READY. Creation and Editing of site map – Layer, Tables, Frame set, **-** CSS style – Forms –Tools like Insert, Rollover etc., in DREAM WEAVER

SCRIPTING LANGUAGES AND ANIMATION USING FLASH

Client side scripting :XHTML – DHTML – JavaScript – XML Server Side Scripting: Perl–PHP– ASP/JSP Designing a Simple Web Application **-** Introduction to MACROMEDIA FLASH, Importing Other File Formats to Flash – Saving and Exporting Flash Files, Frame by Frame Animation–Motion Tweening – Shape Tweening.

PRE-PRODUCTION MANAGEMENT

Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing Content.

PRODUCTION, MAINTENANCE AND EVALUATION

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – **Case Study:** Using the Skills and Concepts Learn with the ADOBE IMAGE READY, DREAM WEAVER, FLASH, and Scripts, Develop Portfolios in the Form of Web Pages which have to be uploaded in Free Public Domain.

TEXT BOOKS

1.Themas A. Powell, ―The Complete Reference–Web Design‖, Tata McGraw Hill, Third Edition, 2003.
2.Ashley Friedlein, ―Web Project Management‖, Morgan Kaufmann Publishers, 2001.
3.H.M. Deitel, P.J. Deitel, A.B. Goldberg, ―Internet and World Wide Web – How to Program‖, Third Edition, Pearson Education, 2004.

REFERENCES

1.Joel Sklar, ―Principles of Web Design‖, Thomson Learning, 2001.
2.Van Duyne, Landay and Hong, ―The Design of Sites: Patterns for Creating Winning Websites‖, Second Edition, Prentice Hall, 2006.
3.Lynch, Horton and Rosenfeld, ―Web Style Guide: Basic Design Principles for Creating Websites‖, Second Edition, Yale University Press, 2002.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	K.Karthik	Assistant Professor	CSE	karthik@avit.ac.in
2	R.Bharanidharan	Professor	CSE	bharanidharan@vmkvec.edu.in

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

PREAMBLE

To analyze the basic concepts of security and hacking process

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand Technical foundation of cracking and ethical hacking
2	To identify Aspects of security, importance of data gathering, foot printing and system hacking
3	To understand evaluation of computer security
4	To understand Practical tasks will be used to re-enforce and apply theory to encourage an analytical and problem based approach to ethical hacking
5	To discuss about security tools and its applications

COURSE OUTCOMES

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

CO1: Identify and analyse the stages an ethical hacker requires to take in order to compromise a target system.	Understand
CO2: Identify tools and techniques to carry out a penetration testing.	Understand
CO3: Critically analyze security techniques used to protect system and user data.	Apply
CO4: Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.	Apply
CO5: To apply information security features in real time	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Introduction to Hacking, Types of Hacking, Hacking Process, Security – Basics of Security- Elements of Security, Penetration Testing, Scanning, Exploitation- Web Based Exploitation. Simple encryption and decryption techniques implementation.

HACKING TECHNIQUES

Building the foundation for Ethical Hacking, Hacking Methodology, Social Engineering, Physical Security, Hacking Windows, Password Hacking, and Privacy Attacks, Hacking the Network, Hacking Operating Systems- Windows & Linux, Application Hacking, Footprinting, Scanning, and Enumeration. Implementing System Level Hacking- Hacking Windows & Linux.

WEB SECURITY

Evolution of Web applications, Web application security, Web Application Technologies- Web Hacking, Web functionality, How to block content on the Internet, Web pages through Email, Web Messengers, Unblocking applications, Injecting Code- Injecting into SQL, Attacking Application Logic. Check authentication mechanisms in simple web applications. Implementation of Web Data Extractor and Web site watcher. Implementation of SQL Injection attacks in ASP.NET.

WIRELESS NETWORK HACKING

Introduction to Wireless LAN Overview, Wireless Network Sniffing, Wireless Spoofing, Port Scanning using Netcat, Wireless Network Probing, Session Hijacking, Monitor Denial of Service (DoS) UDP flood attack, Man-in-the-Middle Attacks, War Driving, Wireless Security Best Practices, Software Tools, Cracking WEP, Cracking WPA & WPA-II. Implementation- Locate Unsecured Wireless using Net-Stumbler/ Mini-Stumbler.

APPLICATIONS

Safer tools and services, Firewalls, Filtering services, Firewall engineering, Secure communications over insecure networks, Case Study: Mobile Hacking- Bluetooth-3G network weaknesses, Case study: DNS Poisoning, Hacking Laws. Working with Trojans using NetBus.

TEXT BOOKS

1. Stuart McClure, Joel Scambray, George Kurtz, "Hacking Exposed 6: Network Security Secrets & Solutions", Seventh edition, McGraw-Hill Publisher, 2012.
2. Kevin Beaver, "Hacking for Dummies" Second Edition, Wiley Publishing, 2007.
3. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws" Wiley Publications, 2007.
4. Ankit Fadia, "An Unofficial Guide to Ethical Hacking" Second Edition, Macmillan publishers India Ltd, 2006.

REFERENCES

1. Hossein Bidgoli, "The Handbook of Information Security" John Wiley & Sons, Inc., 2005.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.R.Jaichandran	Associate Professor(G-II)	CSE	rjaichandran@avit.ac.in
2	M. Annamalai	Assistant Professor	CSE	annamalaim@vmkvec.edu.in

17CSEC11	GREEN COMPUTING	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

To acquire knowledge to adopt green computing practices and To learn about energy saving practices

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To acquire knowledge to adopt green computing practices
2	To minimize negative impacts on the environment
3	To learn about energy saving practices
4	To learn about green compliance. And implementation using IT

COURSE OUTCOMES

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

CO1: Explain the significance knowledge to adopt green computing practices	Understand
CO2: Design and develop the green asset used to minimize negative impacts on the environment	Apply
CO3: Identify an appropriate cooling technologies and infrastructure for optimizing the cost of data center operations	Apply
CO4: Make use of an knowledge about energy saving practices ,the impact of e-waste and carbon waste	Apply
CO5: Analyze about green compliance, implementation using IT and derive the case study.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

FUNDAMENTALS

Green IT Fundamentals: Business, IT, and the Environment – Benefits of a Green Data Centre - Green Computing:Carbon Foot Print, Scoop on Power–GreenITStrategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

GREEN ASSETS AND MODELING

Green Assets: Buildings, Data Centres, Networks, Devices, Computer and Earth Friendly peripherals, Greening Mobile devices – Green Business Process Management: Modelling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

GRID FRAMEWORK

Virtualizing of IT Systems – Role of Electric Utilities, Telecommuting, Teleconferencing and Teleporting – Materials Recycling – Best Ways for Green PC – Green Data Center – Green Grid Framework. Optimizing Computer Power Management, Systems Seamless Sharing Across. Collaborating and Cloud Computing, Virtual Presence.

GREEN COMPLIANCE

Socio-Cultural Aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, And Audits – Emergent Carbon Issues: Technologies and Future. Best Ways to Make Computer Greener.

GREEN INITIATIVES WITH IT and CASE STUDIES

Green Initiative Drivers and Benefits with IT - Resources and Offerings to Assist Green Initiatives. - Green Initiative Strategy with IT - Green Initiative Planning with IT - Green Initiative Implementation with IT - Green Initiative Assessment with IT. The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TEXT BOOKS

1.Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖,CRC Press, June 2011
2.Carl Speshocky, ―Empowering Green Initiatives with IT‖, John Wiley and Sons, 2010.

REFERENCES

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: Steps for the Journey‖, Shoff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on Regulations and Industry‖, Lulu.com, 2008.

COURSE DESIGNERS

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

17CSEC32	VIRTUAL REALITY	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

This course provides a detailed understanding of the concepts of Virtual Reality and its application.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To Learn Geometric modeling and Virtual environment
2	To Learn Virtual Hardware and Software
3	To Learn Virtual Reality applications

COURSE OUTCOMES

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

CO1: Differentiate between Virtual, Mixed and Augmented Reality platforms.	Understand
CO2: Identify appropriate design methodologies for immersive technology development, especially from a physiological perspective.	Apply
CO3: Demonstrate foundational literacy in designing gaming systems	Apply
CO4: Categorize the benefits/shortcomings of available immersive technology platforms.	Analyze
CO5: To apply the VR concepts to various applications	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics – Flight Simulation – Virtual environments –requirement – benefits of virtual reality**- 3D Computer Graphics** : Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modelling – Illumination models – Reflection models – Shading algorithms

GEOMETRIC MODELLING

Geometric Modelling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation **- Geometrical Transformations**: Introduction – Frames of reference – Modelling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection **- A Generic VR system**: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR System

CONTENT CREATION AND INTERACTION ISSUES

Gestalt perceptual organization - real world content - field of view - paradigm shift from real environment to virtual environment - reusing existing content - transition to VR content Human factors : Direct Vs Indirect Interaction - Modes and flow - Input device characteristics - viewpoint and control patterns.

DESIGN ISSUES

Optimizing performance - optimizing target hardware and software **- VR Hardware** : Introduction – sensor hardware – Head-coupled displays –Aquatic hardware – Integrated VR systems**-VR Software**: Introduction – Modelling virtual world –Physical simulation- VR toolkits - multiplayer environment - multiplayer networking architecture.

APPLICATION

Engineering – Entertainment – Science – Training – classroom.

TEXT BOOKS

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2002
2. Jason Jerald, "The VR book: Human centered design for virtual reality", CRC Press, 2015

REFERENCES

1. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
2. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology” , WileyInterscience,1 Edition,1994.
3. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application, and Design”, Morgan Kaufmann, 1st Edition,2002.
4. Jonathan Linowes, "Unity Virtual Reality Projects- Explore the world of virtual reality by building immersive and fun VR Projects using Unity 3D", Packt Publishing, 2015.

COURSE DESIGNERS

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

17CSCC01	DATA STRUCTURES	CATEGORY	L	T	P	CREDIT
		CC	3	0	0	3

PREAMBLE

This course aims at understanding the basic concepts in programming structures, linear structures and non linear structures

PRERQUISITE

NIL

COURSE OBJECTIVES

1.	To remember and understand the basic concepts in linear structures
2.	To learn about tree structures.
3.	To understand about balanced trees
4.	To learn about hashing and sets.
5.	To learn and understand about graphs

COURSE OUTCOMES

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

CO1. Remember the basic concepts in linear structures	Understand
CO2. Learn about tree structures and tree traversals	Apply
CO3. Understand about balanced trees	Apply
CO4. Learn about hashing and sets.	Apply
CO5. Learn and understand about graphs	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

Linear Structures

Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists –Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues.

Tree Structures

Tree ADT – tree traversals – left child right sibling data structures for general trees and graphs.

Balanced Trees

AVL Trees – Splay Trees – B-Tree - heaps – binary heaps – applications of binary Heaps **.**

Hashing and Set

Hashing – Separate chaining – open addressing – rehashing – extendible hashing -Disjoint Set ADT – dynamic equivalence problem – smart union algorithms – path compression – applications of Set.

Graphs

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms –minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – bi-connectivity – Euler circuits – applications of graphs.

TEXT BOOKS:

1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C (2nd Edition), Pearson Education.

REFERENCES:

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition Reprint.
2. R. F. Gilberg, B. A. Forouzan, "Data Structures", Second Edition, Thomson India, Edition

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1.	Dr. R. Jaichandran	Associate Professor	CSE	jaichandran@avit.ac.in
2.	Dr.V.Amirthalingam	Associate Professor	CSE	amirthalingam@vmkvec.edu.in

17CSCC02	OBJECT ORIENTED PROGRAMMING	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

This syllabus is intended for the Computer science students and enables them to learn Object Oriented Programming and the design of computer solutions in a precise manner. The syllabus emphasizes on OOP concepts, Functions, Polymorphism, Inheritance and I/O. The intention is to provide sufficient depth in these topics to enable candidates to apply Object Oriented Programming approach to programming. The modules in the syllabus reflect solving general problems via programming solution. Thus, modules collectively focus on programming concepts, strategies and techniques; and the application of these toward the development of programming solutions.

PRERQUISITE

Nil

COURSE OBJECTIVES

1.	To learn about the syntax and semantics of C++ programming language
2.	To learn about the concepts of object oriented programming.
3.	To determine how to reuse the code, Constructors and member functions
4.	To Analyse how to reduce the coding by applying overloading concepts
5.	To Analyse how to reuse the code, how to verify and validate the coding

COURSE OUTCOMES

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

CO1. Construct object-oriented programs for a given scenario using the concepts of abstraction, encapsulation, message-passing and modularity	Apply
CO2. Construct object-oriented programs for a given application by using constructors	Apply
CO3. Develop object-oriented programs for a given application using the concepts of compile-time and run-time polymorphism	Analyze
CO4. Develop object-oriented applications through inheritance concepts	Analyze
CO5. Construct object-oriented applications for a given scenario using files, Sting handling and to handle exceptions	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO FUNDAMENTAL CONCEPTS OF OOP

Object Oriented Paradigm: Elements of Object Oriented Programming – Working with classes, Classes and Objects-Class specification- accessing class members- defining member functions - Passing and returning objects – Array of objects - inline functions - accessing member functions within class - Static members.

OBJECT INITIALIZATION AND FRIEND FUNCTION

Constructors - Parameterized constructors - Constructor overloading. Copy constructor, Destructors, Default arguments - new, delete operators - "this" pointer, friend classes and friend functions.

OVERLOADING AND GENERIC PROGRAMMING

Function overloading – Operator overloading- Non-over loadable operators- unary operator overloading- operator keyword- limitations of increment/decrement operators- binary operator overloading- Generic programming with templates-Function templates- class templates.

INHERITANCE AND VIRTUAL FUNCTION

Inheritance-Base class and derived class relationship-derived class declaration-Forms of inheritance- inheritance and member accessibility, abstract class, virtual functions, pure virtual function**.**

EXCEPTION HANDLING AND STREAMS

Exception handling - Try Catch Throw Paradigm - Uncaught Exception- Files and Streams-Opening and Closing a file- file modes- file pointers and their manipulation, sequential access to a file-random access to a file-Reading and Writing – Exception handling. String Objects.

TEXT BOOKS:

1. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
2. K. R. Venugopal, Rajkumar, T. Ra vishankar, Mastering C++, 4th Edition, Tata McGraw 2. Hill, 2008.
3. Budd T., An Introduction to Object-oriented Programming, Addison-Wesley 3rd 4. Edition, 2008.
4. Bjarne stroustrup, The C++ programming Language, Addison Wesley, 3rd edition2008.
5. Harvey M. Deitel and Paul J. Deitel, C++ How to Program, 7th edition, Prentice Hall, 2010.
6. Tony Gaddis, Starting Out with Java: From Control Structures through Objects, 4/E, Addison-Wesley, 2009.

REFERENCES:

1. H.M. Deitel and P.J. Deitel, C How to program Introducing C++ and Java, Fourth Edition, Pearson Prentice Hall, 2005.
2. 2. B. Stroustrup, "The C++ Programming language", Third edition, Pearson Education, 2004.

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.S. Muthuselvan	Assistant Professor Gr. II	CSE	muthuselvan@avit.ac.in

17CSCC03	DATABASE MANAGEMENT SYSTEM	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE:

This course aims at facilitating the student to understand the various concepts and functionalities of Database Management Systems, the method and model to store data and how to manipulate them through query languages, the effective designing of relational database and how the system manages the concurrent usage of data in multi user environment.

PREREQUISITE:

NIL

COURSE OBJECTIVES

1	Describe a relational database and object-oriented database.
2	Create, maintain and manipulate a relational database using SQL.
3	Describe ER model and normalization for database design.
4	Examine issues in data storage and query processing and can formulate appropriate solutions.
5	Design and build database system for a given real world problem.

COURSE OUTCOMES

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

CO1. Illustrate the database design for applications and use of ER Diagram.	Understand
CO2. Build and manipulate the relational database using Structured Query Language and relational languages.	Apply
CO3. Develop a normalized database for a given application by incorporating various constraints like integrity and value constraints.	Apply
CO4. Apply concurrency control & recovery mechanism for database problems.	Apply
CO5. Construct data structures like indexes and hash tables for the fast retrieval of data.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Database System Applications - Views of data - Data Models - Database Languages -Modification of the Database - Database System Architecture - Database users and Administrator- Introduction to relational databases - Structure of Relational Databases - Entity-Relationship model (E-R model) - E-R Diagrams.

RELATIONAL APPROACH

The relational Model - Additional & Extended Relational - Types of Keys - Relational Algebra - Null Values - Domain Relational Calculus - Tuple Relational Calculus - Fundamental operations - Additional Operations- SQL fundamentals - Structure of SQL Queries - SQL Data Types and Schemas - Nested Sub queries - Complex Queries - Integrity Constraints - Triggers - Security - Advanced SQL Features - Embedded SQL- Dynamic SQL- Views - Introduction to Distributed Databases and Client/Server Databases..

DATABASE DESIGN

Overview of the Design Process - Functional Dependencies - Non-loss Decomposition - Functional Dependencies - Normalization and its Types - Dependency Preservation - Boyce/Codd Normal Form- Decomposition Using Multi-valued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form - Entity Sets and its Types.

TRANSACTION &CONCURRENCY CONTROL

Transaction Concepts - Transaction State - Transaction Recovery - ACID Properties - System Recovery - Media Recovery - Two Phase Commit - SQL Facilities for recovery -Advanced Recovery Techniques - Buffer Management - Remote Backup Systems - Concurrency Control - Need for Concurrency - Locking Protocols -Two Phase Locking - Internet Locking - Deadlock Handling - Serializability - Recovery Isolation Levels - SQL Facilities for Concurrency.

STORAGE STRUCTURE

Introduction to Storage and File Structure - Overview of Physical Storage Media - Magnetic Disks - RAID - Tertiary storage - File Organization - Organization of Records in Files - Indexing and Hashing - Ordered Indices - B+ tree Index Files - B- tree Index Files - Bitmap Indices - Static Hashing - Dynamic Hashing -Query Processing - Catalogue Information for Cost Estimation – Selection Operation - Sorting - Join Operation - Query optimization - Database Data Analysis.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw-Hill Education; 6 edition, 2010).

REFERENCES:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson India; 7th edition, 2017, 2017).

2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, Third Edition, McGraw Hill, 2002.

3. Carlos Coronel, Steven Morris , “Database Systems – Design, Implementation and Management, 13th Edition, Cengage Learning; 13th edition, 2018) .

COURSE DESIGNERS

S. No.	Name of the faculty	Designation	Department	Mail Id
1	Mr. S. SenthilKumar	Assistant Professor	CSE	senthilkumar@vmkvec.edu.in
2	Mr. S. Muthuselvan	Assistant Professor Gr. II	CSE	muthuselvan@avit.ac.in

17CSEC06	CRYPTOGRAPHY AND NETWORK SECURITY	Category	L	T	P	Credit
		EC	3	0	0	3

PREAMBLE

To understand the concepts in cryptography and network security and their applications in real time

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand the basic concepts in understanding cryptography and network security
2	To know about various encryption techniques.
3	To understand the concept of Public key cryptography.
4	To study about message authentication and hash functions
5	To impart knowledge on Network security

COURSE OUTCOMES

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

CO1: Classify the symmetric encryption techniques	Understand
CO2: Illustrate various Public key cryptographic techniques	Apply
CO3: Evaluate the authentication and hash algorithms.	Apply
CO4: Discuss authentication applications	Apply
CO5: Summarize the intrusion detection and its solutions to overcome the attacks.	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	-	M	-	-	-	-	-	-	M	M	-	-
CO2	S	M	L	-	M	-	-	-	-	-	-	M	M	-	-
CO3	S	M	L	-	M	-	-	-	-	-	-	M	M	-	-
CO4	S	M	L	-	M	-	-	-	-	-	-	M	M	M	M
CO5	S	L	L	-	M	-	-	-	-	-	-	M	M	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Security trends – Attacks and services – Classical crypto systems – Different types of ciphers – LFSR sequences – Basic Number theory – Congruences – Chinese Remainder theorem – Modular exponentiation – Fermat and Euler's theorem – Legendre and Jacobi symbols – Finite fields – continued fractions.

METHODS

Simple DES – Differential cryptanalysis – DES – Modes of operation – Triple DES –AES – RC4 – RSA – Attacks – Primality test – factoring

TECHNIQUES

Discrete Logarithms – Computing discrete logs – Diffie-Hellman key exchange –ElGamal Public key cryptosystems – Hash functions – Secure Hash – Birthday attacks -MD5 – Digital signatures – RSA – ElGamal – DSA.

AUTHENTICATION

Authentication applications – Kerberos, X.509, PKI – Electronic Mail security – PGP,S/MIME – IP security – Web Security – SSL, TLS, SET.

SECURITY AND FIREWALLS

System security – Intruders – Malicious software – viruses – Firewalls – Security Standards

TEXT BOOKS

1. Dr. S. Bose and Dr.P. Vijayakumar, “Cryptography and Network Security”, First Edition, Pearson Education, 2016.
2. Wade Trappe, Lawrence C Washington, “Introduction to Cryptography with coding theory”, 2nd ed, Pearson, 2007.
3. William Stallings, “Cryptography and Network Security Principles and Practices”, Pearson/PHI, 6th edition, 2013.

REFERENCES

1. W. Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, Second Edition, 2007.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing Third Edition –Prentice Hall of India, 2006.

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.R.Jaichandran	Associate Professor	CSE	rjaichandran@avit.ac.in
2	Dr.K.Sasikala	Associate Professor	CSE	sasikala@vmkvec.edu.in

17BMEC09	DESIGN OF MEDICAL DEVICES	Category	L	T	P	Credit
		EC-PC	3	0	0	3

PREAMBLE

This course will offer students exposure to the core concepts of the global medical device regulatory framework and provide a foundation for the practical application. It includes all elements of the device product lifecycle from idea to initial market entry, sustaining activities and post-market activities.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the post-marketing requirements associated with medical devices.
2	To understand the necessary steps to take an idea to a prototype.
3	To follow a deterministic engineering design process to create new products.
4	To apply engineering theory to practice.
5	To perform risk assessment and countermeasure development.

COURSE OUTCOMES

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

CO1.	Discuss the necessary steps to take an idea to a prototype.	Understand
CO2.	Utilize fundamental design principles, machine elements, manufacturing and assembly techniques.	Apply
CO3.	Analyze risk management concepts into the quality management system.	Analyze
CO4.	Assess the medical device regulatory framework for any given country based upon device type.	Evaluate
CO5.	Create potential regulatory pathway.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO MEDICAL DEVICES AND MEDICAL DEVICE REGULATIONS

Medical Device Classification, Bioethics and Privacy, Biocompatibility and Sterilization Techniques, Design of Clinical Trials, Design Control & Regulatory Requirements.

INTRODUCTION TO SPECIFIC MEDICAL TECHNOLOGIES
Biopotential measurement (EMG, EOG, ECG, EEG), Medical Diagnostics (In-vitro diagnostics), Medical Diagnostics (Imaging), Minimally Invasive Devices, Surgical Tools and Implants.

MEDICAL DEVICES STANDARD AND INTELLECTUAL PROPERTY
Standard-ISO, IES, Intellectual Property - Patents, Copy rights, Trademarks, Trade secrets.

HARDWARE AND SOFTWARE DESIGN
Hardware design, Hardware risk analysis, Design and project merits, Design for six sigma, software design, software coding, software risk analysis, software metrics.

DESIGN TRANSFER AND MANUFACTURING
Transfer to manufacturing, hardware manufacturing, software manufacturing, configuration management, documents and deliverables.

TEXT BOOKS:

1. Richard Fries, **"Reliable Design of Medical Devices"**, CRC Press, 2nd Edition, 2006.
2. Paul H. King, Richard C. Fries, Arthur T. Johnson, **"Design of Biomedical Devices and Systems"**, Third Edition, ISBN 9781466569133.

REFERENCES:

1. John G. Webster (ed), **"Medical Instrumentation: Application and Design"**, 2007.
2. Peter J. Ogrodnik, **"Medical Device Design: Innovation from Concept to Market"**, Academic Press Inc; 1st Edition (2012), ISBN-10: 0123919428

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in
2	Ms.R.Sandhiya	Assistant Professor (Gr-I)	BME	sandhiya@avit.ac.in
3	Mr.R.Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in

17BMEC01	**MEDICAL OPTICS**	**Category**	**L**	**T**	**P**	**Credit**
		EC-PS	**3**	**0**	**0**	**3**

PREAMBLE

Medical optics is a branch of science uses light as an electromagnetic wave, similar to X-rays, microwaves, and radio waves, which is used as an investigational technique for medical applications. Examples include optical microscopy, spectroscopy, endoscopy, scanning laser ophthalmoscopy and optical coherence tomography.

PREREQUISITE: Nil

COURSE OBJECTIVES

1	To learn about properties of light and its application
2	To study various instruments in photonics
3	To understand the applications of laser
4	To understand optical holography
5	To study optical tomography

COURSE OUTCOMES

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

CO1. Describe the optical properties of the tissues.	Understand
CO2. Apply laser in medical field for diagnosis and therapeutic application.	Apply
CO3. Analyze the various instruments used in photonics	Analyze
CO4. Categorize the various techniques for hologram construction.	Analyze
CO5. Illustrate optical tomogram.	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	--	--	M	--	--	M
CO2	S	M	L	--	--	--	--	--	L	--	--	S	M	--	M
CO3	S	S	M	M	--	M	--	--	M	--	--	S	M	M	--
CO4	S	S	S	S	M	M	--	L	M	M	--	S	S	M	--
CO5	S	S	S	S	M	M	--	L	M	M	--	S	S	M	--

S- Strong; M-Medium; L-Low

SYLLABUS

OPTICAL PROPERTIES OF THE TISSUES
Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles.

INSTRUMENTATION IN PHOTONICS
Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, LASERs, optical filters, polarisers, solid state detectors, time resolved and phase resolved detectors.

APPLICATIONS OF LASERS
Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology.

OPTICAL HOLOGRAPHY
Wavefronts, Interference patterns, principle of hologram, optical hologram, applications.

OPTICAL TOMOGRAPHY
Optical coherence tomography, Elastography, Doppler optical coherence tomography, Application towards clinical imaging.

TEXT BOOK

1. Leon Goldman, M.D., & R. James Rockwell, Jr., **"Lasers in Medicine"**, Gordon and Breach, Science Publishers Inc., New York, 1971.

REFERENCE

1. Mark E. Brezinski., **"Optical Coherence Tomography: Principles and Applications"**, Academic Press, 2006.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.N.Babu	Professor	BME	babu@vmkvec.edu.in
2	Ms.B.Farhana Ansoor	Assistant Professor (G-I)	BME	farhanaansoor@avit.ac.in
3	Mrs.S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in

17BMEC21	MEDICAL SIMULATION IN LIFE SUPPORTING DEVICES	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The purpose of the course on medical simulation and life supporting device for biomedical engineering students is to get practical knowledge in operating basic life supporting devices under emergency condition.

PREREQUISITE:NIL

COURSE OBJECTIVES

1	To understand the structure and function of heart and brain.
2	To learn the various techniques available for deployment in patient suffering from respiratory emergency.
3	To operate and trouble shoot mechanical ventilator in a patient.
4	To provide hands on training on life supporting instruments.
5	Explain the use of ultrasound in critical cardiovascular and respiratory diseases and trauma diagnosis.

COURSE OUTCOMES

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

CO1. Explain anatomy and physiology of the heart and demonstrate various lifesaving technique used under cardiac arrest	Understand
CO2. Describe various techniques available for deployment in patient suffering from respiratory emergency	Understand
CO3. Illustrate the Initiate, operate and troubleshoot the ventilator.	Apply
CO4. Outline various arrhythmias that can be treated by life supporting device and approach algorithmically towards management of these patients	Analyze
CO5. Analyze life supporting 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	M	--	L	L	--	L	--	M	L	--	--	L	M	--	M
CO2	M	--	L	L	--	L	--	M	L	--	--	L	--	--	M
CO3	S	M	M	M	M	M	--	M	M	--	--	M	S	--	M
CO4	S	M	M	S	M	M	--	M	S	--	--	M	S	S	S
CO5	S	M	M	S	M	S	--	M	S	--	--	M	S	M	S

S- Strong; M-Medium; L-Low

SYLLABUS

BASIC LIFE SUPPORT
Anatomy and physiology of heart, Cardiogenic shock complicating acute coronary syndrome, CPR practice using mannequin, AHA BLS guidelines and practice, Automatic external Defibrillator, Defibrillator practice and troubleshooting.

ANALYZING ARRHYTHMIAS FOR LIFE SUPPORT
Description of ECG arrhythmias-an overview, Tachycardia and Bradycardia algorithm and practice, ECG arrhythmia simulator and practice, ACLS guidelines and practice using mannequins.

BASIC AIRWAY MANAGEMENT
Ventilation failure and oxygenation failure, Inserting airway adjunct (OPA – Oropharyngeal airway and NPA - Nasopharyngeal airway), Oxygen therapy, LMA and insertion Technique, AMBUBAG indication and practice.

VENTILATOR FOR LIFE SUPPORT
Basic anatomy of lung and mechanism of breathing, Mechanical ventilator history and classification, Pressure –volume flow diagram, Different modes of ventilator, Ventilator alarm and trouble shooting, Indication and disease specific ventilation, Weaning from ventilator.

ROLE OF ULTRASOUND IN LIFE SUPPORT
Basic principle of ultrasound and different modes of display, Different transducers used in ultrasound, Ultrasound doppler blood flow meter, Ultrasonography in emergency cardiovascular care, Lung ultrasound, Fast scan.

TEXT BOOKS:

1. Arthur C. Guyton, John Edward Hall, **“Textbook of Medical Physiology”**,13th Edition Elsevier Inc 2016.
2. John M. Field, Peter J. Kudenchuk, Robert O'Connor, Terry Vanden Hoek, **“The Textbook of Emergency Cardiovascular Care and CPR”**, lippinocot William and wilkins, 1st Edition, 2009.
3. James G. Adams, **“Emergency Medicine: Clinical Essentials”**, Saunders an imprint of Elsevier Inc, 2nd Edition, 2013.
4. Khandpur R.S, **“Hand-book of Biomedical Instrumentation”**, Tata Mc Graw Hill, 2nd Edition, 2003.

REFERENCES:

1. Peter Papadakos, Burkhard Lachmann, **“Mechanical Ventilation: Clinical Applications and Pathophysiology”**, sunders an imprint of Elsevier, 1st Edition 2008.
2. Ashfaq Hasan ,**“Understanding Mechanical Ventilation: A Practical Handbook”**, Springer verlag London limited, 2nd Edition 2010.
3. Matthias Hofer, **“Ultrasound Teaching Manual: The Basics of Performing and Interpreting”**, thieme newyork Stuttgart, 3rd Edition, 2013.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr. R. Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in
2	Dr.N.Babu	Professor	BME	babu@vmkvec.edu.in
3	Ms.S.Mythrehi	Assistant Professor (G-I)	BME	mythrehi@avit.ac.in

17BMSE07	MEDICAL RADIATION SAFETY ENGINEERING	Category	L	T	P	Credit
		PS-SE	3	0	0	3

PREAMBLE
To impart sufficient information on the various precautionary and safety measures for radiation protection in medicine.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To provide an insight to the basics of radiation physics.
2	To enable them understand the guidelines of radiation protection and radiation detectors.
3	To provide information on safety measures related to UV, laser and nuclear medicine.

COURSE OUTCOMES

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

CO1. Explain the Radio frequency and Microwave radiations.	Understand
CO2. Examine the Laser and UV radiation control measure.	Apply
CO3. Outline the protective measures and radiation hazards in nuclear medicine and radiotherapy.	Analyze
CO4. Assess the various monitoring methods & Hazard in radiation protection	Evaluate
CO5. Designing to reduce the radiation hazards.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO RF AND MICROWAVE RADIATION
Sources of radio frequency radiation – Effects of radio frequency radiation – Development of standards for human safety – Calculation of RF field quantities – RF radiation measuring instruments and methods.

RADIATION DETECTION AND MEASUREMENT
Fundamentals of radiation detection – Conducting radiation measurements and surveys – Gas detectors – Designing to reduce radiation hazards – Radio frequency radiation safety management and training – Scintillation detectors – Statistics of Counting – minimum detectable activity – Quality assurance of radiation counters.

RADIATION SAFETY IN NUCLEAR MEDICINE AND RADIOTHERAPY
Design and description of NM department – Radiation protection in nuclear industry – Guidelines for radiation protection- Molecular medicine and radiation safety program procedures for safe operation of radiation equipment – Radiation protection in external beam radiotherapy – Radiation protection in brachytherapy – Radioactive wastes.

LASER AND ULTRAVIOLET RADIATION SAFETY
Classification of UV radiation – Sources of UV – Biological effects of UV – Hazards associated with UV radiation – UV control measures – Safety management of UV Classifications of LASER and its radiation hazards – control measures – Emergencies and incident procedures.

MONITORING AND INTERNAL DOSIMETRY
Monitoring methods – personal radiation monitoring – Records of personal dosimetry – ICRP method – MIRD method – Internal doses from radiopharmaceuticals – Bioassay of radioactivity –Hazard and risk in radiation protection – radiological incidents and emergencies – Regulation to radiation protection.

TEXT BOOKS:

1. Jamie V Trapp, Thomas Kron, **"An introduction to radiation protection in medicine"**, CRC press Taylor & Francis group, 2008
2. Alan Martin, Samuel Harbison, Karen Beach, Peter Cole, Hodder Arnold, **"An introduction to radiation protection"**, 6th Edition 2012.

REFERENCES:

1. Max Hlombardi, **"Radiation safety in nuclear medicine"**, CRC Press Taylor & Francis group, 2nd Edition, 2007.
2. Aruna Kaushik, Anupam mondal, B.S. Dwarakanath, R.P.Tripathi, **"Radiation protection manual"**, INMAS, DRDO, 2010.
3. Ronald kitchen, **"RF and microwave radiation safety"**, Newness publishers, 2nd Edition, 2001.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs. S.Vaishnodevi	Assistant Professor	BME	vaishnodevi@vmkvec.edu.in
2	Ms.S.Mythrehi	Assistant Professor (Gr-I)	BME	mythrehi@avit.ac.in
3	Mr. R.Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in

17BMSE18	ROBOTICS & AUTOMATION IN MEDICINE	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

The purpose of learning this course on automation and robotics in medicine to acquire knowledge and understand the basic function and to create new application of robotic and automation system in medical field especially in surgery.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To understand the basics of Robotics, Kinematics.
2	To understand the basics of Inverse Kinematics.
3	To explore various kinematic motion planning solutions for various Robotic configurations.
4	To study the basic inverse Kinematic motion planning solutions.
5	To explore various applications of Robots in Medicine.

COURSE OUTCOMES

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

CO1. Understand the basics of robotic systems.	Understand
CO2. Illustrate the application of automation and robotics in medicine.	Apply
CO3. Categorize the level of planning for various Robotic configurations.	Analyze
CO4. Compare Robotics system and formulate Kinematics.	Evaluate
CO5. Design Robotic systems for Medical application.	Create

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Introduction Automation and Robots, Classification, Application, Specification, Notations, Direct Kinematics Dot and cross products, Coordinate frames, Rotations, Homogeneous coordinates Link coordination arm equation – Five-axis robot, Four-axis robot, Six-axis robot.

KINEMATICS
Inverse Kinematics – General properties of solutions tool configuration, Five axis robots, Three Four axis, Six axis Robot, Workspace analysis and trajectory planning work envelope and examples, workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.

ROBOT VISION
Robot Vision Image representation, Template matching, Polyhedral objects, Shane analysis, Segmentation – Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured illumination, Camera calibration.

PLANNING
Task Planning Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp Planning, Fine-motion planning, Simulation of planar motion, Source and Goal scenes, Task Planner simulation.

APPLICATIONS
Applications in Biomedical Engineering – Bio Engineering, Biologically Inspired Robots, Neural Engineering, Application in Rehabilitation – Interactive Therapy, Bionic Arm, Clinical and Surgical – Gynaecology, Orthopaedics, Neurosurgery.

TEXT BOOKS:

1. Robert Schilling, "**Fundamentals of Robotics-Analysis and control"**, Prentice Hall, 2003.
2. J.J.Craig, **"Introduction to Robotics"**, Pearson Education, 2005.

REFERENCES:

1. Staugaard, Andrew C, **"Robotics and Artificial Intelligence: An Introduction to Applied Machine Learning"**, Prentice Hall Of India, 1987
2. Grover, Wiess, Nagel, Oderey, **"Industrial Robotics: Technology, Programming and Applications"**, McGraw Hill, 1986.
3. Wolfram Stadler, **"Analytical Robotics and Mechatronics"**, McGraw Hill, 1995.
4. Saeed B. Niku, **"Introduction to Robotics: Analysis, Systems, Applications"**, Prentice Hall, 2001.
5. K. S. Fu, R. C. Gonzales and C. S. G. Lee, **"Robotics"**, McGraw Hill, 2008.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.V.Prabhakaran	Assistant Professor (Gr-II)	BME	prabhakaran@avit.ac.in
2	Mr.R.Ezhilan	Assistant Professor	BME	ezhilan@vmkvec.edu.in
3	Mr. S.Kannan	Assistant Professor	BME	kannan@vmkvec.edu.in

17CVEC08	REMOTE SENSING TECHNIQUES AND APPLICATIONS	Category	L	T	P	Credit
		EC	3	0	0	3

Preamble

Remote sensing is the science and art of obtaining information about an object, area or phenomenon, by the use of either recording or real time sensing devices that are not in physical contact with the object. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. These GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. Remote sensing and GPS data are further used in numerous applications, including GIS data collection, surveying, and mapping.

Prerequisite

Nil

Course Objectives

1	Students will learn about the land use mapping techniques,site suitability techniques
2	Students will learn about the use of zone mapping for water bodies
3	Students will learn about the use of mapping techniques for Agriculture and Earth sciences
4	Students will also learn about the recent techniques used for GPS system

Course Outcomes

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

Co1. Recollect the fundamentals of physics of Remote sensing and concepts.	Remember
Co2. Outline the various data acquisition systems and collection methods for remote sensing data information and storage	Understand
Co3.Apply knowledge of satellites on various Civil Engineering applications.	Apply
Co4. Utilize the various data input methods for mapping	Apply
Co5. Creation of data models using remote sensing techniques and GPS	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT – I	INTRODUCTION	9 – hours
Definition – Physics of remote sensing – electromagnetic radiation (EMR) – remote sensing windows – interaction of EMR with atmosphere, earth surface, soils, water and vegetation – platform and sensors – image interpretations.		
UNIT – II	**LAND USE STUDIES**	**9 – hours**
Definition of land use – land use / land cover classification – schemes and levels of classification systems with RS data – land use mapping – change detection – urban land use planning, site suitability analysis, transportation planning.		
UNIT – III	**WATER RESOURCES**	**9 – hours**
Areal assessment of surface water bodies – Capacity survey of water bodies – mapping of snow-covered areas – flood risk zone mapping – identification of groundwater potential zones, recharge areas – droughts, definition, drought assessment and management.		
UNIT – IV	**AGRICULTURE, SOIL AND FORESTRY**	**9 – hours**
Crop inventory mapping – production estimation – command area monitoring – soil mapping – crop stress detection – estimation of soil erosion – forest types and density mapping – forest fire risk zone mapping.		
UNIT – V	**EARTH SCIENCE**	**9 – hours**
Lithology – lithological mapping – structural mapping – Geomorphology – nature and type of landforms – identification – use of remote sensing data for landslides – targeting mineral resources – Engineering geology and Environmental geology.		

Text Books

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman., Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (Asia) Pvt. Ltd., New Delhi, 2004

2. Lo. C.P.and A.K.W.Yeung, Concepts and Techniques of Geographic Information Systems. Prentice-Hall of India Pvt. Ltd., New Delhi, 2002

Reference Books

1 .Chandra,A.M,Geo Informatics,New Age International(P) Limited,Publishers.

2. Fazal,Shahab,GIS Basics,New Age International(P) Limited,Publishers.

3. Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990, pp-253.

4. Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H.Freeman & Co., 1978.

5. Manual of Remote Sensing Vol. II. American Society of Photogrammetry

Course Designers:

S.No.	Name of the Faculty	E-Mail ID
1.	M.Senthilkumar , Asst. Professor	senthilkumar@vmkvec.edu.in
2.	A.Fizoor Rahman, Asst. Professor	fizoorr@gmail.com
3.	D.Parthiban, Asst. Professor	Parthiban.civil@avit.ac.in

17CVEC18	WIND ENGINEERING	Category	L	T	P	Credit
		EC	3	0	0	3

Preamble

The course includes studies of sustainable development and energy sources. Basic mathematical and physical concepts will be covered. An introduction to prerequisites for wind power development including how a wind turbine works, planning for wind energy, environmental impact, location and economic aspects will be given. The phases of wind power projects is studied. Oral and written presentations in a scientific context will be discussed and practiced in the course. A site study visit to an operating wind farm is included.

Prerequisite

Nil

Course Objectives

1. To learn about the forces generated on structures due to normal wind as well as gusts.
2. To analyses the dynamic effects produced due to chimney,tower and silos
3. To understand about the seismic design of various structures
4. To analyses the application in design and its implementations

Course Outcomes

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

CO1. give an account of and analyse energy sources and their sustainability	Understand
Co2. identify and explain a wind power project's phases	Create
Co3. identify and evaluate factors affecting wind energy development	apply
Co4. analyse the siting conditions for wind power development	apply
CO5. clearly present an individual or group assignment within wind power in oral or written form	Create

Mapping with Programme Outcomes and Programme Specific Outcomes

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	L	S	S	S	---	L	S	L	---	---	L	---	L	-	L
CO2	L	S	S	S	L	M	S	L	---	L	L	---	L	-	L
CO3	S	S	S	S	L	M	L	L	---	L	---	---	L	L	M
CO4	L	S	L	S	L	---	S	L	---	L	---	L	L	L	M
CO5	S	S	S	S	---	---	S	M	---	L	L	---	L	L	M

S- Strong; M-Medium; L-Low

Syllabus

UNIT - I	INTRODUCTION	9 - hours
Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.		
UNIT - II	EFFECT OF WIND ON STRUCTURES	9 - hours
Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).		
UNIT - III	EFFECT ON TYPICAL STRUCTURES	9 - hours
Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.		
UNIT - IV	APPLICATION TO DESIGN	9 - hours
Design forces on multistorey building, towers and roof trusses.		
UNIT - V	INTRODUCTION TO WIND TUNNEL	9 - hours
Types of models (Principles only) – Basic considerations – Examples of tests and their use.		

Text Books

1. Peter Sachs, “Wind Forces in Engineering, Pergamon Press, New York, 1992.
2. Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers,

London, 1993.

Reference Books

1. Devenport A.G., “Wind Loads on Structures”, Division of Building Research, Ottowa, 1990.
2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 1995

Course Designers:

S.No.	Name of the Faculty	E-Mail ID
1	A.Fizoor Rahman	fizoorr@gmail.com
2	M.Senthilkumar	Senthilkumar@vmkvec.edu.in

17ECPI01	PROJECT	Category	L	T	P	Credit
		PI	0	0	18	9

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 further develop their analytical and ethical leadership skills necessary to address and help solve these issues.	Create
CO4. Refine research skills and demonstrate their proficiency in written & oral communication skills.	Evaluate

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	PSO1	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.T.Muthumanickam	Professor & Head	ECE	muthumanickam@vmkvec.edu.in
2	Dr. L. K. Hema	Professor & Head	ECE	hemalk@avit.ac.ins
3	Mr. S. Selvaraj	Professor	ECE	selvaraju@vmkvec.edu.in
4	Dr. D. Vijendra Babu	Professor	ECE	vijendrababu@avit.ac.in

17ECPI02	MINI PROJECT	Category	L	T	P	Credit
		PI	0	0	6	3

PREAMBLE To 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. T. Muthumanickam	Professor & Head	ECE	muthumanickam@vmkvec.edu.in
2	Dr. D. Vijendra Babu	Professor	ECE	Vijendrababu@avit.ac.in

17ECPI03	ADVANCED MICROPROCESSOR	Category	L	T	P	Credit
		PI	3	0	0	3

PREAMBLE

To learn the architecture and programming of advanced microprocessors.

PREREQUISITE - Nil

COURSE OBJECTIVES

1	To introduce the concepts of advanced microprocessors.
2	To introduce the programming techniques using MASM, DOS and BIOS function calls.
3	To introduce the basic architecture of Pentium family of processors.
4	To introduce the architecture programming and interfacing of advanced Microprocessors.
5	To introduce the concepts and architecture of RISC processor.

COURSE OUTCOMES

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

CO1: Explain the x86 architecture and memory organization of the processor	Understand
CO2: Demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor	Understand
CO3: List and describe the RISC and CISC architecture	Evaluate
CO4: Illustrate the instructions set present in a processor for logical and arithmetic operations	Apply
CO5: Analyze the features and operations of various features of the open source hardware .	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	M	M	L	M	S	-	-	-	S		-
CO2	S	S	M	-	S	M	L	M	S	-	-	-	S	S	-
CO3	S	M	-	-	-	M	L	M	S	-	-	-	S	S	-
CO4	S	-	S	L	S	M	L	M	S	-	-	-	S	S	-
CO5	S	-	-	M	S	M	L	-	S	-	-	-	S	-	-

S- Strong; M-Medium; L-Low

8086 MICROPROCESSOR:
Register organization, x86 architecture and signal description, physical memory organization, Bus operation, I/O addressing, special processor activities, Modes of operations. Addressing modes, Instruction sets.

PENTIUM MICROPROCESSORS
Pentium Microprocessor Architecture – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Pentium Pro Microprocessor Architecture – Special features – Pentium II Microprocessor Architecture – Pentium III Microprocessor Architecture – Pentium III Architecture – Pentium IV Architecture – Comparison of Pentium Processors.

RISC PROCESSORS I
PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching – dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basics of P6 micro architecture – Pipelining – our of- order core pipeline – Memory subsystem.

RISC PROCESSORS II(Superscalar Processors)
Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

PC HARDWARE OVERVIEW
Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces and Controller, Memory and I/O Port Addresses.

TOTAL HOURS: 45

TEXT BOOKS

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Architectures, Programming & Interfacing, Pearson Education , 2004.
2. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata McGraw Hill, 2006.

REFERENCE BOOKS

1. Douglas V.Hall, “Microprocessors and Interfacing”, Tata McGraw Hill, II Edition 2006
2. Mohamed Rafiquzzaman, “Microprocessors and Microcomputer Based System Design”, II Edition, CRC Press, 2007

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.G.Sureshkumar	Assistant Professor	ECE	sureshkumar@vmkvec.edu.in
2	G.Ramachandran	Assistant Professor	ECE	ramachandrang@vmkvec.edu.in
3	Mr.S.Selvam	Assistant Professor (Gr-II)	ECE	selvam@avit.ac.in

17ECPI04	VIRTUAL INSTRUMENTATION FOR ELECTRONICS	Category	L	T	P	Credit
		PI	3	0	0	3

PREAMBLE

To obtain comprehensive knowledge in virtual instrumentation and some of its applications.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To review background information required for studying virtual instrumentation.
2	To study the programming techniques of virtual instrumentation.
3	To study the various data acquisition techniques
4	To study the various tool set in virtual instrumentation.
5	To study applications using virtual Instrumentation

COURSE OUTCOMES

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

CO1. Enumerate the concept of information required for studying virtual instrumentation.	Understand
CO2. Break down the programming techniques of virtual instrumentation.	Analyze
CO3. Describe the various data acquisition techniques	Understand
CO4. Review the various tool set in virtual instrumentation.	Understand
CO5. Demonstrate the applications using virtual Instrumentation	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	M	S	S	-	M	-	-	-	-	-	-	M	M	-	-
CO2	L	S	M	-	M	-	-	-	-	-	-	M	M	S	-
CO3	S	M	S	L	L	M	-	-	-	-	-	M	M	-	-
CO4	M	M	L	S	L	S	-	-	-	-	-	M	-	S	-
CO5	M	M	S	-	M	L	-	-	-	-	-	M	-	-	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Virtual Instrumentation: Historical perspective - advantages - block diagram and architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

VI PROGRAMMING TECHNIQUES: VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web

DATA ACQUISITION: Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. Latest ADCs, DACs, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements – Issues involved in selection of Data acquisition cards – Data acquisition cards with serial communication - VI Chassis requirements. SCSI, PCI, PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

TOOL SETS: Use of Analysis tools, Fourier transforms, power spectrum, correlation methods, windowing and filtering. Application of VI in process control designing of equipments like oscilloscope, Digital multimeter, Design of digital Voltmeters with transducer input Virtual Laboratory, Web based Laboratory

APPLICATIONS: Distributed I/O modules- Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, 99 Motion control. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

TEXT BOOKS:

1. Gary Johnson, LabVIEW Graphical Programming, Second edition, McGraw Hill, New York, 1997.
2. Lisa K. wells & Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersey, 1997

REFERENCE BOOKS:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Dept	Mail ID
1	Mr. S. Selvam	Assistant Professor (Gr-II)	ECE	Selvam@avit.ac.in
2	Mr.G.Ramachandran	Assistant Professor	ECE	ramachandran@vmkvec.edu.in

17CSPI04	BUSINESS INTELLIGENCE AND ITS APPLICATIONS	Category	L	T	P	Credit
		PI	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	M	M	M
CO2	S	M	L	-	M	-	-	-	-	-	-	M	M	M	M
CO3	S	M	L	-	M	-	-	-	-	-	-	M	M	M	M
CO4	S	M	L	-	M	-	-	-	-	-	-	M	M	M	M
CO5	S	M	L	-	M	-	-	-	-	-	-	M	M	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

17CSPI07	LEARNING IT ESSENTIALS BY DOING	Category	L	T	P	Credit
		PI	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	M	M	-
CO2	S	M	M	M	-	-	-	-	-	-	-	M	M	M	-
CO3	S	M	M	M	-	-	-	-	-	-	-	M	M	M	-
CO4	M	M	M	M	M	-	-	-	-	-	-	M	M	-	-
CO5	M	M	M	M	S	-	-	-	-	-	-	M	S	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