AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR

&

VINAYAKA MISSION'S KIRUPANANDA VARIYAR ENGINEERING COLLEGE, SALEM

(Constituent Colleges of Vinayaka Mission's Research Foundation Deemed to be University)

NAAC Accredited

VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University under section 3 of the UGC Act 1956)

BACHELOR OF CIVIL ENGINEERING/TECHNOLOGY (BE / B.Tech.)

DEGREE PROGRAMME - FULL TIME

UNDER FACULTY OF ENGINEERING AND TECHNOLOGY

(Semester I to VIII)

REGULATIONS 2021

CHOICE BASED CREDIT SYSTEM (CBCS)

(FOR THE STUDENTS ADMITTED FROM 2021-22 ONWARDS)

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY, PAIYANOOR

&

VINAYAKA MISSION'S KIRUPANANDA VARIYARENGINEERING COLLEGE, SALEM

Department of Civil Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1	Graduates will perform as professional engineers in the various fields of Civil engineering.
PEO 2	Graduates will perform well in their specialized field and also trained in teamwork and leadership positions
PEO 3	Graduates will pursue lifelong learning in their specialized fields of Civil Engineering
PEO 4	Graduates will exhibit entrepreneurship qualities.
PEO 5	Graduates will contribute to the development of the profession, nation andsociety

PROGRAM SPECIFIC OUTCOMES (PSOs)

To achieve the mission of the program, Civil Engineering graduates will be able:

PSO 1	To work independently as well as in team to formulate, design, execute solutions for engineering problems and also analyze, synthesize technical data for application to product, process, system design & development
PSO 2	To understand & contribute towards social, environmental issues, following professional ethics and codes of conduct and embrace lifelonglearning for continuous improvement
PSO 3	To develop expertise towards use of modern engineering tools, careers in industries and research and demonstrate entrepreneurial skill

PROGRAMME OUTCOMES

Engineering Graduates will be able to:

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science,engineering fundamentals, and an engineering specialization to the solution ofcomplex engineering problems
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyzecomplex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**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.
PO 4	**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.
PO 5	**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.
PO 6	**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.
PO 7	**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.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**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.

Vinayaka Mission's Research Foundation -Deemed to be University

Faculty of Engineering & Technology

Aarupadai Veedu Institute of Technology, Chennai
& Vinayaka Missions Kirupananda Variyar Engineering College, Salem

B.E. - Choice Based Credit System - 2021 - 2022 onwards

Regulation: R 2021

Name of the Board: Civil Engineering

Name of the Program: B.E. – Civil Engineering (Full Time - Regular)

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM – REGULAR STUDENTS

Sl. No.	Category of Course	Types of Courses		Breakup of Credits
1	A. Foundation Courses	Humanities and Social Sciences including Management courses		9-12
2		Basic Science courses		18-25
3		Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.		18-24
4	B. Professional Courses	Core courses		48-54
5	C. Elective Courses	Professional Electives		12
6		Industry Designed / Industry supported / Industry offered/Industry Sponsored Courses		6
7		Open Electives	Innovation, Entrepreneurship, Skill Development etc.	6-9
			Emerging Areas like 3D Printing, Artificial Intelligence, Internet of Things etc.	6-9
8	D. Courses for presentation of technical skills related to the specialization	Project work		8
		Mini Project		3
		Seminar		1
		Internship		3
9	E.**Mandatory Courses	Mandatory Courses [Gender Equity and Law, Indian Constitution, Essence of Indian Traditional Knowledge,Employability Enhancement courses, Yoga and Meditation,NCC, NSS, RRC, YRC, Rotaract, Sports and Games, Science Clubs, Arts Clubs, Unnat Bharat Abhiyan, Swachh Bharat etc.]		Zero credit course (Min. 2 courses to becompleted)
		Credits to be earned		160
** Credits earned under this category will not be considered for CGPA calculation				

A. Foundation Courses									
Humanities and Social Sciences including Management Courses –Credits (9 - 1 2)									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		TECHNICAL ENGLISH	ENG	FC-HS	3	0	0	3	NIL
2.		BUSINESS ENGLISH	ENG	FC-HS	3	0	0	3	NIL
3.		ENGLISH LANGUAGE LAB	ENG	FC-HS	0	0	4	2	NIL
4.		UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY	ENG	FC-HS	3	0	0	3	NIL
5.		TOTAL QUALITY MANAGEMENT	MANAG	FC-HS	3	0	0	3	NIL
6.		ENGINEERING MANAGEMENT AND ETHICS	MANAG	FC-HS	3	0	0	3	NIL

Basic Science Courses –Credits (18-25)									
S.No	**CODE**	**COURSE**	**OFFERIN GDEPT.**	**CATEGOR Y**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		ENGINEERING MATHEMATICS	MATH	FC-BS	2	1	0	3	NIL
2.		MATHEMATICS FOR CIVIL ENGINEERS	MATH	FC-BS	2	1	0	3	ENGINEERING MATHEMATICS
3.		PROBABILITY AND STATISTICS	MATH	FC-BS	2	1	0	3	NIL
4.		NUMERICAL METHODS	MATH	FC-BS	2	1	0	3	ENGINEERING MATHEMATICS
5.		PHYSICAL SCIENCES	PHY & CHEM	FC-BS	4	0	0	4	NIL
6.		SMART MATERIALS	PHY	FC-BS	3	0	0	3	PHYSICAL SCIENCES
7.		PHYSICAL SCIENCES LAB	PHY & CHEM	FC-BS	0	0	4	2	NIL
8.		GREEN BUILDING MATERIALS	CHEM	FC-BS	3	0	0	3	NIL
9.		ENVIRONMENTAL SCIENCES	CHEM	FC-BS	3	0	0	3	NIL

Engineering Science courses including Workshop, Drawing, Basics of Electrical/Mechanical/Computer etc., - Credits – (18-24)									
S.No.	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		FOUNDATIONS OF COMPUTING AND PROGRAMMING (THEORY AND PRACTICALS)	CSE	FC-ES	2	0	2	3	NIL
2.		PYTHON PROGRAMMING (THEORY AND PRACTICALS)	CSE	FC-ES	2	0	2	3	NIL
3.		BASICS OF CIVIL AND MECHANICAL ENGINEERING	CIVIL & MECH	FC-ES	4	0	0	4	NIL
4.		BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	EEE & ECE	FC-ES	4	0	0	4	NIL
5.		ENGINEERING SKILLS PRACTICALS LAB	CIVIL & MECH	FC-ES	0	0	4	2	NIL
6.		BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB	EEE &ECE	FC-ES	0	0	4	2	NIL
7.		ENGINEERING MECHANICS	MECH	FC-ES	2	1	0	3	NIL
8.		ENGINEERING GRAPHICS AND DESIGN	MECH	FC-ES	0	0	6	3	NIL

B. Professional									
Core Courses-Credits (48-54)									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1		DESIGN OF REINFORCED CONCRETE ELEMENTS	CIVIL	CC	2	1	0	3	STRENGTH OF MATERIALS
2		CONSTRUCTION MATERIALS AND TECHNIQUES (THEORY AND PRACTICALS)	CIVIL	CC	3	0	2	4	NIL
3		STRENGTH OF MATERIALS	CIVIL	CC	2	1	0	3	NIL
4		FLUIDS MECHANICS AND HYDRAULIC ENGINEERING	CIVIL	CC	2	1	0	3	NIL
5		ENGINEERING SURVEYING (THEORY AND PRACTICALS)	CIVIL	CC	2	1	4	5	NIL
6		ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)	CIVIL	CC	2	1	2	4	NIL
7		DESIGN OF REINFORCED CONCRETE STRUCTURES	CIVIL	CC	2	1	0	3	DESIGN OF REINFORCED CONCRETE ELEMENTS
8		STRUCTURAL ANALYSIS	CIVIL	CC	2	1	0	3	STRENGTH OF MATERIALS

9		MODERN METHODS OF STRUCTURAL ANALYSIS	CIVIL	CC	2	1	0	3	STRUCTURAL ANALYSIS
10		GEOTECHNICAL ENGINEERING (THEORY AND PRACTICALS)	CIVIL	CC	2	1	4	5	NIL
11		DESIGN OF STEEL STRUCTURES	CIVIL	CC	2	1	0	3	STRENGTH OF MATERIALS
12		TRANSPORTATION ENGINEERING	CIVIL	CC	3	0	0	3	NIL
13		ESTIMATION COSTING AND VALUATION	CIVIL	CC	2	1	0	3	NIL
14		COMPUTER AIDED BUILDING DRAWING LAB	CIVIL	CC	0	0	4	2	NIL
15		STRENGTH OF MATERIALS LAB	CIVIL	CC	0	0	4	2	NIL
16		HYDRAULIC ENGINEERING LAB	CIVIL	CC	0	0	4	2	NIL
17		CONCRETE AND CONSTRUCTION TECHNOLOGY LAB	CIVIL	CC	0	0	4	2	CONSTRUCTION MATERIALS AND TECHNIQUES (THEORY AND PRACTICALS)
18		SURVEY CAMP	CIVIL	CC	0	0	2	1	ENGINEERING SURVEYING

C. Elective Courses

Professional Electives- Credits (12)

S.No	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1		IRRIGATION ENGINEERING	CIVIL	EC-PS	3	0	0	3	ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)
2		ENGINEERING GEOLOGY	CIVIL	EC-PS	3	0	0	3	NIL
3		REMOTE SENSING AND GIS	CIVIL	EC-PS	3	0	0	3	NIL
4		REPAIR AND REHABILITATION OF STRUCTURES	CIVIL	EC-PS	3	0	0	3	CONSTRUCTION MATERIALS AND TECHNIQUES (THEORY AND PRACTICALS)
5		TRAFFIC ENGINEERING AND MANAGEMENT	CIVIL	EC-PS	3	0	0	3	TRANSPORTATION ENGINEERING
6		HYDROLOGY	CIVIL	EC-PS	3	0	0	3	NIL
7		DISASTER MANAGEMENT	CIVIL	EC-PS	3	0	0	3	NIL
8		HOUSING PLANNING AND MANAGEMENT	CIVIL	EC-PS	3	0	0	3	NIL
9		GROUND IMPROVEMENT TECHNIQUES	CIVIL	EC-PS	3	0	0	3	GEOTECHNICAL ENGINEERING (THEORY AND PRACTICALS)

10		ELECTRONIC SURVEYING	CIVIL	EC-PS	3	0	0	3	ENGINEERING SURVEYING (THEORY AND PRACTICALS)
11		AIR POLLUTION MANAGEMENT	CIVIL	EC-PS	3	0	0	3	ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)
12		BRIDGE STRUCTURES	CIVIL	EC-PS	3	0	0	3	DESIGN OF STEEL STRUCTURES
13		TALL BUILDINGS	CIVIL	EC-PS	3	0	0	3	DESIGN OF STEEL STRUCTURES
14		STRUCTURAL DYNAMICS	CIVIL	EC-PS	3	0	0	3	STRUCTURALANALYSIS
15		WIND ENGINEERING	CIVIL	EC-PS	3	0	0	3	NIL
16		INDUSTRIAL STRUCTURES	CIVIL	EC-PS	3	0	0	3	DESIGN OF STEEL STRUCTURE
17		FINITE ELEMENT TECHNIQUES	CIVIL	EC-PS	3	0	0	3	STRUCTURALANALYSIS
18		GROUND WATER ENGINEERING	CIVIL	EC-PS	3	0	0	3	ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)
19		CONTRACT LAWS AND REGULATIONS	CIVIL	EC-PS	3	0	0	3	NIL
20		SOLID WASTE MANAGEMENT	CIVIL	EC-PS	3	0	0	3	NIL
21		CONSTRUCTION PLANNING AND SCHEDULING	CIVIL	EC-PS	3	0	0	3	NIL
22		CONCRETE TECHNOLOGY	CIVIL	EC-PS	3	0	0	3	CONSTRUCTION MATERIALS AND TECHNIQUES (THEORY AND PRACTICALS)
23		PRESTRESSED CONCRETE	CIVIL	EC-PS	3	0	0	3	DESIGN OF REINFORCED CONCRETEELEMENTS
24		PREFABRICATED STRUCTURES	CIVIL	EC-PS	3	0	0	3	DESIGN OF STEEL STRUCTURES

Industry Designed/ Industry Supported/ Industry Offered/ Industry Sponsored courses –Credits (6)									
S.NO.	**COURSE CODE**	**COURSE**	**OFFERING INDUSTRY**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQ UISITES**
1.		BUILDING DESIGN WITH OPEN BUILDINGS DESIGNER PART 1	BENTLEY LEARNING PATH: OPEN BUILDING DESIGNER	EC-IE	3	0	0	3	NIL
2.		BUILDING DESIGN WITH OPEN BUILDINGS DESIGNER PART 2	BENTLEY LEARNING PATH: OPEN BUILDING DESIGNER	EC-IE	3	0	0	3	NIL
3.		AECOSIM BUILDING DESIGN	BENTLEY LEARNING PATH: OPEN BUILDING DESIGNER	EC-IE	3	0	0	3	NIL

4.		PROSTRUCTURES	BENTLEY LEARNING PATH: OPEN BUILDING DESIGNER	EC-IE	3	0	0	3	NIL
5.		SOFT SKILLS	INFOSYS	EC-IE	3	0	0	3	NIL
6.		GREEN BUILDINGS AND BUILT ENVIRONMENT	IGBC	EC-IE	3	0	0	3	NIL

Open Courses – Electives from Innovation, Entrepreneurship, Skill Development etc. Credits (6-9)

S.NO	COURSE CODE	COURSE	OFFERING INDUSTRY	CATEGORY	L	T	P	C	PREREQUISITES
1		INNOVATION, PRODUCT DEVELOPMENT AND COMMERCIALIZATION	MANAG	OE-IE	3	0	0	3	NIL
2		NEW VENTURE PLANNING AND MANAGEMENT	MANAG	OE-IE	3	0	0	3	NIL
3		SOCIAL ENTREPRENEURSHIP	MANAG	OE-IE	3	0	0	3	NIL
4		ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	MANAG	OE-IE	3	0	0	3	NIL
5		INTELLECTUAL PROPERTY RIGHTS	MANAG	OE-IE	3	0	0	3	NIL

Open subjects –Electives from other Emerging Areas Credits (6-9)

S.NO	COURSE CODE	COURSE	OFFERING INDUSTRY	CATEGORY	L	T	P	C	PREREQUISITES
1.		GREEN POWER GENERATION SYSTEMS	EEE	OE-EA	3	0	0	3	NIL
2.		INDUSTRIAL DRIVES AND AUTOMATION	EEE	OE-EA	3	0	0	3	NIL
3.		PRINCIPLES OF BIOMEDICAL INSTRUMENTATION	BME	OE-EA	3	0	0	3	NIL
4.		BIOSENSORS AND TRANSDUCERS	BME	OE-EA	3	0	0	3	NIL
5.		INTRODUCTION TO BIOFUELS	BTE	OE-EA	3	0	0	3	NIL
6.		FOOD AND NUTRITION TECHNOLOGY	BTE	OE-EA	3	0	0	3	NIL
7.		FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	CSE	OE-EA	3	0	0	3	NIL
8.		INTRODUCTION TO INTERNET OF THINGS	CSE	OE-EA	3	0	0	3	NIL
9.		CYBER SECURITY	CSE	OE-EA	3	0	0	3	NIL
10.		INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	ECE	OE-EA	3	0	0	3	NIL

11.		DESIGN OF ELECTRONIC EQUIPMENT	ECE	OE-EA	3	0	0	3	NIL
12.		3D PRINTING AND ITS APPLICATIONS	MECH	OE-EA	3	0	0	3	NIL
13.		INDUSTRIAL ROBOTICS	MECH	OE-EA	3	0	0	3	NIL
14.		BIOMOLECULES – STRUCTURE AND FUNCTION	PE	OE-EA	3	0	0	3	NIL
15.		PHARMACOGENOMICS	PE	OE-EA	3	0	0	3	NIL

Project Work,Seminar and Internship in Industry or elsewhere Credits -Credits (15)

S.No	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1		PROJECT WORK	CIVIL	PI-P	0	0	16	8	NIL
2		MINI PROJECT	CIVIL	PI-M	0	0	6	3	NIL
3		SEMINAR	CIVIL	PI-S	0	0	2	1	NIL
4		INTERNSHIP	CIVIL	PI-I	3 WEEKS			3	NIL
TOTAL					0	0	30	15	

MANDATORY COURSES (NON CREDITS)

(Not Included for CGPA Calculations)

S.No	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1.		YOGA AND MEDITATION	PHED	AC	0	0	2	0	NIL
Any Two of The Following Courses									
2.		INDIAN CONSTITUTION	LAW	AC	0	0	2	0	NIL
3.		ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	GEN	AC	0	0	2	0	NIL
4.		NCC/NSS/RRC/ /YRC/STUDENT CLUBS/UNNAT BHARAT ABHIYAN/SWATCH BHARAT	GEN	AC	0	0	2	0	NIL
5.		SPORTS AND GAMES	PHED	AC	0	0	2	0	NIL
6.		GENDER EQUITY AND LAW	LAW	AC	0	0	2	0	NIL

Specialization – Irrigation Engineering									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1		SURFACE AND GROUND WATER HYDROLOGY	CIVIL	EC-SE	3	0	0	3	NIL
2		ENVIRONMENTAL IMPACT ASSESSMENT OF IRRIGATION PROJECTS	CIVIL	EC-SE	3	0	0	3	IRRIGATION ENGINEERING
3		WATERSHED CONSERVATION AND MANAGEMENT	CIVIL	EC-SE	3	0	0	3	NIL
4		IRRIGATION SYSTEMS MANAGEMENT	CIVIL	EC-SE	3	0	0	3	IRRIGATION ENGINEERING
5		COMPUTATIONAL METHODS IN IRRIGATION MANAGEMENT	CIVIL	EC-SE	3	0	0	3	NIL
6		AGRICULTURAL ECONOMICS	CIVIL	EC-SE	3	0	0	3	NIL
7		MODERNIZATION OF IRRIGATION SYSTEMS	CIVIL	EC-SE	3	0	0	3	IRRIGATION ENGINEERING
8		IRRIGATION ENGINEERING DRAWING LABORATORY	CIVIL	EC-SE	0	0	4	2	NIL

Specialization – Mass Transport Systems									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1		ADVANCED SYSTEM DYNAMICS MODELING IN TRANSPORTATION ENGINEERING	CIVIL	EC-SE	3	0	0	3	NIL
2		ENVIRONMENTAL IMPACT ASSESSMENT OF TRANSPORTATION PROJECTS	CIVIL	EC-SE	3	0	0	3	NIL
3		INTELLIGENT TRANSPORTATION SYSTEMS	CIVIL	EC-SE	3	0	0	3	NIL
4		LOGISTICS IN TRANSPORTATION ENGINEERING	CIVIL	EC-SE	3	0	0	3	NIL
5		PAVEMENT MANAGEMENT SYSTEM	CIVIL	EC-SE	3	0	0	3	NIL
6		REMOTE SENSING AND GIS IN TRANSPORTATION DEVELOPMENT	CIVIL	EC-SE	3	0	0	3	NIL
7		URBAN TRANSPORTATION INFRASTRUCTURE– PLANNING AND DESIGN	CIVIL	EC-SE	3	0	0	3	NIL
8		CAD IN TRANSPORTATION ENGINEERINGLABORATORY	CIVIL	EC-SE	0	0	4	2	NIL

Specialization – Real Estate and Valuation

S.No	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1		PRINCIPLES OF VALUATION	CIVIL	EC-SE	3	0	0	3	NIL
2		REAL ESTATE MANAGEMENT & ECONOMICS	CIVIL	EC-SE	3	0	0	3	NIL
3		REAL ESTATE HUMAN RESOURCE MANAGEMENT	CIVIL	EC-SE	3	0	0	3	NIL
4		LAWS FOR ACQUISITION ANDCONTRACT	CIVIL	EC-SE	3	0	0	3	NIL
5		REAL ESTATE FINANCE& MARKETING	CIVIL	EC-SE	3	0	0	3	NIL
6		VALUATION & DOCUMENTATION WRITING	CIVIL	EC-SE	3	0	0	3	NIL
7		QUALITY CONTROL AND ASSURANCE INREAL ESTATE	CIVIL	EC-SE	3	0	0	3	NIL
		ESTIMATING, COSTING AND PROFESSIONAL PRACTICE	CIVIL	EC-SE	0	0	4	2	NIL

Specialization – Sustainable Construction Technology

S.No	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1		RENEWABLE ENERGY SYSTEMS	CIVIL	EC-SE	3	0	0	3	NIL
2		THERMAL INSULATION INSTALLATION	CIVIL	EC-SE	3	0	0	3	NIL
3		SUSTAINABLE URBAN SYSTEMS	CIVIL	EC-SE	3	0	0	3	NIL
4		ENERGY AUDITING IN SPECIAL STRUCTURES	CIVIL	EC-SE	3	0	0	3	NIL
5		LIFE CYCLE ASSESSMENT FOR COMPLEX SYSTEMS	CIVIL	EC-SE	3	0	0	3	NIL
6		INFRASTRUCTURE PROJECT DEVELOPMENT	CIVIL	EC-SE	3	0	0	3	NIL
7		GREEN BUILDING AND ENERGY EFFICIENT BUILDING	CIVIL	EC-SE	3	0	0	3	NIL
8		SUSTAINABLE BUILDING MATERIALLABORATORY	CIVIL	EC-SE	0	0	4	2	NIL

Specialization - Environmental Engineering									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1		ENVIRONMENTAL IMPACT ASSESSMENT	CIVIL	EC-SE	3	0	0	3	NIL
2		INSTRUMENTAL MONITORING OF ENVIRONMENT	CIVIL	EC-SE	3	0	0	3	NIL
3		INDOOR AIR QUALITY	CIVIL	EC-SE	3	0	0	3	NIL
4		ENVIRONMENTAL POLICIES AND LEGISLATIONS	CIVIL	EC-SE	3	0	0	3	NIL
5		SUSTAINABLE DEVELOPMENT AND ENVIRONMENT	CIVIL	EC-SE	3	0	0	3	NIL
6		REMOTE SENSING AND GIS FOR ENVIRONMENTAL APPLICATION	CIVIL	EC-SE	3	0	0	3	NIL
7		WASTE WATER MANAGEMENT	CIVIL	EC-SE	3	0	0	3	NIL
8		ENVIRONMENTAL ANALYSIS LABORATORY	CIVIL	EC-SE	0	0	4	2	NIL

Specialization –3D Printing									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1		3D PRINTING WITH SKETCHUP	CIVIL	EC-SE	3	0	0	3	NIL
2		MODERNISTIC APPROACHESIN BUILDING CONSTRUCTION	CIVIL	EC-SE	3	0	0	3	NIL
3		FUNDAMENTALS OF 3DPRINTING	CIVIL	EC-SE	3	0	0	3	NIL
4		NANO MATERIALS FOR 3DPRINTING	CIVIL	EC-SE	3	0	0	3	NIL
5		BIM AND 3D PRINTING OFCONCRETE	CIVIL	EC-SE	3	0	0	3	NIL
6		ADVANCED 3D PRINTING APPLICATION IN CONSTRUCTION	CIVIL	EC-SE	3	0	0	3	NIL
7		ADDITIVE MANUFACTURING TECHNIQUES	CIVIL	EC-SE	3	0	0	3	NIL
8		MEASUREMENT SCIENCE IN3D PRINTING	CIVIL	EC-SE	0	0	4	2	NIL

	TECHNICAL ENGLISH	Category	L	T	P	Credit
		FC-HS	3	0	0	3

PREAMBLE

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

PREREQUISITE: NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

SELF INTRODUCTION

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

STRESS

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

SPEAKING SKILLS

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

READING SKILLS

English as language of Opportunity and Employability- Impersonal Passive Voice - Conditional Sentences - Technical and Non technical Report Writing (Attend a technical seminar and submit a report) - News Letters and Editing - Skimming- Scanning - How to Improve Reading Speed - Designing Invitations and Poster Preparation – Technical Jargons

TECHNICAL WRITING

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

TEXTBOOK

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

REFERENCE BOOKS

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

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

Course Designers:

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

	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 Objective

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

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

CO1.	Communicate with a range of formal and informal context	Understand
CO2.	Demonstrate interaction skills and consider how own communication is adjusted in different scenario.	Apply
CO3.	Use strengthened oral and written skills in the business context.	Apply
CO4.	Create interest in a topic by exploring thoughts and ideas.	Apply
CO5.	Have better performance in the art of communication	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS OF LANGUAGE AND LISTENING SKILLS

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

SPEAKING SKILLS

Stress (Word Stress and Sentence Stress) Intonation- Difference between British and American English Vocabulary-Indianism-Compound Words (including Technical Terminology) Jargons- Technical and Business, Listening to TED Talks and discussion on the topic heard

READING SKILLS

Extempore**,** , Speaking activities- pair and group designed by the faculty, Group Discussion-Types of Interviews, Watching Documentary Films and Responding to Questions, Reading Skills-Skimming, Scanning, Understanding Ideas and making Inferences-– FAQs –,Critical Reading-Book Review-Finding Key Information and Shifting Facts from Opinions, reading for pleasure (motivational, short novels, classical etc)

CORPORATE COMMUNICATION

What is Corporate Communication? Types of Office communications -Recommendation-Instruction-Check List- Circulars-Inter Office Memo- Minutes of Meeting and Writing Agenda - Discourse Markers , Technical Articles – Written communication Project Proposals- E - Mail Netiquette - Sample E – mails Making Presentations on given Topics -Preparing Power Point Presentations-Business Letters (Calling for Quotation, Placing Orders and Complaint Letters)

Text Books

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

Alternative NPTEL/SWAYAM Course – Nil

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

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	Dr. Jennifer G Joseph	Professor & Head	English /AVIT	jennifer@avit.ac.in
2	Dr. P.Saradha	Associate Professor	English /VMKVEC	saradhap@vmkvec.edu.in

	ENGLISH LANGUAGE LAB	Category	L	T	P	Credit
		FC-HS	0	0	4	2

PREAMBLE

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

PREREQUISITE: NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

CO1. Give best performance in group discussion and interview	Understand
CO2. Best performance in the art of conversation and public speaking.	Apply
CO3. Give better job opportunities in corporate companies	Apply
CO4. Better understanding of nuances of English language through audio-visual experience and group activities	Apply
CO5. Speaking skills with clarity and confidence which in turn enhances their employability skills	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

MODULE I: Ice Breaker, Grouping, Listening- (Hearing and listening)- Active Listening- Passive Listening – Listening to songs, videos and understanding- (fill in the blanks) Telephone Conversation

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

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

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

MODULE V: Case study of Etiquette in different scenario.

Course Designers:

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

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

Course Objectives:

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

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

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

UNIT I Introduction

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

UNIT II Understanding Harmony in the Human Being

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

UNIT III Understanding Harmony in the Family and Society

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

UNIT IV Understanding Harmony in the Nature and Existence

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

UNIT V Holistic Understanding of Harmony on Professional Ethics

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

Total Hours : 45 Hours

Text Book

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

Reference Books

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.

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

	TOTAL QUALITY MANAGEMENT	Category	L	T	P	Credit
		FC-HS	3	0	0	3

PREAMBLE:

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

PREREQUISITE: Not Required

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION

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

TQM PRINCIPLES AND PHILOSOPHIES

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

STATISTICAL PROCESS CONTROL (SPC) & PROCESS CAPABILITY

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

TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT

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

QUALITY SYSTEMS \

Introduction to IS/ISO 9004:2000 – quality management systems – Elements- Implementation of Quality System - Documentation- Quality Auditing- ISO 14000 – Concept- Requirements and Benefits.

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	A. Mani	Associate Professor	Management Studies	mani@vmkvec.edu.in
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	ENGINEERING MANAGEMENT AND ETHICS	Category	L	T	P	Credit
		FC-HS	3	0	0	3

PREAMBLE:

Engineering management provides technological problem-solving ability of engineering and the organizational to oversee the operational performance of complex engineering enterprises to Engineers. Engineers require honesty, impartiality, fairness, and equity, and dedication to the protection of the public health, safety, and welfare. Ethics emphasises the importance of moral issues, rights and duties of the employees through basic ethics confronting individuals and organizations engaged. It also emphasise values that are morally desirable in engineering practice and research. It allows them to understand various occupational crimes and learn the moral leadership.

PREREQUISITE: Not Required

COURSE OBJECTIVES:

1. To Understand the principles of planning at various levels of the organisation.
2. To analyse and practice the concepts of organizing, staffing to higher productivity.
3. To apply the concepts related to directing and controlling.
4. To understand and apply the case studies to practice code of ethics in organisation.
5. To apply the ethical principles in working environment.

COURSE OUTCOMES:

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

CO1: Understand the importance of planning principles in organization	Understand
CO2: Apply the various strategies of organising and staffing process.	Apply
CO3: Analyse various leadership skills and control techniques for shaping the organization.	Analyse
CO4: Understand and apply best ethical practices in organization	Analyse
CO5: Analyse and Apply relevant ethical practices in engineering.	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	L	S	M	M	L	S	S	S	S			
CO2	M	L	L	-	M	M	M	L	M	S	M	M			
CO3	M	M	L	-	M	M	M	L	L	S	S	M			
CO4	L	M	-	M	-	M	S	S	S	S	-	M			
CO5	M	M	-	L	-	M	S	S	S	S	-	M			

S- Strong; M-Medium; L-Low

SYLLABUS:

PLANNING

Nature and purpose of planning – planning process – types of planning – objectives – setting -Objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

ORGANISING

Nature and purpose – Formal and informal organization – organization chart – organization structure– types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

DIRECTING

Foundations of individual and group behavior – motivation – motivation theories – motivational - Techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – Communication – process of communication – barrier in communication – effective communication – communication and IT.

CONTROLLING

System and process of controlling – budgetary and non-budgetary control techniques – use of Computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

ETHICS IN ENGINEERING

Moral dilemmas -Uses of Ethical Theories- Engineering As Social Experimentation- Engineer's Responsibility For Safety-Codes of Ethics-Challenger - Employed Engineers Rights and Duties- Collective Bargaining - Occupational Crime - Global Issues- Multinational Corporation- Technology transfer - Engineers as managers - Consulting Engineers - Expert Witness-Moral Leadership.

TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.
3. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

REFERENCES:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson South-western, 7th edition, 2007.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

COURSE DESIGNERS:

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1	M. Manickam	Associate Professor	Management Studies	manickam@vmkvec.edu.in
2	Mr. T. Thangaraja	Assistant Professor	Management Studies	thangaraja@avit.ac.in

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

PREAMBLE

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

PREREQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

MATRICES:

Characteristic equation– Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof).

DIFFERENTIAL CALCULUS&PARTIAL DERIVATIVES :

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

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

ORDINARY DIFFERENTIAL EQUATIONS:

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

MULTIPLE INTEGRALS:

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

VECTOR CALCULUS:

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

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS

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	MATHEMATICS FOR CIVIL ENGINEERS	Category	L	T	P	Credit
		FC-BS	2	1	0	3

PREAMBLE

An engineering student needs to have some basic mathematical tools and techniques to apply in diverse applications in Engineering. This emphasizes the development of rigorous logical thinking and analytical skills of the student and appraises him the complete procedure for solving different kinds of problems that occur in engineering. Based on this, the course aims at giving adequate exposure in Ordinary differential equations, Laplace transforms, Applications of Laplace transforms, Fourier transforms and Z-transforms.

PREREQUISITE

Engineering Mathematics

COURSE OBJECTIVES

1	To equip themselves familiar with Laplace transform.
2	To gain good knowledge in the application of Laplace transforms
3	Fourier transforms has the wide application in the field of heat diffusion, wave propagation and in signal and systems analysis.
4	To learn about Z- transforms and its applications.
5	To expose the concept of Analytical function.

COURSE OUTCOMES

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

CO1. Apply Laplace transform technique to solve the given ordinary differential equation.	Apply
CO2. Apply Applications of Laplace transform technique to solve the given ordinary differential equation.	Apply
CO3. Demonstrate Fourier Transform as a tool for solving integral equations.	Apply
CO4. Used to solve second-order ordinary difference equations using Z-transform techniques Tools	Apply
CO5: Predict an analytic function, when its real or imaginary part is known	

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

S- Strong; M-Medium; L-Low

SYLLABUS

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 TRANSFORMS AND APPLICATIONS

Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

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.

ANALYTICAL GEOMETRY

Equation of a sphere-Plane section of a sphere-Tangent Plane-Equation of a cylinder-Right circular cylinder,

TEXT BOOKS:

1. Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore (2012).
2. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi (2020)

REFERENCES:

3. "Engineering Mathematics I & II", by Department of Mathematics, VMKVEC (Salem) & AVIT (Chennai), (2017).
4. Dr.A. Singaravelu, "Transforms and Partial differential Equations", 18th Edition, Meenakshi Agency, Chennai (2013).
5. Kandasamy. P, Thilagavathy. K. and Gunavathy. K., "Engineering Mathematics", Volumes I & II (10thEdition), S. Chand & Co., New Delhi (2014).

COURSE DESIGNERS

S. No	Name of the Faculty	Designation	Department	Mail ID
1	Dr. L. Tamilselvi	Professor	Mathematics	ltamilselvi@avit.ac.in
2	Dr.G.Selvam	Asso.Prof	Mathematics	selvam@vmkvec.edu.in

	PROBABILITY AND STATISTICS	Category	L	T	P	Credit
		FC-BS	2	1	0	3

PREAMBLE

Probabilistic and statistical analysis is mostly used in varied applications in Engineering and Science. Statistical method introduces students to cognitive learning in statistics and develops skills on analyzing the data by using different tests and designing the experiments with several factors. Statistical Quality control is a method of quality control which employs statistical methods to monitor and control a process and ensure the process operates efficiently, producing more specification-conforming product. Based on this, the course aims at giving adequate exposure in random variables, probability distributions, regression and correlation, test of hypothesis and statistical quality control.

PREREQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

CO1. Select an appropriate probability distribution to determine probability function for solving engineering problem.	Apply
CO2. Derive the marginal and conditional distributions of bivariate random variables.	Apply
CO3. Apply the concepts of large/small sample tests into real life problems	Apply
CO4. Interpret results from Analysis of Variance (ANOVA), a technique used to compare means amongst more than two independent populations.	Apply
CO5. Prepare Control charts and decide on the in-control status of the process. Estimate whether a lot is acceptable or unacceptable based on acceptance sampling plans.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

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

S- Strong; M-Medium; L-Low

SYLLABUS

STANDARD DISTRIBUTION: Standard Distributions - Binomial, Poisson, Geometric, Uniform, Exponential, Normal distributions.

TWO DIMENSIONAL RANDOM VARIABLES: Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression Analysis.

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

DESIGN OF EXPERIMENTS: Analysis of Variance – One Way Classification – Two Way Classification – Completely Randomized Design – Randomized Block Design – Latin Square Design.

STATISTICAL QUALITY CONTROL: Introduction – Process control – Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling – single sampling, double sampling, multiple sampling and sequential sampling.

TEXT BOOKS:

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

REFERENCES:

1. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", 12th Edition, Sultan Chand & Sons, New Delhi (2020).
2. Miller, "Probability and Statistics for Engineers", 9th Edition, Freund-Hall, Prentice India Ltd. (2017).

COURSE DESIGNERS

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1	Dr.M.Vijayarakavan	Associate Professor	Mathematics	vijayarakavan@vmkvec.edu.in
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	NUMERICAL METHODS	Category	L	T	P	Credit
		FC-BS	2	1	0	3

PREAMBLE

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

PREREQUISITE

1. Engineering Mathematics
2. Mathematics for Civil Engineers

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

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

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

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

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

BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS:

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

TEXT BOOKS:

3. S.K Gupta, "Numerical Methods for Engineers", New Age International Pvt. Ltd. Publishers (2015).
4. S.R.K. Iyengar, R.K. Jain, Mahinder Kumar Jain, "Numerical methods for Scientific and Engineering Computations", New Age International publishers , 6th Edition (2012).
5. T. Veerarajan, T.Ramachandran, "Numerical Methods with Programs in C and C++", Tata McGraw-Hill (2008).

REFERENCES:

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

COURSE DESIGNERS

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1	Dr. S. Gayathri	Assistant Professor	Mathematics	gayathri@avit.ac.in
2	Dr. M.Vijayarakavan	Associate Professor	Mathematics	vijayarakavan@vmkvec.edu.in

	PHYSICAL SCIENCES - Part A: ENGINEERING PHYSICS	Category	L	T	P	Credit
		FC-BS	2	0	0	2

PREAMBLE

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

PREREQUISITE : NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

Unit: I **9 hours**

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

Unit: II **9 hours**

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

Unit: III **9 hours**

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

TEXT BOOKS

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

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

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

REFERENCE BOOKS

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

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

3. Gaur R. K. and Gupta S. L., Engineering Physics, DhanpatRai publishers, New Delhi, 2012.

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

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

COURSE DESIGNERS

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

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

PREAMBLE

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

PREREQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOME

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT – I: WATER TECHNOLOGY

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

UNIT – II: ELECTROCHEMISTRY, CORROSION AND BATTERIES

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

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

UNIT – III FUELS AND COMBUSTION

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

TEXTBOOK

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

REFERENCES

1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane, 3rd Edition, McGraw Hill, 1980
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

3. Physical Chemistry, by P. W. Atkins, Julio de Paula, 8th Edition, Oxford University press, 2007

4. Engineering Chemistry by Dr. A. Ravikrishnan, Sri Krishna Publications, Chennai.

Course Designers:

S.No	Name of the Faculty	Mail ID
1	Dr. A.R. Sasieekumar	sasieekhumar@vmkvec.edu.in
2	Dr. R. Nagalakshmi	nagalakshmi.chemistry@avit.ac.in

	SMART MATERIALS	Category	L	T	P	Credit
		FC-BS	3	0	0	3

PREAMBLE

Smart Materials give an outlook about various types of functional materials having potential device applications in different engineering disciplines. In particular, students learn the functional properties and industrial applications of shape memory alloys, nanomaterials, magnetic materials and superconducting materials.

PREREQUISITE - : Physical Sciences – Engineering Physics

COURSE OBJECTIVES

1	To impart the basic properties of different materials.
2	To understand the structure of crystalline materials.
3	To understand the properties of smart materials and realize its industrial applications.
4	To learn the synthesis of Nano materials and carbon nanotubes.
5	To learn the properties, classification and relevant applications of magnetic materials.
6	To understand the concept of superconductivity, properties of super conductor and their industrial applications.

COURSE OUTCOMES

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

CO1. understand the basic properties of various materials.	Understand
CO2.learn the structure of Crystalline Materials	Apply
CO3.gain the basic knowledge and recognize the applications of Smart Materials	Apply
CO4.get an exposure about the properties of Nano materials	Apply
CO5.gain the knowledge about the properties of magnetic materials and familiarize their applications.	Apply
CO6.gain the knowledge about Superconducting materials	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

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 – determination of interplanar distance (d).

SMART MATERIALS: Shape Memory Alloys (SMA) – Characteristics and properties of SMA, Application – SMA in Actuators and Blood clot filters, advantages and disadvantages of SMA. Metallic glasses – Preparation, properties and industrial applications (Core of the Transformer).

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

MAGNETIC MATERIALS: Basic concepts – Classification of magnetic materials – Domain theory – Hysteresis – Soft and Hard magnetic materials – Applications of Magnetic materials (Magnets in Generators and MRI scan).

SUPERCONDUCTING MATERIALS: Superconducting phenomena – properties of superconductors – Meissner effect – isotope effect – Type I and Type II superconductors – High Tc Superconductors – Industrial Applications of superconductors (SQUID, Cryotrons and Maglev Trains).

TEXT BOOKS:

1. Palanisamy P.K. Materials Science. SCITECH Publishers, 2015.
2. A.K. Katiyar and C.K. Pandey, Engineering Physics Theory and Practical, Wiley Publisher, 2015.

REFERENCES:

1. Pillai S.O., Solid State Physics, 9th Edition, New Age International (P) Ltd., Publishers, 2020.
2. William D. Callister Jr., David G. Rethwisch., Materials Science and Engineering: An Introduction, 10th Edition, Wiley Publisher, 2018.

COURSE DESIGNERS

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1.	Dr. G. Suresh	Associate Professor	Physics	suresh.physics@avit.ac.in
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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

CO6. Recognize the importance of units while performing the experiments, calculating the physical parameters and obtaining results	Understand
CO7. Operate the equipments with precision	Apply
CO8. Practice to handle the equipments in a systematic manner	Apply
CO9. Demonstrate the experiments through virtual laboratory	Apply
CO10. 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	PO 12	PSO1	PS O2	PS O3
CO1	S	S													
CO2	S	S	M	M	S				M			M	M		M
CO3	S														
CO4	S	S	M	M	S							S	M		M
CO5	S	S													

S- Strong; M-Medium; L-Low

SYLLABUS

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer

5. Particle size determination using Laser
6. Wavelength of spectral lines – grating – Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer

LAB MANUAL

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

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. C. SENTHIL KUMAR	PROFESSOR	PHYSICS	senthilkumarc@vmkvec.edu.in
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	PHYSICAL SCIENCES LAB PART B - ENGINEERING CHEMISTRY LAB (Common to All Branches)	Category	L	T	P	Credit
		FC-BS	0	0	2	1

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

PREREQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO12	PSO 1	PS O2	PSO3
CO1	S	M	M	-	L	M	M	S	-	-	-	M	-	-	-
CO2	S	M	M	-	L	M	M	L	-	-	-	M	-	-	-
CO3	S	S	M	-	L	M	M	M	-	-	-	M			

S- Strong; M-Medium; L-Low

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

Solution8.Estimation of Iron by Spectrophotometer

TEXT BOOK:

1. Engineering Chemistry Lab Manual by VMU.

COURSE DESIGNERS

S.No	Name of Faculty	Designation	Department	Mail Id
1	Dr. A.R. Sasieekumar	Associate Professor	Chemistry	sasieekhumar@vmkvec.edu.in
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	GREEN BUILDING MATERIALS	Category	L	T	P	Credit
		FC-BS	3	0	0	3

Preamble

This course is designed to understand the principles and mechanisms of green building concepts. To enlighten the students to the current green building trend and to help them realize the positive impacts of the applications of green materials as a practice in the present scenario.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand the concept of green building and its characteristics
2	To categories the design concepts of green buildings.
3	To understand the various green building materials.
4	To categories the various green materials for the interior .
5	To emphasize the role and significance of nano materials in green buildings.

COURSE OUTCOMES

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

CO1. Gain knowledge in green buildings concept and principles.	Understand
CO2. Identify and analyse the various rating systems of green buildings and life cycle of sustainable buildings.	Analyse
CO3. Understand and demonstrate the green building design	Understand
CO4. Gain knowledge about green materials and apply the concept in construction of sustainable buildings	Apply
CO5. To gain awareness about the nanotechnology applications in green buildings materials and apply for improved performance characteristics	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	-	-	-	-	-	-	-
CO2	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT –I CONCEPT OF GREEN BUILDINGS

Green building principles, characteristics and benefits of a green building, certification of green buildings rating systems (BREEAM, USGBC, LEED, IGBC) criteria for rating, sustainability. Sustainable green building, criteria for green selection product, current issues and trends in green building, green building tool, CASBEE (Comprehensive Assessment System for Built Environment Efficiency) and BEE (Building Environmental Efficiency), GRIHA.

UNIT –II DESIGN OF GREEN BUILDINGS

Characteristics and principles of green building design, Intelligent and living buildings, passive and active solar design, Sustainable sites, life cycle assessment, site development and layout, building orientation and building system design, storm water system design, considerations of energy consumption, carbon emissions, water use, environmental performance target, indoor air quality, noise level, comfort.

UNIT –III GREEN BUILDING MATERIALS

Green materials - introduction, ICFs, SIPs, sustainable green building materials, product selection criteria, green cement, flyash, RHA, SBS, Depleting natural resources of building materials, renewable and recyclable resources, energy efficient materials - green cement, biomaterials, biopolymers, bioplastics, smart materials and Green composites.

UNIT –IV GREEN MATERIALS FOR INTERIOR

Natural clay plaster, Natural fiber flooring, green building materials for interiors(bamboo, hemp, wool, natural fibre), HVAC (Heating Ventilaiton Air Conditioning), construction materials and furnishings, cement substitutes for sustainable concrete, paving materials for green buildings, Low/no-VOC (volatile organic compound) paints, stains, and coatings, Paperless drywall-Heating and Air Conditioning, Solar hot water, Environmentally sustainable interior design (ESID) .

UNIT –V NANOMATERIALS FOR GREEN SYSTEMS

Nano cement, BIPV(Building Integrated Photovoltaics), Nano insulating coating materials, nanotechnology and it's applications in construction,nano composites, nano particle reinforced materials, nano technology for green buildings, nano architecture, nanotechnology in concrete,Nanotechnology applications in Windows, Skylights, and Lighting-Paints, Roofs, Walls, and Cooling- Multifunctional GasSensors, Biomimetic Sensors, Optical Interference Sensors.

Text Book

1. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.
3. Green building materials by Ross Spiegel and Dru Meadows,3rd Edition,2011.

Reference

1. Complete Guide to Green Buildings by Trish riley.
2. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Prasad Vaidya, 2016.
3. Understanding Green building materials by Traci Rose Rider, Stacy Glass and Jessica McNaughton.
4. Green building materials, Energy & Civil Engineering by Jimmy C.M. Kao, Wen-Pei Sung, Ran Chen,2014.

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2	Dr. K. Sanghamitra	Assistant Professor	Chemistry	sanghamitra.chemistry@avit.ac.in

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

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

PREREQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT –I ENVIRONMENT AND NATURAL RESOURCES 6 hrs

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

UNIT –II ECOSYSTEMS AND BIO – DIVERSITY 6 hrs

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

UNIT –III ENVIRONMENTAL POLLUTION 6 hrs

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

UNIT-IV SOCIAL ISSUES AND ENVIRONMENT 6 hrs

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

UNIT-V HUMAN POPULATION AND ENVIRONMENT 6 hrs

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

TEXT BOOK

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

REFERENCES:

1.Wager K.D. "Environmental Management", W.B. Saunders Co. Philadelphia, USA, 1998.

2. Anubha Kaushik and C.P Kaushik “Perspectives of Environmental Studies”, New age international publishers.

3. Trivedi R.K. “Handbook of Environmental Laws", Rules, Guidelines,Compliances and Standards Vol I & II, Enviromedia.

4. Environmental Science and Engineering by Dr. J. Meenambal, MJP Publication, Chennai Gilbert M. Masters: Introduction to Environmental Engineering and Science , Pearson EducationPvtLtd., II Edition, ISBN 81-297-0277-0,2004.

5. Miller T.G.Jr. Environmental Science Wads worth Publishing. Co.
6. Townsend C. Harper J. and Michael Begon, Essentials of Ecology, Blackwell Science.

COURSE DESIGNERS

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

PREAMBLE

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

PRERQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

Introduction to computers:

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

Operating System Fundamentals:

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

Lab Component-, Basic unix commands

Introduction to Principles of programming

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

Introduction to Database Management Systems

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

Internet Basics

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

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

TEXT BOOKS:

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

REFERENCES:

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

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

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

COURSE DESIGNERS				
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	PYTHON PROGRAMMING (THEORY AND PRACTICALS)	CATEGORY	L	T	P	CREDIT
		FC-ES	2	0	2	3

PREAMBLE

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

PRERQUISITE

NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

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

DATA STRUCTURES

Strings-Lists-Tuples-Dictionaries-Sets

CONTROL STATEMENTS

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

FUNCTIONS

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

EXCEPTION HANDLING

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

LIST OF EXPERIMENTS

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

TEXT BOOKS:

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

REFERENCES:

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

COURSE DESIGNERS				
S.No.	Name of the Faculty	Designation	Department	Mail ID
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	BASICS OF CIVIL AND MECHANICALENGINEERING PART-A BASICS OF CIVIL ENGINEERING (Common to All Branches)	Category	L	T	P	Credit
		FC-ES	2	0	0	2

PREAMBLE

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

PREREQUISITE-NIL

COURSEOBJECTIVES

1	To understand the basic concepts of surveying and apply in practical problems
2	To study in detail different types of construction materials.
3	To impart basic knowledge about building components.

COURSE OUTCOMES

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

CO1.An ability to apply concepts of Surveying on practical applications.	Apply
CO2. Explain different types of buildings, building components, building materials and building construction.	Remember
CO3.Expalin the essentials of components of a building and application of load on it	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S-Strong;M-Medium; L-Low

SYLLABUS

SURVEYING

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

CIVIL ENGINEERING MATERIALS

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

BUILDING COMPONENTS AND STRUCTURES:

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

TEXTBOOKS:

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

REFERENCES:

1. Ramamrutham S., “Basic Civil Engineering”, Dhanpatrai Publishing Co. (P) Ltd., 2009.
2. Rangwala S.C and Dalal K.B, Building Construction, Charotar Publishing house, 2022.

COURSE DESIGNERS				
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	BASICS OF MECHANICAL ENGINEERING	Category	L	T	P	Credit
		FC (ES)	2	0	0	2

Preamble

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

Prerequisite-NIL

CourseObjective

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

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S-Strong; M-Medium; L-Low

SYLLABUS

BASIC MANUFACTURING PROCESSES

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

IC ENGINES

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

POWER PLANT ENGINEERING

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

Text Books

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

Reference Books

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

Course Designers

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

	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING A. BASIC ELECTRICAL ENGINEERING	Category	L	T	P	Credit
		FC-ES	2	0	0	2

PREAMBLE

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

PREREQUISITE – Nil

COURSE OBJECTIVES

1	To explain the basic laws used in Electrical circuits and various types of measuring instruments.
2	To explain the different components and function of electrical dc and ac machines.
3	To understand the fundamentals of safety procedures, Earthing and Power system.

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

ELECTRICAL CIRCUITS AND MEASUREMENTS

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

ELECTRICAL MACHINES

Faraday's Law, Construction, Principle of operation, Basic Equation and Applications of DC & AC Generators

and Motors - Single Phase Transformer, Single phase and Three phase Induction Motor.

ELECTRICAL SAFETY AND INTRODUCTION TO POWER SYSTEM

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

COURSE DESIGNERS

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1	Dr. R. Devarajan	Professor	EEE/VMKVEC	devarajan@vmkvec.edu.in
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4	Mr. S. Prakash	Assistant Professor (Gr-II)	EEE/AVIT	sprakash@avit.ac.in

	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING B. BASIC ELECTRONICS ENGINEERING	Category	L	T	P	Credit
		FC-ES	2	0	0	2

PREAMBLE

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

PRERQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS SEMICONDUCTOR DEVICES

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

DIGITAL FUNDAMENTALS

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

COMMUNICATION AND ADVANCED GADGETS

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

TEXT BOOKS:

1. R.K. Rajput, "Basic Electrical and Electronics Engineering", Laxmi Publications, Second Edition, 2012.
2. Dr.P.Selvam, Dr.R.Devarajan, Dr.A.Nagappan, Dr.T.Muthumanickam and Dr.T.Sheela,"Basic Electrical andElectronics 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
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4	Ms.R.Mohana Priya	Assistant Professor (Gr-II)	ECE	mohanapriya@avit.ac.in

	ENGINEERING SKILL PRACTICALS LAB PART- A BASICS OF CIVIL ENGINEERING	Category	L	T	P	Credit
		FC-ES	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

COURSEOBJECTIVES

1	To understand the basic concepts of building components.
2	To impart basic knowledge about Plumping and Carpentry works.

COURSEOUTCOMES

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

CO1. Prepare the different types of fitting and plumbing lines.	Apply
CO2.Prepare the different types of joints using wooden material	Apply

MAPPINGWITHPROGRAMMEOUTCOMESANDPROGRAMMESPECIFICOUTCOMES

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

S-Strong; M-Medium; L-Low

SYLLABUS

Buildings:

1. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.

Plumbing and Carpentry Works:

2. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands on Exercise on Demonstration of plumbing requirements of high-risebuildings.

CarpentryusingPowerToolsonly:

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

TEXTBOOK

1.BasiccivilengineeringLabManual by Department of Civil Engineering, VMRF.

COURSEDESIGNERS

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

	ENGINEERING SKILL PRACTICALS LAB B. BASICS OF 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 executive joints using wooden materials.
3	To apply in depth knowledge in metal joining processes.
4	To demonstrate the pattern using foundry processes

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

CO1.	Perform the different types of fitting using MS plate.	Apply
CO2.	Practice the different types of joints using wooden material	Apply
CO3.	Demonstrate the different types of joints in metal by Arc Welding	Apply
CO4.	Utilize the different types of green sand mould	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

Tee – FittingVee –
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 CarpentryLap
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

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	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB A. BASIC ELECTRICAL ENGINEERING	Category	L	T	P	Credit
		FC-ES	0	0	2	1

PREAMBLE

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

PRERQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS

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

REFERENCES

1. Laboratory Reference Manual.

COURSE DESIGNERS

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

	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB PART B - BASIC ELECTRONICS ENGINEERING	Category	L	T	P	Credit
		FC-ES	0	0	2	1

PREAMBLE

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

PRERQUISITE – Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

CO1. Familiarize with the fundamentals of soldering techniques.	Understand
CO2. Construct experiments for PN and Zener diode characteristics also determine diode forward and reverse resistance	Apply
CO3. Construct clipper and clamper circuit and verify their voltage levels	Apply
CO4. Construct and justify operation simple voltage regulator for given Zener diode	Apply
CO5. Verify the truth tables and characteristics of logic gates (AND, OR, NOT, NAND, NOR, XOR).	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

Syllabus

LIST OF EXPERIMENTS

1. Practicing of Soldering and Desoldering.
2. Characteristics of PN junction Diode and find the forward and reverse resistance
3. Construct and Study simple clipper and clamper circuits

8. Construct and Study simple voltage regulator using zener diode.				
COURSE DESIGNERS				
S.No.	**Name of the Faculty**	**Designation**	**Department**	**Mail ID**
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	ENGINEERING MECHANICS	Category	L	T	P	Credit
		FC-ES	2	1	0	3

Preamble

This course provides the basic knowledge about the behavior of the bodies which are under static and dynamic conditions.

Prerequisite

NIL

Course Objective

1	To explain the basic laws of mechanics and forces
2	To relate the basic concepts and application of rigid bodies under equilibrium in two Dimension
3	To employ the concepts of properties of surfaces and to find the Centroid and moment of Inertia using various methods in solid sections.
4	To practice problems in the areas of Friction and Rigid body dynamics by understanding the basic concepts of Friction and Rigid body dynamics.
5	To calculate and categorize of problems in the area of dynamics of particles.

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

CO1.	Identify the engineering problems using the concept of static Equilibrium	Understand
CO2.	Solve problems of rigid bodies under equilibrium in two dimension and apply various conditions	Apply
CO3.	Determine the Centroid of a line, areas, and volumes, center of mass of body and moment of inertia of composite areas, mass moment of inertia	Apply
CO4.	Solve problems involving frictional phenomena.	Apply
CO5.	Solve problems in engineering systems using the concept of dynamic equilibrium and analyze the numerical results	Analyze

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

BASICS & STATICS OF PARTICLES

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem. Parallelogram and triangular law of forces - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force.

EQUILIBRIUM OF RIGID BODIES

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimension.

PROPERTIES OF SURFACES AND SOLIDS

Determination of Areas and Volumes - First moment of area the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - second and product moments of plane area - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallelaxis theorem and perpendicular axis theorem - Polar moment of inertia - Principle moments of inertia of plane areas - Mass moment of inertia.

FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS

Frictional force - Laws of Coloumb friction - simple contact friction - Rolling resistance - Belt friction. Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

DYNAMICS OF PARTICLES

Displacement, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion - Newton's law - Work Energy equation of particles - Impulse and Momentum - Impact of elastic bodies.

Text Books

1	Beer & Johnson, Vector Mechanics for Engineers. Vol. I Statics and Vol. II Dynamics, McGraw Hill International Edition, 1995.
2	Kottiswaran N,Engineering Mechanics-Statics & Dynamics,Sri Balaji Publications,2014.
3	Meriam, Engineering Mechanics, Vol. I Statics & Vol. II Dynamics 2/e, Wiley Intl., 1998.

Reference Books

1	Rajasekaran.S, and Sankara Subramanian G, “Engineering Mechanics”, Vikas Publishing Co. New Delhi.
2	Irving H. Sharma, Engineering Mechanics - Statics & Dynamics, III Edition, Prentice Hall of India Pvt. Ltd., 1993.
3	K.L.Kumar, Engineering Mechanics III Edition, Tata McGraw Hill Publishing Co. Ltd., 1998

Course Designers				
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	ENGINEERING GRAPHICS AND DESIGN	Category	L	T	P	Credit
		FC-ES	0	0	6	3

Preamble

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

Prerequisite

NIL

Course Objective

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

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

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

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

PLANE CURVES AND DIMENSIONING

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

PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to anyone 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 referenceplane and perpendicular to the other – Obtaining true shape of section.
Development of lateral surfaces of simple and truncated solids like Prisms, pyramids, cylinders andcones.

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

Principles of isometric View – isometric scale – Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones.

INTRODUCTION TO AUTO CAD

Introduction to Auto CAD- Basic introduction and operational instructions of various commands inAutoCAD. Limit System-Tolerance, Limits, Deviation, Actual Deviation, Upper Deviation, Lower Deviation,Allowance. Preparation of manual parts drawing and assembled sectional views from orthographic part drawings,

Text Books

1	Natarajan K V, "Engineering Graphics", Tata McGraw-Hill Publishing Company Ltd. New Delhi.
2	K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International Private Limited.
3	K.R.Gopalakrishna"Engineering Drawing" (Vol. I & II), Subhas Publications, 2014.
4	Bhatt-N.D.-"Machine Drawing"-Published by R.C.Patel- Chartstar Book Stall- Anand-India- 2003

Reference Books

1	N.D. Bhat and V.M. Panchal, Engineering Graphics, Charotar Publishers 2013
2	E. Finkelstein, "AutoCAD 2007 Bible", Wiley Publishing Inc., 2007
3	R.K. Dhawan, "A text book of Engineering Drawing", S. Chand Publishers, Delhi,2010.
4	DhananjayA.Jolhe, "Engineering Drawing with an Introduction to AutoCAD", Tata McGraw Hill Publishing Company Limited, 2008.
5	G.S. Phull and H.S.Sandhu, "Engineering Graphics", Wiley Publications, 2014.

Course Designers

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DESIGN OF REINFORCED CONCRETE ELEMENTS	Category	L	T	P	Credit
	CC	2	1	0	3

PREAMBLE

The primary concern of an engineer is design. Structural design consists conceptualization, idealization, analysis, design, construction and maintenance. Conceptualization is required to arrive at the final shape and size of the structure. Idealization involves reducing the conceived structure into primary elements. Byanalysis internal forces like bending moments, shear, torsion, compression and tension in each and every element is determined. Design assigns every element a particular material and size. Construction involves putting all the elements together to perform like the originally conceived structure. Maintenance is neededto keep the performance of the structure without deterioration. In this course, designs of structural elements,like beam, walls and columns, made of specific materials like timber, masonry and steel are dealt with.
Further the elements are designed for internal forces like tension, compression, bending moment and shear.

PRE-REQUISITE - STRENGTH OF MATERIALS

COURSE OBJECTIVES

1	To understand the basic concepts of all methods of design.
2	To obtain the knowledge of using Indian standard codes and special publication.
3	To know the design concepts of all the structural members and learn economical design for materialssaving
4	To know the design methodologies by limit state design for the beams, slabs, column and footings
5	To know the design methodologies for retaining walls, water tanks and concrete walls.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Understand the usage of IS codes in design of reinforced concrete structures	Understand
CO:2	Apply the concepts of beams for shear, torsion and serviceability	Analyse & Apply
CO:3	Identify the types and design of slabs.	Analyze
CO:4	Design the uniaxial and biaxial bending of column.	Analyze
CO:5	Design the simple footings and combined footings	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO10	PO 11	PO12	PSO 01	PSO 02	PSO03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

INTRODUCTION TO RCC STRUCTURES AND LIMIT STATE METHOD

Introduction about IS codes - Concept of elastic method ultimate load method and limit state method - advantages of limit state method over other methods - Analysis and design of singly and doubly reinforced rectangular and flanged beams – Plain Cement Concrete Materials.

LIMIT STATE DESIGN OF BEAMS FOR SHEAR, TORSION AND SERVICEABILITY

Limit state design of RC beams for shear and torsion - Design of RC beams for combined bending, shearand torsion – Use of design aids - Design requirement for bond and anchorage as per IS code – Design of Singly Reinforced Beam – Design of Doubly Reinforced Beam - Detailing of reinforcement – Concept of Serviceability – Reinforced Cement Concrete Beam Serviceability requirements for deflection.

LIMIT STATE DESIGN OF RCC SLABS

Behaviour of one way and two way slabs - Design of one way simply supported, cantilever and Continuous slabs - Design of two-way slabs for various edge conditions - Torsion reinforcement at
corners - Design of flat slabs.

LIMIT STATE DESIGN OF RCC COMPRESSION MEMBERS

Types of columns-analysis and design of short columns for axial, uniaxial and bi axial bending due to external load-design of long columns- Design of Slender Column- Detailing of reinforcement - use of design aids

LIMIT STATE DESIGN OF RCC FOUNDATION

Design of footing for masonry and reinforced walls – Types of footing - Design of axially and eccentrically loaded square and rectangular footings – Design of combined rectangular footings for two columns – Design of wall footing - Detailing of reinforcement.

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. Subramanian, N. "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
2. N.Krishna Raju, "Design of Reinforced Concrete Structures (IS: 456-2000)", CBS Publishers & Distributors Pvt Ltd., 2016

REFERENCE BOOKS

1. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice.
2. IS 800: 2007 General Constructions in Steel - Code of Practice.
3. Devadoss Menon and Pillai S., "Reinforced Concrete Design", McGraw Hill Education India Private Limited; 3rd edition 2009.
4. VARGHEESE P C," Limit State Design of Reinforced Concrete", Prentice Hall of India, Private, Limited New Delhi, 2004
5. Dr.B.C. PUNMIA, Er.ASHOK KUMAR JAIN, Dr.ARUN KUMAR JAIN, "Limit State Design of Reinforced concrete (As per IS 456: 2000)" , Laxmi Publications(P)Ltd.
6. Reinforced Cement Concrete Design by Neelam Sharma - S K KATARIA & SONS-NEW DELHI.

Relevant NPTEL Course

Design of Reinforced Concrete Structures by Prof.Nirjhar Dhang, IIT Kharagpur.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Dr.S.P.Sangeetha	Professor	Civil/AVIT	sangeetha@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	CONSTRUCTION MATERIALS AND TECHNIQUES (Theory and Practicals)	Category	L	T	P	Credit
		CC	3	0	2	4

PREAMBLE

The aim of the course is to know about the various construction materials, both conventional and modern, that are commonly used in civil engineering construction. A construction technique focuses more on detailed understanding of concrete making materials and production process. And also know about temporary construction structures like formwork and Scaffolding.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To understand the role of civil engineers and accomplishment in civil engineering profession.
2	To understand the physical and mechanical properties of construction materials and their respective testing procedure.
3	To know the building materials available in market for construction purpose.
4	To learn the principles and methods to be followed in construction of various civil engineering structures.
5	To learn different types of scaffolding and centering in building construction.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Understand the role of civil engineers and accomplishment in civil engineering.	Understand
CO:2	Identify the relevant physical and mechanical properties of construction materials.	Understand
CO:3	Apply the modern construction materials and roofing materials appropriate to theclimate and functional aspects of the buildings.	Understand
CO:4	Decide construction technique to be followed in brick, stone and hollow block masonry, concreting, flooring, roofing, plastering and painting etc.	Understand
CO:5	Identify suitable types of scaffolding and its applications in construction.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	S	L	S	S	-	M	S	L	M	S
CO:3	S	M	M	-	S	S	M	M	S	L	S	S	L	S	M
CO:4	S	M	M	-	M	L	M	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	L	L	M	M	S	-	S	S	L	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

INTRODUCTION TO CIVIL ENGINEERING

Role of Civil Engineers in Society; Outstanding accomplishments of the profession; Future trends. Techno-economic considerations

MATERIALS & ITS PROPERTIES

Physical and Mechanical properties of construction materials - commonly used types of stones - Tests for stones, road aggregates and concrete aggregates, properties of sand, BIS specification for testing of aggregates –Bricks – Properties and testing methods for Bricks, Recycled Aggregates- Cement-Cement – Manufacturing -wet and dry processes, constituents and constitution, properties - Types of cement – Testingof Cement

MODERN CONSTRUCTION MATERIALS & ROOFING MATERIAL

Modern materials – Neoprene, thermocole, decorative panels and laminates, architectural glass andceramics, ferrocement, PVC, polymer base materials, fibre reinforced plastics. Structural Steel and Aluminium – Roofing Material – Physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials - Timber - Types, Seasoning and various products.

CONSTRUCTION COMPONENTS

Principles of construction – Selection of suitable type of masonry – Reinforced brick work – Stone masonry – Hollow block masonry - Pointing and Plastering- its purpose – Damp proof Course (DPC)- Anti-termite measures and treatments-Construction Joints- need and materials used.

SCAFFOLDING

Types of scaffolding and centering-its suitability as per situations and the type of structures.

LIST OF EXPERIMENTS

1. **TEST ON BRICKS**
   - i. Shape and size test of brick.
   - ii. Determination of water absorption of brick
   - iii. Determination of compressive strength of brick.
2. **TEST ON CEMENT**
   - i. Determination of fineness of cement by dry sieving/ by air permeability method.
   - ii. Determination of normal consistency of cement.
   - iii. Determination of initial and final setting time of cement.
   - iv. Determination of specific gravity of cement by using specific gravity bottle. / by using Le- Chatelier Flask.
   - v. Determination of soundness of cement.
3. **TEST ON COARSE AGGREGATE AND FINE AGGREGATE**
   - i. Determination of fineness modulus and grain size distribution of fine aggregate.
   - ii. Determination of fineness modulus and grain size distribution of coarse aggregate.
   - iii. Determination of crushing value of coarse aggregate.
4. **TEST ON STEEL**
   - i. Tensile strength of Steel.

TEXT BOOK (S)

1. Rangwala, (2016), Building construction, Charotar Publishers.
2. M.S.SHETTY, Concrete Technology (Theory and Practice), S.Chand & Company Ltd, 2018.

REFERENCE BOOKS

1. Ken Ward-Harvey (2009) (fourth edition), Fundamental building materials, Universal Publisher.
2. Edward Allen, Joseph Iano (2013) Fundamentals of Building Construction; Materials and Methods, Willey Publications.
3. Rangwala, (2015), Engineering materials, Charotar Publishers.
4. Edward Allen, Joseph Iano (2014) (Sixth Edition), Fundamental building materials, John Wiley & sons inc (Publisher).

Relevant NPTEL Course

Building materials and Construction, Dr. B. Bhattacharjee, IIT Delhi

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Dr.S.P.Sangeetha	Professor	Civil/AVIT	sangeetha@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	STRENGTH OF MATERIALS	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

The mechanics of deformable solids is more concerned with the internal forces and associated changes in the geometry of the components involved of particular importance are the properties of the materials used, the strength of which will determine whether the components fail by breaking in service, and the stiffness of which will determine whether the amount of deformation they suffer is acceptable. Therefore, the subject of mechanics of materials or strength of materials is central to the whole activity of engineering design. Usually the objectives in analysis here will be the determination of the stresses, strains, and deflections produced by loads. Theoretical analyses and experimental results have equal roles in this field.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To provide the basic concepts and principles of strength of materials.
2	To give an ability to calculate stresses and deformations of objects under external loadings.
3	To give an ability to apply the knowledge of strength of materials on engineering applications and design problems.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Understand the fundamental concepts of stress and strain	Understand
CO:2	Evaluate the problems relating to pure and uniform bending of beams and other simple structures. Examine the deflection of beams under various loading condition.	Apply
CO:3	Understand the concept of hoop and radial stress in design of thin and thick cylinders. Solve torsional deformation of Shafts	Understand and Apply
CO:4	Understand the concept of crushing and buckling of columns	Understand and Apply
CO:5	Apply the Energy methods in the structural elements to solve the stress/strain values	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

SIMPLE STRESSES AND STRAINS

Stress - Strain-types of stresses and strain - Hooke's law - tension -compression and shear – stress - strain diagrams - relation between elastic constants - Hoop stress - composite bars in tension and compression - Principle of superposition - bars of varying sections and of different materials - Thermal stresses and strains - principal stresses and strains - Mohr's circle. Theory of failures.

SHEAR FORCE, BENDING MOMENT AND DEFLECTION OF BEAMS

Beams and Bending - Types of loads, supports - Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, uniformly distributed load, uniformly varying load - Point of Contra flexure - Theory of Simple bending - Distribution of bending stresses and shear stress. Slope and deflection of beams - Macaulay's method - Moment area method - Conjugate beam method.

THIN AND THICK SHELLS AND TORSION IN CIRCULAR SHAFT

Introduction - Thin Cylindrical shells - hoop stress - longitudinal stresses - Lame's theory – Design of thin & thick cylindrical shells.

Torsion - Torsion equation - solid and hollow circular shaft - Torsional rigidity - power transmitted by the shafts

THEORY OF COLUMNS

Theory of columns - Long column and short column - Euler's formula - Rankine's formula - Secant formula - Beam column

INTRODUCTION TO DETERMINATE AND INDETERMINATE STRUCTURES

Castigliano's I theorem - unit load method - Maxwell-Betti theorem

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. R Subramanian, Strength of Materials, Oxford University Press, 2010.

REFERENCE BOOKS

1. Gere, J.M. and Goodno, B. J., "Strength of Materials", Indian Edition (4th reprint), Cengage Learning India Private Ltd., 2009.
2. 2. Beer, F.P., Johuston, Jr., E.R., Dewolf, J.T. and Mazureu, D.E., "Mechanics of Materials", Fifth Edition, McGraw Hill, 2009.
3. Timoshenko, S. P. and Young, D. H., "Elements of Strength of Materials", Fifth Edition, (In MKS Units), East-West Press Pvt. Ltd., 2009.
4. Bansal R. K, "Strength of Materials", Laxmi Publications, 2010.

Relevant NPTEL Course

Strength of Materials, IIT Roorkee, Dr. Satish C Sharma

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr.R.Divahar	Associate Professor	Civil/AVIT	Divahar.civil@avit.ac.in

	FLUIDS MECHANICS AND HYDRAULIC ENGINEERING	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

Fluid Mechanics and Hydraulic Engineering is a subject of engineering science deals with the behaviour of fluids at rest as well as in motion. It is an important subject with unlimited practical applications ranging from biological system systems to automobiles, airplanes and spacecraft propulsion. Thus this subject is given considerable importance in Civil, Mechanical and Chemical Engineering at core as well as at professional levels.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To apply hydrostatic law, principle of mass and momentum in fluid flows, concepts in Euler's and Bernoulli equations.
2	To provide fundamental knowledge of fluids, its properties and behaviour under various conditions of internal and external flows.
3	To determine the losses in a flow system, flow through pipes, boundary layer concepts.
4	To motivate the students to identify, formulate, solve the complex problem to manage the hydraulic related issues.
5	To prepare the students to synthesize data and technical concepts to apply in water resources engineering.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	The student is introduced to the definition and properties of fluid.	Understand
CO:2	Principles of fluid statics, kinematics and dynamics are dealt with subsequently.	Apply
CO:3	The application of similitude and model study is covered subsequently and Application to real situations of fluid flow will be learned	Apply
CO:4	Explain the various types of open channels and Uniform Flow And Varied Flow	Understand
CO:5	Describe the Dimensional Analysis and Model Analysis in hydraulic engineering problems.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	-	M	S	-	M	S	-	S	S	M	S	L
CO:2	S	M	S	S	S	M	L	M	S	-	M	S	S	M	S
CO:3	M	M	M	-	S	S	-	M	S	L	S	S	L	S	M
CO:4	S	M	M	-	M	S	-	M	S	-	M	S	S	M	S
CO:5	S	M	M	-	M	S	-	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

FLUID PROPERTIES AND STATISTICS

Definitions - Fluid and Fluid Mechanics - Dimensions and units - Fluid properties - Continuum - Concept of system and control volume - Pascal's law and Hydrostatic equation - Forces on plane and curved surfaces - Buoyancy - Pressure measurement.

FLUID KINEMATICS AND FLUID DYNAMICS

Classification of flows -stream, streak and path lines - Continuity equation - Stream and potential functions - Flow nets - Velocity measurement - Euler and Bernoulli's equations - Application of Bernoulli's equation - Discharge measurement- Momentum Principle - Laminar flows through pipes and between plates - Hagen Poiseuille equation - Darcy Weisbach formula - Moody diagram -Turbulent flow

BOUNDARY LAYER AND FLOW THROUGH PIPES

Definition of boundary layer - Thickness and classification - Displacement and momentum thick nesses - Development of Laminar and Turbulent flows in circular pipes - - Major and minor losses of flow in pipes - Pipes in series and in parallel - Pipe network

OPEN CHANNEL FLOW, UNIFORM FLOW AND VARIED FLOW

Open channel flow - types and regime of flow - Velocity distribution in open channel - wide open channel - specific energy - critical flow and its computation -Uniform flow - Velocity measurement - Manning's and Chezy's formula - determination of roughness coefficients - determination of normal depth and velocity - most economical sections - minimum permissible velocity determination - non-erodible channels - Dynamic equation of gradually varied flow - assumptions - characteristics of flow profiles - drawdown and backwater curves - profile determination - graphical integration, direct step, standard step method-hydraulic jump - types - energy dissipation - surges - surge through channel transitions

TURBINES AND PUMPS

Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels - indicator diagram and its variation - savings in work done - rotary pumps.

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. R.K.Bansal,"Fluid Mechanics and Hydraulic Machines",Laxmi Publications,2005 \
2. Jain A.K., " Fluid Mechanics (including Hydraulic Machines) ", Khanna Publishers, 8th edition, 1995.

REFERENCE BOOKS

1. Kumar K.L., "Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd., New Delhi, 2008
2. Streeter, Victor L. and Wylie, Benjamin E., " Fluid Mechanics ", McGraw-Hill Ltd., 1998.
3. Natarajan M.K., "Principles of Fluids Mechanics ", Anuradha Agencies, Vidayal Karuppur, Kumbakonam, 1995.
4. Subramanya K., " Flow in Open channels ", Tata McGraw Hill Publishing Company, 2001.
5. Ramamirtham S., "Fluid Mechanics, Hydraulics and Fluid Mechines ", Dhanpat Rai & Sons, Delhi, 1998

COURSE DESIGNERS

Relevant NPTEL Course

Hydraulic Engineering, IIT Kharagpur, Prof. Mohammad Saud Afzal

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr.R.Divahar	Associate Professor	Civil/AVIT	Divahar.civil@avit.ac.in

	ENGINEERING SURVEYING (Theory and Practicals)	Category	L	T	P	Credit
		CC	2	1	4	5

PREAMBLE

Surveying is the process of determining by measurement, the relative positions of points on or near the earth surface. The data collected from a survey is used in the preparation of plans, maps, profiles, charts and diagrams. In addition survey may be used for the delineation of property boundaries, computation of areas and volumes also to set out the proposed work on the ground.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
2	To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
3	To introduce the concepts of Control Surveying
4	To introduce the basics of Astronomical Surveying
5	Understand the importance of advanced techniques involved in surveying such as Total station and GPS

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	The use of various surveying instruments and mapping	Understand
CO:2	Measuring Horizontal angle and vertical angle using different instruments	Understand
CO:3	Methods of Leveling and setting Levels with different instruments.	Apply
CO:4	Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth	Apply
CO:5	Concept and principle of modern surveying	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	L	M	S	-	M	S	-	S	S	M	S	L
CO:2	S	M	S	L	S	M	L	M	S	-	M	S	S	s	S
CO:3	M	M	M	L	S	S	-	M	S	-	S	S	L	S	M
CO:4	S	M	M	L	M	S	L	M	S	-	M	S	S	M	S
CO:5	S	M	M	L	M	S	-	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

FUNDAMENTALS OF CONVENTIONAL SURVEYING AND LEVELLING

Classifications and basic principles of surveying – Equipment and accessories for ranging and chaining – Methods of ranging – Compass – Types of Compass – Basic Principles- Bearing – Types – True Bearing – Magnetic Bearing – Levelling- Principles and theory of Levelling – Datum- – Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction – Sources of errors in Levelling – Curvature and refraction

THEODOLITE AND TACHEOMETRIC SURVEYING

Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometer – Stadia Constants – Analytic Lens -Tangential and Stadia Tacheometry surveying – Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring – Contour gradient – Uses of contour plan and map

COMPASS SURVEYING AND PLANE TABLE SURVEYING

Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction – Magnetic declination - Dip - Traversing - Plotting - adjustment of error - Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing.

ADVANCED TOPICS IN SURVEYING

Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying – Field observations and determination of Azimuth by altitude and hour angle methods –.Astronomical terms and definitions - Motion of sun and stars – Celestial coordinate systems - different time systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of time, longitude, latitude and azimuth by altitude and hour angle method

MODERN SURVEYING:

Total Station : Advantages - Fundamental quantities measured - Parts and accessories – working principle - On board calculations - Field procedure - Errors and Good practices in using Total Station GPS Surveying : Different segments - space, control and user segments – satellite on figuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - Hand Held and Geodetic receivers – data processing - Traversing and triangulation.

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

LIST OF EXPERIMENTS

1. Finding Pace Value of Surveyor using Chaining and Ranging
2. Computation of Included Angle after adjustment of Local Attraction
3. Planimetric Mapping of an Area using Plane Table Surveying (Radiation, Intersection)
4. Fly leveling using dumpy level and tilting level.
5. Transfer of Bench Mark using Check Levelling.
6. Contour Mapping using Grid Levelling.
7. Study of Theodolite and Angle Observations by Repetition.
8. Observation of Angles by method of Reiteration and Station Adjustment.
9. Establishment of Horizontal Control Points by Traversing.
10. Area calculating by Total Station

TEXT BOOK (S)

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008
2. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2005
3. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.

REFERENCE BOOKS

1. Alfred Leick, “GPS satellite surveying”, John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, “GPS Theory , Algorithms and Applications”, Springer – Berlin, 2003.
3. SatheeshGopi, rasathishkumar, N. madhu, “Advanced Surveying, Total Station GPS and Remote Sensing” Pearson education, 2007

Relevant NPTEL Course

Surveying, IIT Kanpur, Dr. Bharat Lohani
Digital Land Surveying And Mapping (DLS&M), IIT Roorkee, Prof. J. K. Ghosh

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	E-Mail ID
1	Mr.C.Kathirvel	Associate Professor & Head	Civil / VMKVEC	kathirvel@vmkvec.edu.in
2	Dr.P.S Aravindraj	Associate Professor	Civil/AVIT	Aravindraj.civil@avit.ac.in

	ENVIRONMENTAL ENGINEERING AND DESIGN (Theory and Practicals)	Category	L	T	P	Credit
		PC-CC	2	1	2	4

PREAMBLE

This course work aims at imparting the knowledge on various stages of works involved in planning, designing and execution of protected water supply system to a town / city. Starting from demand estimation, identification of sources, studying the quality aspects of water at these sources, evolving a suitable treatment method to bring the quality to the permissible standards and finally, distribution of this treated water to the individual dwelling units are well addressed.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	The student is expected to know about the design principles involved in treatment of municipal water
2	The student will study about the Design principles of water treatment
3	At the end of the semester, the student shall conceive, design and draw the environmental engineering structures in detail showing the plan, elevation and Sections.
4	The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.
5	An ability to estimate sewage generation and design sewer system including sewage pumping stations

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	an understanding of water quality criteria and standards, and their relation to public health	Understand
CO:2	An ability to perform basic design of the unit operations and processes that are used in sewage treatment	Understand
CO:3	an ability to design the various functional units in water treatment	Apply
CO:4	the knowledge in various unit operations and processes in water treatment	Apply
CO:5	The students after completing this course will be able to design and draw various units of Municipal water treatment plants and sewage treatment plants.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	L	M	S	S	M	L	-	S	S	M	S	L
CO:2	M	M	S	L	S	M	S	M	L	-	M	S	S	M	S
CO:3	M	M	M	M	S	S	S	M	L	-	S	S	L	S	M
CO:4	M	M	M	L	M	S	S	M	S	-	M	S	S	M	S
CO:5	M	M	M	L	M	S	S	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

PLANNING FOR WATER SUPPLY AND CONVEYANCE SYSTEM

Design Period – Population Forecasting – Water Demand – Sources of Water – Source Selection – Water Quality- Intake Structures -– Pumps – Design of pumping mains.

DESIGN PRINCIPLES OF WATER TREATMENT

Objectives – Selection of unit operations and processes – Principles of coagulation and flocculation, sedimentation, filtration, disinfection – Design principles of flash mixer, flocculator, clarifiers, filters –

Disinfection devices – Softening – Demineralisation – Aeration – Iron removal – Defluoridation – Operation and Maintenance aspects - Residue Management

SEWERAGE SYSTEM: COLLECTION & TRANSMISSION

Sources of wastewater – Quantity of sanitary sewage – Estimation of storm runoff – Wastewater characteristics and significance – Effluent disposal standards – Design of sewers – Computer applications – Laying, jointing and testing of sewers – Sewer appurtenances – Pump selection – Drainage in buildings – Sanitary fixture and fittings – Systems of Sanitary plumbing – House Drainage – House Sewer connection.

WATER SUPPLY AND TREATMENT

Design and Drawing of flash mixer, flocculator, clarifier – Rapid sand filter – Service reservoirs – Pumping station – House service connection for water supply and drainage.

SEWAGE TREATMENT & DISPOSAL

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank – Trickling filter – Sludge digester – Sludge drying beds – Septic tanks and disposal arrangements.

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

LIST OF EXPERIMENTS

1. ANALYSIS OF WATER SAMPLE

i. Sampling and preservation methods for water and wastewater (Demonstration only)
ii. Measurement of Electrical conductivity and turbidity
iii. Determination of fluoride in water by spectrophotometric method /ISE
iv. Determination of iron in water (Demo)
v. Determination of Sulphate in water
vi. Determination of available Chlorine in Bleaching powder and residual chlorine in water

2. ANALYSIS OF WASTEWATER SAMPLE

i. Estimation of suspended, volatile and fixed solids
ii. Determination of Sludge Volume Index in waste water
iii. Determination of Dissolved Oxygen
iv. Estimation of B.O.D and C.O.D.
v. Determination of Ammonia Nitrogen in wastewater
vi. Determination of coliform (Demonstration only)

TEXT BOOK (S)

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
3. Punmia, B.C., Jain, A.K., and Jain.A.K.., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

REFERENCE BOOKS

1. Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGraw-HillBook Co., New Delhi, 1995.
2. Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill,New Delhi, 2010.

Relevant NPTEL Course

Environmental Engineering, IIT Roorkee, Dr. V. C. Srivastava
Water and Waste Water Engineering, IIT Madras, Prof. C. Venkobachar, Prof. Ligy Philip, Prof. B.S. Murty

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	E-Mail ID
1	Mr.C.Kathirvel	Associate Professor & Head	Civil / VMKVEC	kathirvel@vmkvec.edu.in
2	Dr.P.S Aravindraj	Associate Professor	Civil/AVIT	Aravindraj.civil@avit.ac.in

	DESIGN OF REINFORCED CONCRETE STRUCTURES	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

The primary concern of an engineer is design. Structural design consists conceptualization, idealization, analysis, design, construction and maintenance. Conceptualization is required to arrive at the final shape and size of the structure. Idealization involves reducing the conceived structure into primary elements. By analysis internal forces like bending moments, shear, torsion, compression and tension in each and every element is determined. Design assigns every element a particular material and size. Construction involves putting all the elements together to perform like the originally conceived structure. Maintenance is needed to keep the performance of the structure without deterioration. In this course, designs of structural elements, like beam, walls and columns, made of specific materials like timber, masonry and steel are dealt with. Further the elements are designed for internal forces like tension, compression, bending moment and shear.

PRE-REQUISITE – DESIGN OF REINFORCED CONCRETE ELEMENTS

COURSE OBJECTIVES

1	To understand the basic concepts of all methods of design.
2	To obtain the knowledge of using Indian standard codes and special publication.
3	To know the design concepts of all the structural members and learn economical design for materials saving
4	To know the design methodologies by limit state design for the beams, slabs, column and footings
5	To know the design methodologies for retaining walls, water tanks and concrete walls.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Apply the usage of IS codes in design of reinforced concrete structures	Understand
CO:2	Identify the types and design of slabs and staircase	Apply
CO:3	Design the uniaxial and biaxial bending of column.	Apply
CO:4	Design the simple footings and combined footings	Apply
CO:5	Develop skills in design of important concrete members.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

DESIGN OF RETAINING WALLS

Retaining wall – Types of Retaining walls – Study of Gravity Retaining wall - Design of cantilever and counter fort retaining walls

DESIGN OF WATER TANKS

Introduction – Joints in water tank – Design of Circular Tanks resting on the Ground – Design of Rectangular water tank – Study of Underground water tank and Overhead water tank.

DESIGN OF STAIRCASES AND RCC WALLS

Types of staircases - Design of dog-legged staircase – Study of Reinforced concrete walls

INTRODUCTION ABOUT PRESTRESSED CONCRETE DESIGN

Concept of Prestressing - Types of Prestressing - Advantages - Limitations -Prestressing systems - Anchoring devices - Materials - Mechanical Properties of high strength concrete - high strength steel - Stress-Strain curve for High strength concrete.

ADVANCED TOPICS

Introduction to computer aided RCC design – Study of Modeling, Analysis and designing software's like STAAD Pro, ETABS and Etc… - Study about Design of deep beams - Principles of design of road bridges for IRC loading

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. Subramanian, N. "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
2. N.Krishna Raju, "Design of Reinforced Concrete Structures (IS: 456-2000)", CBS Publishers & Distributors Pvt Ltd.

REFERENCE BOOKS

1. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice.
2. IS 800: 2007 General Constructions in Steel - Code of Practice.
3. Devadoss Menon and Pillai S., "Reinforced Concrete Design", McGraw Hill Education India Private Limited; 3rd edition 2009.
4. VARGHEESE P C," Limit State Design of Reinforced Concrete", Prentice Hall of India, Private, Limited New Delhi, 2004
5. Dr.B.C. PUNMIA, Er.ASHOK KUMAR JAIN, Dr.ARUN KUMAR JAIN, "Limit State Design of Reinforced concrete (As per IS 456: 2000)" , Laxmi Publications(P)Ltd.
6. Reinforced Cement Concrete Design by Neelam Sharma - S K KATARIA & SONS-NEW DELHI.

Relevant NPTEL Course

Design of Reinforced Concrete Structures, IIT Kharagpur, Prof. N. Dhang

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr. D.S Vijayan	Assistant Professor II	Civil/AVIT	Vijayan.has.siva@gmail.com

	STRUCTURAL ANALYSIS	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

This course offers the various methods of analysis for indeterminate beams and portal frames. It aims at determination of end moments and constructing shear force and bending moment diagrams for the beams and frames. Also, ILD for indeterminate beams will be dealt with.

PRE-REQUISITE - STRENGTH OF MATERIALS

COURSE OBJECTIVES

1	The basics of a structure subjected to internal forces like axial forces, shearing forces, bending and torsional moments while transferring the loads acting on it will be taught
2	Analyzing the internal forces in the members of the structures.
3	To calculate deflection using slope deflection and moment distribution method
4	To analysis different types of arches
5	At the end of this course students will be conversant with classical method of analysis

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Calculate the Deflection of Determinate Structures	Apply
CO:2	Analyse beams by Slope Deflection Method	Analyze
CO:3	Analyse beams by Moment Distribution Method	Analyze
CO:4	Draw influence line for Moving Loads and Influence Lines (Determinate & Indeterminate Structures)	Apply
CO:5	Analyse three hinged, two hinged and fixed arches	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

DEFLECTION OF DETERMINATE STRUCTURES

Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Willot diagram - Mohr's correction

SLOPE DEFLECTION METHOD

Continuous beams and rigid frames (with and without sway) – Simplification for hinged end – Support displacements.

MOMENT DISTRIBUTION METHOD

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway.

MOVING LOADS AND INFLUENCE LINES

Influence lines for reactions in statically determinate structures – influence lines for members forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections.Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames

ARCHES

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2003.

REFERENCE BOOKS

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004
2. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.
3. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008
4. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.

Relevant NPTEL Course

Structural analysis I, IIT Kharagpur, Prof. Amit Shaw

Structural Analysis II, IIT Bombay, Dr. P. Banerji

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr. D.S Vijayan	Assistant Professor II	Civil/AVIT	Vijayan.has.siva@gmail.com

	MODERN METHODS OF STRUCTURAL ANALYSIS	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

This course offers the various methods of analysis for indeterminate beams and portal frames. It aims to learn advanced methods like matrix methods of structural analysis of structures, plastic theory, analysis of special structures like arches and suspension cables and influence line for indeterminate structures.

PRE-REQUISITE - STRUCTURAL ANALYSIS

COURSE OBJECTIVES

1	This course is in continuation of Structural Analysis I. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered
2	Advanced topics such as FE method and Space Structures are covered
3	Advanced method of analysis like finite element and matrix will be taught
4	After completion of the course the student will be able to Differentiate between various structural forms such as beams, plane truss, space truss, plane frame, space frame, arches, cables, plates and shells
5	The student studies to calculate the degree of static and kinematic indeterminacy of a given structure such as beams, truss and frames

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Analyse beams and frames by moment distribution method	Analyze
CO:2	Analyse beams by matrix stiffness and flexibility methods	Analyze
CO:3	Analyse continuous beams using theorem of three moments	Analyze
CO:4	Plastic analysis of indeterminate beams and frames	AAnalyze
CO:5	Analysis of Space trusses using method of tension coefficients	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

FLEXIBILITY METHOD FOR INDETERMINATE FRAMES

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

MATRIX STIFFNESS METHOD

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames

FINITE ELEMENT METHOD

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element.

PLASTIC ANALYSIS OF STRUCTURES

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

SPACE AND CABLE STRUCTURES

Analysis of Space trusses using method of tension coefficients – Suspension bridges- cables with two and three hinged stiffening girders

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2003.

REFERENCE BOOKS

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004
2. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.
3. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008
4. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.

Relevant NPTEL Course

Matrix Method of Structural Analysis, IIT Kharagpur, Prof. Amit Shaw, Prof. Biswanath Banjerjee

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Mrs.P.Subathra	Assistant Professor II	Civil/AVIT	Subathra@avit.ac.in

	GEOTECHNICAL ENGINEERING (Theory and Practicals)	Category	L	T	P	Credit
		CC	2	1	4	5

PREAMBLE

This course is a branch of Civil Engineering which deals with the application of law of Mechanics and Hydraulics to Engineering problems related with soils like Permeability, stresses within soils, Shear strength and compressibility of soils. These form the basis for the computation of discharge through earthen dams, shear strength parameters required for determining the bearing capacity of soils and calculating settlement of structures.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To impart the fundamental concepts of soil mechanics and understand the bearing capacity
2	To understand the concept of compaction and consolidation of soils
3	To understand the design aspects of foundation
4	To evaluate the stress developed in the soil medium
5	To study the stability of slopes

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Compare the various engineering and index properties of soil.	Understand
CO:2	Explain the hydraulic conductivity of the soil and seepage actions.	Understand
CO:3	Discuss the soil investigation techniques for advanced explorations and to conduct the field test like SPT & PLT.	Apply
CO:4	Evaluate the safe bearing capacity of shallow foundations	Apply
CO:5	Estimate load carrying capacity of pile foundations and to compute the lateral earth pressure.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	L	M	S	S	M	L	-	S	S	M	S	L
CO:2	M	M	S	L	S	M	S	M	L	-	M	S	S	M	S
CO:3	M	M	M	M	S	S	S	M	L	-	S	S	L	S	M
CO:4	M	M	M	L	M	S	S	M	S	-	M	S	S	M	S
CO:5	M	M	M	L	M	S	S	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

SOIL PROPERTIES AND COMPACTION

Basic definitions; Phase relations; Index properties; Grain size distribution & Index properties; Soil Classification (IS) Compaction, Laboratory compaction tests & Factors affecting compaction.

STRESS PRINCIPLE, PERMEABILITY, DISTRIBUTION AND CONSOLIDATION

Principle of effective stress; Capillarity; Seepage force and quicksand condition One-dimensional flow; Darcy's law; Laboratory methods for permeability determination.

Boussinesq stress distribution theory and Newmarks chart Compressibility of soils, e-p data and stress history; Normally consolidated and over-consolidated soils; Terzaghi's theory of one-dimensional consolidation; Time-rate of consolidation; Evaluation of compressibility and consolidation parameters.

SHEAR STRENGTH BEHAVIOUR AND SOIL EXPLORATION

Mohr's stress circle; Mohr-Coulomb failure criterion; Laboratory tests for shear strength determination; Effective and total stress shear strength parameters; Shear strength characteristics of clays and sands.

Objective of site investigation– Detailed site investigation – Methods of exploration – Depth of exploration – Factors governing location and depth of foundation – Types of Foundations – Selection of Foundation. Preparation of soil investigation report

BEARING CAPACITY AND SETTLEMENTS OF SHALLOW FOUNDATIONS

Terzaghi's theory of bearing capacity – General and local shear failure - Effect of Water table – Plate load test – Standard Penetration Test – Design of Footings – Settlement of footings - Immediate and Time dependent settlement – Permissible limits of total and differential Settlement.

PILE FOUNDATIONS AND SLOPE STABILITY

Classification and selection of piles – Static and dynamic formulae for single pile capacity – Efficiency and capacity of pile groups – Design of Pile group – Settlement of Pile Groups– Load test on piles
Failure of infinite and finite slopes – Swedish circle method – Factor of safety - Slope stability of earth dams. Definitions – Earth pressure at rest – Rankin's active and passive earth pressures - Coulomb's earth pressure theories – Types of retaining walls

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

LIST OF EXPERIMENTS

1. **DETERMINATION OF INDEX PROPERTIES**
   i. Specific gravity of soil solids
   ii. Grain size distribution – Sieve analysis
   iii. Grain size distribution - Hydrometer analysis
   iv. Liquid limit and Plastic limit tests
   v. Shrinkage limit and Differential free swell tests
2. **DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS**
   i. Field density Test (Sand replacement method)
   ii. Determination of moisture – density relationship using standard proctor compaction test**.**
3. **DETERMINATION OF ENGINEERING PROPERTIES.**
   i. Permeability determination (constant head and falling head methods)
   ii. One dimensional consolidation test (Determination of co-efficient of consolidation only)
   iii. Direct shear test in cohesionless soil
   iv. Unconfined compression test in cohesive soil
   v. Laboratory vane shear test in cohesive soil
   vi. Tri-axial compression test in cohesionless soil (Demonstration only)
   vii. California Bearing Ratio Test

TEXT BOOK (S)

1. K. R. Arora, "Soil mechanics and Foundation Engineering" Std. Publishers, New Delhi, 2011.

REFERENCE BOOKS

1. Braja M. Das, "Principles of Geotechnical Engineering", Cengage learning Pvt. Ltd., 8th Edition, 2014.
2. Holtz D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall. 2nd Edition 2011.

Relevant NPTEL Course

Geotechnical Engineering - 1, IIT Bombay, Prof. Devendra Narain Singh

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Mrs.P.Subathra	Assistant Professor II	Civil/AVIT	Subathra@avit.ac.in

	DESIGN OF STEEL STRUCTURES	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

The primary concern of an engineer is design. Structural design consists conceptualization, idealization, analysis, design, construction and maintenance. Conceptualization is required to arrive at the final shape and size of the structure. Idealization involves reducing the conceived structure into primary elements. By analysis internal forces like bending moments, shear, torsion, compression and tension in each and every element is determined.

PRE-REQUISITE – STRENGTH OF MATERIALS

COURSE OBJECTIVES

1	The student is expected to know about the design principles involved in treatment of municipal water
2	The student will study about the Design principles of water treatment
3	At the end of the semester, the student shall conceive, design and draw the environmental engineering structures in detail showing the plan, elevation and Sections.
4	The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.
5	An ability to estimate sewage generation and design sewer system including sewage pumping stations

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Understand the concepts of various design philosophies	Understand
CO:2	Design common bolted and welded connections for steel structures	Understand
CO:3	Design tension members and understand the effect of shear lag.	Apply
CO:4	Understand the design concept of axially loaded columns and column base connections.	Apply
CO:5	Understand specific problems related to the design of laterally restrained and unrestrained steel beams.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	S	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

INTRODUCTION

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints

TENSION MEMBERS

Tension Members - Types of Tension members and sections –Behaviour of Tension Members modes of failure-Slenderness ratio- Net area – Net effective sections for Plates ,Angles and Tee in tension – Concepts of Shear Lag- Design of plate and angle tension members-design of built up tension Members-Connections in tension members – Use of lug angles – Design of tension splice.

COMPRESSION MEMBERS

Types of compression members and sections–Behaviour and types of failures-Short and slender columns-Current code provisions for compression members- Effective Length, Slenderness ratio – Column formula and column curves- Design of single section and compound Angles-Axially Loaded solid section Columns-Design of Built up Laced and Battened type columns – Design of column bases – Plate and Gusseted bases for Axially loaded colums- Splices for colums.

BEAMS

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders - Intermediate and bearing stiffeners – Flange and web splices

DESIGN OF FLEXURAL MEMBERS

Types of steel Beam sections- Behaviour of Beams in flexure- Codal Provisions – Classification of cross sections- Flexural Strength and Lateral stability of Beams –Shear Strength-Web Buckling, Crippling and defection of Beams- Design of laterally supported Beams- Design of solid rolled section Beams- Design of Plated beams with cover plates - Design Strength of Laterally unsupported Beams – Design of laterally unsupported rolled section Beams- Purlin in Roof Trusses-Design of Channel and I section Purlins.

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

TEXTBOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

REFERENCE BOOKS

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
2. Sai Ram. K.S. “Design of Steel Structures “ Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2nd Edition, 2015, www.pearsoned.co.in/kssairam
3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013
4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800– 2007, IK International Publishing House Pvt. Ltd., 2009
5. IS800 :2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
6. SP 6(1) Hand book on structural Steel Sections

Relevant NPTEL Course

Design of steel structures, IIT Kharagpur, Prof. Damodar Maity

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	E-Mail ID
1	Mr.C.Kathirvel	Associate Professor & Head	Civil / VMKVEC	kathirvel@vmkvec.edu.in
2	Mrs.Pa Suriya	Assistant Professor I	Civil/AVIT	pasuriya1@gmail.com

	TRANSPORTATION ENGINEERING	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

The course aims to make the students learn the principles of highways, their components and design of flexible and rigid pavements. Further, students will get acquainted with treatment for Failures and remedial measures during maintenance of pavements.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To expose the students with various transportation modes and their advantages and disadvantages
2	To facilitate students to decide highway alignment and design highway geometry.
3	To enable students to select suitable materials for highway pavements and design the pavement.
4	To explain students with various components of a railway track.
5	To teach students to identify the alignment and length of airport runway and draw an airport layout.
6	To illustrate students with various components of a harbour.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Classify basic design of highway geometry according to the design specifications	Understand
CO:2	Design a flexible pavement using IRC method.	Apply
CO:3	Describe various components of railways and their functions.	Apply
CO:4	Classify various components of an airport and identify the alignment and the required length of a runway.	Apply
CO:5	Identify various components of a harbour and their functions.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	-	M	S	-	M	S	-	S	S	M	S	M
CO:2	S	M	M	-	S	S	S	M	S	-	M	S	S	M	S
CO:3	S	M	M	-	S	S	S	M	S	-	S	S	L	S	M
CO:4	S	M	M	-	M	S	S	M	S	-	M	S	S	M	S
CO:5	S	M	M	-	M	S	-	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

HIGHWAY ENGINEERING

Introduction to Transportation Systems, Classification of Roads, Highway Planning - Road cross section - camber, gradient, Super elevation - Sight distance - Horizontal and Vertical curve.

HIGHWAY MATERIALS AND PAVEMENT DESIGN

Highway materials – soil, aggregate, bitumen – testing and specifications - types of pavements – pavement design - pavement construction and maintenance.

RAILWAY ENGINEERING AND GEOMETRIC DESIGN

History and general features of Indian railways – Permanent way - Rails, sleepers, ballast and subgrade – types and functions - Geometric design of railway track - Curves and super elevation - Points and crossings –Railway stations and yards - Signaling and interlocking.

AIRPORT ENGINEERING AND GEOMETRIC DESIGN OF RUNWAY

Air transportation in India - Airport classifications - Airport site selection. - Runway configurations – wind rose and orientation of runway - runway length- Corrections to runway length - runway geometric design – taxiway, exit taxiway, aprons, hangars – aircraft parking configuration and parking system - Landing and Visual aids

HARBOUR ENGINEERING

Water transportation – Harbours and ports - Classification – Features of harbour – Breakwaters – Docks – Wet and dry docks – Jetties.

TEXT BOOK (S)

1. Highway Engineering by S.K. Khanna, C.E.G. Justo, A. Veeraragavan, 10th edition, published by Nemchand and Bro., Roorkee, (2014)
2. Railway Engineering by Rangwala, 25th edition, Charotar publishing house private limited,Anand, India, (2015)
3. Harbour, Dock & Tunnel Engineering- R. Srinivasan; Charotar Publishers, Ahmedabad,2011 Airport Planning and Design- S. K. Khanna, M. G. Arora & S. S. Jain; Nem Chand & Bros, 2012

REFERENCE BOOKS

1. Planning & Design of Airports – Robert Horonjeff, Francis McKelvey; Tata Mc Grawhill, 2010.
2. Dock & Harbour Engineering- H. P. Oza & G. H. Oza; Charotar Publishers, Ahmedabad, 2013.
3. Railway Engineering 2nd Edition - Satish Chandra & M. M. Agarwal; Oxford University Press-New Delhi, 2013.

Relevant NPTEL Course

Introduction to Transportation Engineering, IIT Kharagpur, Dr. K.S. Reddy, Dr. Bhargab Maitra

COURSE DESIGNERS

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1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in
2	Mrs.Pa Suriya	Assistant Professor II	Civil/AVIT	pasuriya1@gmail.com

	ESTIMATION COSTING AND VALUATION	Category	L	T	P	Credit
		CC	2	1	0	3

PREAMBLE

This course helps to understand estimating of quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To understand the types of estimates
2	To identify the methods used for different structural components
3	To understand road estimate.
4	To understand rate analysis and process of preparation of bills.
5	To impart knowledge in tender practices, contract procedures, valuation of Civil Engineering works.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Understand the methods of estimates of buildings and Develop the specification for the materials used in construction.	Understand
CO:2	Acquire the knowledge of prepare a detailed estimate for different types of structures.	Apply
CO:3	Acquire the knowledge of prepare a Road estimation and cost analysis for roads.	Apply
CO:4	Acquire the knowledge to calculate rate analysis and man-hours required for the common civil works	Apply
CO:5	Identify the valuation for building and land, calculation of rent, mortgage and lease and Acquire the knowledge of construction contracts and contract document preparation.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	-	M	S	-	M	S	-	S	S	M	S	M
CO:2	S	M	M	-	S	S	-	M	S	-	M	S	S	M	S
CO:3	S	M	M	-	S	S	-	M	S	-	S	S	L	S	M
CO:4	S	M	M	-	M	S	-	M	S	-	M	S	S	M	S
CO:5	S	M	M	-	M	S	-	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

INTRODUCTION, METHODS OF ESTIMATES AND SPECIFICATIONS

General items of work in building – standard units –principles of working out quantities for detailed and abstract estimates –methods of estimates of buildings. Bills of Quantity (BOQ) - Specifications – Detailed and general specifications
– Constructions – Sources – Types of specifications

QUANTITY ESTIMATION FOR BUILDING AND STRUCTURAL STEEL

Estimation of building - Short wall and long wall method - Centre line method - Report writing. Estimate of R.C.C and structural Steel - Scheduling - Slab - beam-column. Bar Bending Schedule (BBS). Cost Estimates using Computersoftware's.

QUANTITY ESTIMATION FOR ROADS

Road estimation - earthwork fully in banking - cutting - partly cutting & partly filling – Detailed estimate and cost analysis for roads.

ANALYSIS OF RATES

Rate analysis & preparation of bills - Data analysis of rates for various items of works – Substructure components - Rate analysis for R.C.C. slabs, columns and beams.

VALUATION , TENDERS AND CONTRACTS

Valuation- Capitalized value - Depreciation - Various types of valuations – Valuation methods – Valuation of land – Buildings - Mortgage – Lease- Measurement book, Stores. BOT & EPC - Case studies.

Tenders-Tender document - Cost & quality control - Contracts - Contracts - Types of contracts- Arbitration and legal requirements

TUTORIAL

- A minimum of 3 problems to be worked out by students in every tutorial class.
- 4 problems to be given as homework per tutorial class.

Tutorial Class for Module 1
Tutorial Class for Module 2
Tutorial Class for Module 3
Tutorial Class for Module 4

TEXT BOOK (S)

1. Datta B.N. Estimating and costing, Charator Publishing House, 2012.

REFERENCE BOOKS

1. Kohli D.D and Kohli R.C, "Estimating and Costing", 12th Edition, S. Chand Publishers, 2014.
2. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd.,2015.
3. Vazirani V.N and Chandola S.P, “Estimating and costing", Khanna Publishers, 2015.
4. PWD Data Book.
5. CPWD Schedule of Rates (SoR).

COURSE DESIGNERS

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	COMPUTER AIDED BUILDING DRAWING LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The aim of this course is to prepare the plan, elevation and sections of various types of buildings using any design software

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	To understand the National Building Code regulations
2	To apply the AUTO CAD commands in layout and plans
3	To identify the requirements for various building components

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Examine the dimensions and describe the types of building.	Apply
CO:2	Apply the AUTO CAD commands in preparation of detailed plan.	Apply
CO:3	Identify the National Building Code standards for planning.	Apply
CO:4	Understand all the parts of the structure and its standard sizes.	Apply
CO:5	Explain the types of roof and roofing materials.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	-	M	S	-	M	S	-	S	S	M	S	M
CO:2	S	M	M	-	S	S	-	M	S	-	M	S	S	M	S
CO:3	S	M	M	-	S	S	-	M	S	-	S	S	L	S	M
CO:4	S	M	M	-	M	S	-	M	S	-	M	S	S	M	S
CO:5	S	M	M	-	M	S	-	M	S	-	S	S	M	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

Preparation of line sketches in accordance with functional requirements and building rules for the following types of building as per National Building Code:

1. Flat roof residential building
2. Pitched roof residential building
3. Multi-storeyed building
4. Industrial Building

Detailed Drawings (Plan, Elevation and section for the following) by manual and by using AutoCAD:

1. Detailed drawing for doors, windows.
2. Planning, design and detail drawings of staircase
3. Flat roof building with load bearing wall
4. Pitched roof with load bearing wall
5. Framed structures
6. Industrial Building with North light roof truss

TEXT BOOK (S)

1. Cad manual – Department of Civil engineering

COURSE DESIGNERS

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1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in
2	Mrs.R.Abirami	Assistant Professor I	Civil/AVIT	Abirami.civil@avit.ac.in

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

PREAMBLE

This laboratory course work is intended to provide students with opportunities to acquire knowledge and to develop skills in testing different materials used for the construction of building under the action of various forces and determining their characteristics experimentally. The experimental work involved in this laboratory will make the student to determine the mechanical and physical properties of materials like steel, wood, aluminium, cement, fine and coarse aggregate, etc. The students will be able to infer the suitability of these materials for construction.

PRE-REQUISITE – Nil

COURSE OBJECTIVES

1	The Experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains..
2	Relating these quantities, the student should be able to obtain the strength of the material and stiffness properties of structural elements.
3	To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Determine the behavior of structural elements, such as bars, beams and springs subjected to tension, compression, shear, bending, and torsion by means of Experiments	Apply
CO:2	Determine the physical properties of constituent materials.	Apply
CO:3	Determine the properties of materials and hardened including strength and durability.	Apply
CO:4	Determine the Deflection strength of the materials.	Apply
CO:5	The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

LIST OF EXPERIMENTS

1. Tension test on mild steel and tor steel rods
2. Compression test on wooden specimen
3. Double shear test on mild steel and Aluminium rods
4. Torsion test on mild steel rods
5. Impact test on metal specimen
6. Hardness test on metals
7. Deflection test on metal beam
8. Compression test on Helical spring
9. Compression test on Helical spring
10. Tension test on Helical spring

11. Y deflection test on carriage spring (Study Experiment)

TEXT BOOK (S)

1. Strength of Materials Lab Manual by VMKV Engineering College
2. Crandall, Dahl, and Lardner, "An Introduction to The mechanics of Solids", McGraw-Hill, 1978.

S. P. Timoshenko, "History of Strength Of materials", Dover Publications, 1953.

REFERENCE BOOKS

1. Bansal, R.K., "A Text Book of Strength of Materials", Laxmi Publications (P) Ltd. New Delhi 2010

2. James M. Gere and Stephen P. Timoshenko, "Mechanics of Materials" (3rd edition), McGraw Hill Book Company, Singapore, 2002.

3. IS 1608 : 1995 Mechanical testing of metals - Tensile Testing.

COURSE DESIGNERS

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	HYDRAULIC ENGINEERING LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The purpose of this course is to get exposure about the function of various hydraulic equipment..

PRE-REQUISITE - FLUIDS MECHANICS AND HYDRAULIC ENGINEERING

COURSE OBJECTIVES

1	Student should be able to verify the principles studied in theory by conducting the experiments
2	Students should be able to verify the principles studied in theory by performing the experiments in lab.
3	The students will be able to measure flow in pipes and determine frictional losses.
4	The students will be able to develop characteristics of pumps and turbines

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Conducting experiments by using the principles studied in theory	Apply
CO:2	Calculate flow in pipes and Frictional losses	Apply
CO:3	Developing characteristic curves of pumps and turbines	Apply
CO:4	The students will be able to measure flow in pipes and determine frictional losses.	Apply
CO:5	The students will be able to develop characteristics of pumps and turbines	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

INTRODUCTION

LIST OF EXPERIMENTS

1.Determination of co-efficient of discharge for orifice

2.Determination of co-efficient of discharge for notches

3.Determination of co-efficient of discharge for venturimeter

4.Determination of co-efficient of discharge for orifice meter

5.Study of impact of jet on flat plate (normal / inclined)

6.Study of friction losses in pipes

7.Study of minor losses in pipes

8.Study on performance characteristics of Pelton turbine.

9.Study on performance characteristics of Francis turbine

10.Study on performance characteristics of Kaplan turbine

11.Study on performance characteristics of Centrifugal pumps (Constant speed / variable speed)

12.Study on performance characteristics of reciprocating pump.

TEXT BOOKS

1.Hydraulic Engineering Lab Manual by VMKV Engineering College

REFERENCE BOOKS

1 Sarbjit Singh."Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
3. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing. Company, 2001.
4. Hydraulics, Fluid Mechanics and Fluid Machines Ramamrutham, and Narayan,R.Dhanpat RaiPublishingCompany, New Delhi,ISBN:818743384

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Dept. / College	E-mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in
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	CONCRETE AND CONSTRUCTION TECHNOLOGY LAB	Category	L	T	P	Credit
		CC	0	0	4	2

PREAMBLE

The purpose of this course is to get exposure about the function of various hydraulic equipment..

PRE-REQUISITE - CONSTRUCTION MATERIALS AND TECHNIQUES

COURSE OBJECTIVES

1	To facilitate the understanding of the behavior of construction materials.
2	Student knows the techniques to characterize various pavement materials through relevant tests..
3	To understand and perform various tests on cement, aggregates and concrete.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Conducting experiments by using the principles studied in theory	Apply
CO:2	Develop the skills in compressive strength test on bricks	Apply
CO:3	Develop the skills in Setting Time Test on Cement	Apply
CO:4	The students will have the required knowledge in the area of testing of construction materials and components of construction elements experimentally.	Apply
CO:5	Test on Impact Resistance Test on Aggregates	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	M	L	M	-	M	S	M	M	S	-	S	S	M	L	L
CO:2	M	M	L	-	S	M	L	S	S	-	M	S	L	S	L
CO:3	L	S	M	L	S	S	M	M	S	L	S	S	M	S	M
CO:4	S	M	S	-	M	S	L	S	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	M	M	M	S	-	S	S	L	S	S

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

INTRODUCTION

LIST OF EXPERIMENTS

1. Tests on various properties of the ingredients of concrete: Cement
2. Tests on various properties of the ingredients of concrete: Fine aggregate
3. Tests on various properties of the ingredients of concrete: Coarse aggregate
4. Workability tests on concrete: Slump Cone test, Compaction factor test and Consistency test (VB Consistometer)
5. Mechanical properties of concrete: Casting of concrete cube, cylinder specimens,curing and testing.
6. Non-destructive Testing: Existing Beam, column & slabs

TEXT BOOKS

1. Gambir M. L, Concrete Technology, Tata MC-Graw Hill-Education, 2013.
2. Shetty M. S., Concrete Technology, S. Chand & Company Ltd., 2010
3. Metha P. K, "Concrete: Microstructure, properties and Materials", McGraw-Hill, 2014
4. Properties of concrete by A. M. Neville, Longman Publishers.
5. Concrete Technology by R.S. Varshney, Oxford, and IBH.
6. Concrete technology by A. M. Neville, J.J. Brooks, Pearson.

REFERENCE BOOKS

1. Zongjin Li, Advanced Concrete Technology, John Wiley & Sons – 2011
2. IS: 12269-1987, Specification for 53 grade ordinary Portland Cement, BIS, New Delhi.
3. IS: 383 – 1970, Specification for Coarse and fine natural sources for Concrete, BIS, New Delhi.

4. IS: 10262-2009, Concrete Mix Proportioning - Guidelines.				
COURSE DESIGNERS				
S.No.	**Name of the Faculty**	**Designation**	**Department**	**E-Mail ID**
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2	Mrs.J.Srija	Assistant Professor	Civil/AVIT	Srija.civil@avit.ac.in

	SURVEY CAMP	Category	L	T	P	Credit
		CC	0	0	2	1

PREAMBLE

To provide the students real field based exposure to learn and apply different surveying methods, modern surveying instruments, computational practices and ways of presentation of their final reports.

PRE-REQUISITE – ENGINEERING SURVEYING

COURSE OBJECTIVES

1	The objective of the survey camp is to enable the students to get practical training in the field work.
2	Groups of not more than six members in a group will carry out each exercise in survey camp.
3	The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus).
4	At the end of the camp, each student shall have mapped and contoured the area.
5	The camp record shall include all original field observations, calculations and plots.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	To impart intensive training in the use of surveying instruments	Apply
CO:2	Io train the students to appreciate practical difficulties in surveying on the field	Apply
CO:3	Providing an opportunity to the students to develop team spirit	Apply
CO:4	Mark a road alignment of (L-section, Cross-section)	Apply
CO:5	Prepare a topographical plan of a given area	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	S	-	S	-	-	-	-	M	L	-	-	-	-	-
CO:2	S	L	M	-	-	M	-	-	S	L	-	L	-	-	-
CO:3	S	M	M	S	L	M	-	-	M	M	L	-	L	-	-
CO:4	M	S	L	S	-	-	-	-	M	L	-	M	--	-	-
CO:5	S	L	M	M	-	-	-	-	L	L	-	L	-	-	-

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

Ten days survey camp using Theodolite, cross staff, levelling staff, tapes, plane table and total station. The camp must involve work on a large area of not less than 400 hectares. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

LIST OF EXPERIMENTS

1. Simple chain survey – calculation of area using cross staff
2. Traversing - Measurement of bearing of survey lines by prismatic compass – Local attraction.
   - (i) Running closed and open compass traverse.
   - (ii) Plotting and adjustments of traverse
3. Theodolite - Measurement of vertical angles and determination of height of an object

4. Plane table survey by Radiation and Intersection methods. Resection: Field solution of Radiation and two point problems.
5. Reduction of levels : (i) Height of collimation method (ii) Rise and Fall method
6. Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods
7. Height of objects with and without accessible bases using Theodolite
8. Setting out work and Computation work.
   i. Spread Footing Foundation marking for residential building.
   ii. Column Footing Foundation marking for commercial / industrial building.
9. Preparing a contour plan by radial line method by the use of a Theodolite /Tachometer
10. Road Alignment Survey: At least 600m road alignment survey Shall be done from where plan, L section, X section etc shall be drawn at standard scale including selection of grades and formation levels etc.

TEXT BOOKS

1.Sueveying Lab Manual by VMKV Engineering College

REFERENCE BOOKS

1 Punima, BC; "Surveying and Leveling ", Standard Publishers Distributors, Delhi
2. Modi Hussain, SK and Nagraj, MS "Text Book of Surveying";, S Chand and Co Ltd., New Delh
3. Kocher, CL; "A Text Book of Surveying"; Katson Publishing House Ludhiana,

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	E-Mail ID
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	IRRIGATION ENGINEERING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

This subject is concerned with the examination of irrigation practices and methods used in our country. Additionally, it is necessary to understand the irrigation water requirements in order to design structures such as dams, weirs, and canals.

PREREQUISITE

Environmental Engineering

COURSE OBJECTIVES

1	To comprehend the necessity and method of irrigation.
2	To know the irrigation management practices of the past, present and future.
3	To gain an understanding of the efficiency and effectiveness of water distribution and optimization techniques

COURSE OUTCOMES

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

Co1. Label the prominence of National Water Policy.	Understand
Co2. Regulate the storage capacity of reservoir for a given demand.	Understand
Co3. Explicate the diverse forms and methods of irrigation practices	Apply
Co4. Calculate the design parameters of canal	Apply
Co5. Converse the various concepts of irrigation water management and software's	Understand

Mapping With Programme Outcomes And Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

SOIL – PLANT WATER RELATIONSHIP

Definition – Need – Benefits- developments – Historical - Scope in the country and state. Soil – Water relationship - Wilting point – Soil fertility- Principal crops – Crop rotation – Crops and cropping season. Ground water Hydrology

CROP WATER REQUIREMENTS

Duty, Delta and Base Period – Definitions – Factors affecting Duty – Methods of Improving Duty, Consumptive use of Crops (Evapo – Transpiration) – Estimation of Evapotranspiration using experimental and theoretical methods – Transpiration – Blaney and Criddle Method – Penman Methods – Lysimeter.

METHODS OF IRRIGATION AND DISTRIBUTION OF WATER

Sources of Water – Rivers – Streams – Reservoirs and Tanks. Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation– design of drip and sprinkler irrigation – ridge and furrow irrigation- Irrigation scheduling – Water distribution system- Irrigation efficiencies.

CONTROL AND REGULAR WORKS

Canal regulation works – Necessity and location of falls – Head and cross regulator – Canal escapes. Cross drainage works – Types of cross drainage work. River training works – Classification of River training works – Groynes or Spurs – Bank protection.

IRRIGATION WATER MANAGEMENT

Modernization techniques- Estimation of Irrigation Demand- Rehabilitation – Optimization of water use-Minimizing water losses- On form development works-Participatory irrigation management- Need for optimization – Need for interdisciplinary andparticipation approach. Roles and responsibilities of farmer's and government agencies in Turn Over.

Text Books

1 Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009.

NPTEL

1. "Irrigation and Drainage" By Prof. Damodhara Rao Mailapalli , IIT Kharagpur

REFERENCE BOOKS

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw- Hill Inc., New Delhi, 1997.
3. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
4. IRRIGATION ENGINEERING | N. N. BASAK | McGraw Hill

COURSE Designers

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2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	ENGINEERING GEOLOGY	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

Engineering Geology is the application of the geologic sciences to engineering practice for the purpose of assuring that the geologic factors affecting the engineering works are recognized and adequately provided for. Engineering geologic studies may be performed during the planning and design. A civil engineer should be able to understand an engineering geologic report, and incorporate adequate measures into the design of engineering works.

PRE-REQUISITE

Nil

COURSE OBJECTIVES

1	To demonstrate the importance of Geology to take Civil Engineering decisions to solve the earth related problems.
2	To introduce the fundamental of the engineering properties of earth materials for the use of Civil Engineering constructions.
3	To develop quantitative skills and a frame work for solving Engineering Geological problems.

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO:1	Know about the various internal structures of earth and plate tectonic movements.	Understand
CO:2	Characterize the engineering properties of rocks, minerals and soil.	Understand
CO:3	Use seismic and electrical methods to investigate the subsurface of the earth.	Apply
CO:4	Apply Remote Sensing knowledge to investigate the Geological structures	Apply
CO:5	Develop a native construction plan to incorporate all relevant aspects of Geology in Civil Engineering work.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO:1	S	L	M	-	M	S	M	M	S	-	S	S	M	S	L
CO:2	M	M	L	-	S	S	L	M	S	-	M	S	S	M	S
CO:3	S	M	M	L	S	S	M	M	S	L	S	S	L	L	M
CO:4	S	M	M	-	M	S	M	M	S	-	M	S	S	M	S
CO:5	M	M	M	-	M	S	M	M	S	-	S	S	L	S	M

S – STRONG, M – MEDIUM and L – LOW

SYLLABUS

GENERAL GEOLOGY

Geology in Civil Engineering - Branches of geology - Earth Structure and composition - Elementary knowledge on continental drift and plate tectonics.

MINERALOGY

Elementary knowledge on symmetry elements of important crystallographic systems - physical properties of minerals - study of the following rock forming minerals - Quartz family. Feldpar family, Augite, Hornblende, mica group of minerals- Fundamentals of process of formation of ore minerals - Coal and Petroleum

PETROLOGY

Classification of rocks - Distinction between Igneous, Sedimentatary and Metamorphic rocks. Decription occurence, engineering properties and distribution of following rocks. Igneous rocks – study of Granite, Sedimentary rocks sandstone, Limestone and Shale, Metamorphic rocks Marble and Slate.

GEOLOGICAL STRUCTURES AND REMOTE SENSING

Geological Structures - Folds, Faults and Joints – Engineering Considerations involves Structures. Seismic and Electrical methods for Civil Engineering investigations. Remote sensing techniques - study of air photos and satellite images

GEOLOGY FOR ENGINEERING STRUCTURES

Geological Investigations - Geophysical Investigations - Remote Sensing-Techniques - Geological Considerations for Dam Reservoirs, Tunnels and Road-Cuts - Practice in Geology - Demonstration for Clinometer, Electrical Resistivity Meter, Geological Maps - Identification of Crystals, Minerals and Rocks

TEXT BOOK (S)

1. Parbin Singh, Engineering & General Geology, S. K. Kataria and Sons- Delhi, 8th Edition.

REFERENCE BOOKS

1. Garg, S. K., Physical and Engineering Geology, Khanna Publishers, New Delhi.
2. M. P. Billings (1972), Structural Geology, Prentice Hall, Eaglewood Cliffs.
3. Dimitri, P. Krynine and William, P. Judd, Principles of Engineering Geology and Geomechanics, CBS Publishers and Distributors, New Delhi.
4. Blyth – Edward Arnold F. G. H (1998), A Geology for Engineers, (7th Edition)
5. M. P. Billings (1972), Structural Geology, Prentice Hall, Eaglewood Cliffs.
6. Legeet, " Geology and Engineering ", McGraw Hill Book Company, 1998.

NPTEL

1. Structural Geology By Prof. Santanu Misra | IIT Kanpur
2. Engineering Geology, IIT Kharagpur Dr. Debasis Roy

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	E-Mail ID
1	Ms.C.Vaidevi	Assistant Professor II	CIVIL/AVIT	Vaidevi.civil@avit.ac.in
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	REMOTE SENSING AND GIS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

Remote sensing provides a continuous and consistent source of information about the Earth, and geographic information systems (GIS) are a methodology for storing and managing all of this geographic data. The combination of the two disciplines enables us to conduct large-scale analyses of the Earth's surface while also providing increasingly detailed information on a variety of planetary variables and improving our understanding of how it works. These analyses are critical for decision-making regarding sustainable resource management, the design of protected area networks, and addressing the threats posed by global change.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	Students will learn about land use mapping techniques and techniques for determining the suitability of a site.
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 grasp the fundamental concepts of geographic information systems (GIS) and to apply spatial modelling techniques in engineering

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. Understand the concepts of Geographic Information Systems (GIS) and to apply spatial modelling techniques in engineering.	Understand
Co5. Develop computer methods for spatial data manipulation	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

CONCEPT OF REMOTE SENSING

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. Application of Remotes sensing in Civil Engineering

LAND USE & WATER RESOURCES

Land use and classification – land use mapping – Methods of change detection – urban land use planning, site suitability analysis, transportation planning. Areal assessment of surface water bodies –Mapping of snow-covered areas – flood risk zone mapping – identification of groundwater potential zones, recharge areas – droughts, definition, drought assessment and management.

AGRICULTURE, SOIL AND FORESTRY

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.

FUNDAMENTALS OF GIS

Components of a GIS – Spatial data – Introduction - Maps and their influence on the character of spatial data– Model and Structure of Spatial data– Data base and models – Creating a database – GIS database applications- Methods of data input –Data editing– data quality and errors sources of errors in GIS

MODELING USING GIS

Process models – Modeling physical and environmental processes – cartography- Problems with using GIS to model spatial processes - Output:from new maps to enhanced decisions: Introduction – Maps as output – Non- cartographic output – Spatial multimedia – Mechanisms of delivery – GIS and spatial decision support

TEXT BOOKS

1. Basudeb Bhatta, 'Remote Sensing and GIS', Second edition, Oxford University Press 2011
2. Ian Heywood, Sarah Cornelius and Steve carver, "Introduction to geographical information systems", Pearson Education, 4th Edition, 2012

REFERENCE BOOKS

1 . Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc, April 2004.

2. Rashed, Tarek; Jürgens, Carsten (Eds.), Remote Sensing of Urban and Suburban Areas,Springer, 1st Edition. 2010 3. DeMers,M.N., "Fundamentals of Geographic Information Systems", 3rdEdition, Wiley Press, 2009.

3. Lo C.P. and Yeung, A.K.W.,"Concepts and Techniques of Geographic Information Systems", Prentice Hall, 2002.

4. Burrough, P.A. and R.A. McDonald, "Principles of Geographical Information Systems", Oxford University Press, 199

NPTEL

1. Remote Sensing and GIS By Prof. Rishikesh Bharti | IIT Guwahati

~~Remote Sensing: Principles and Applications, By Prof. Eswar Rajasekaran | IIT Bombay~~

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.D.Parthiban	Assistant Professor	CIVIL/AVIT	Parthiban.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	REPAIR AND REHABLITATION OF STRUCTURES	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

To impart knowledge about the properties of concrete, the causes of its failure, the consequences, and the methods for repairing and rehabilitating it.

PREREQUISITE

Construction Materials and Techniques

COURSE OBJECTIVES

1	To know about the quality assurance for concrete construction.
2	To understand about the influence on serviceability and durability.
3	To know about the strategies of maintenance and repair.
4	To understand about the properties of repair materials.
5	To get an idea of repair techniques.

COURSE OUTCOMES

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

Co1. Explicate the aspects which affecting the stability of concrete structures	Understand
Co2. Identify the causes and effects of distress in concrete structures	Understand
Co3 Identify distress in concrete structures and propose maintenance tactics	Apply
Co4. Enumerate the concept and the techniques for repair rand protection method	Apply
Co5. Suggest suitable repair, rehabilitation and retrofitting of structures and demolition methods	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

GENERAL

Quality assurance for concrete construction as built concrete properties, strength, permeability, thermal properties and cracking.

INFLUENCE ON SERVICEABILITY AND DURABILITY

Effects due to climate, temperature, chemicals, wear and erosion, design and construction errors, corrosion mechanism, Effect of cover thickness and cracking, Method of corrosion production, corrosion inhibitors, corrosion resistant steels, coatings, cathodic production.

MAINTENANCE AND REPAIR STRATEGIES

Definitions: Maintenance, Repair and Rehabilitation, Facets of maintenance, Importance of maintenance, preventive measures on various aspects, assessment procedure for evaluating damaged structure, causes of deterioration- Testing techniques.

MATERIALS FOR REPAIR

Special concrete and mortar, Concrete chemicals, special elements for accelerator, strength gain, expansive cement, polymer concrete , sulphur infiltrated concrete, ferro cement, fibre reinforced concrete.

TECHNIQUES FOR REPAIR

Rust Eliminators and Polymers coatings for rebars during foamed concrete, mortar and dry pack, vacuum concrete, Guniting, shotcrete epoxy injection, mortar repair for cracks, shoring and under pining. Examples of repairs to structures Repairs to overcome low member strength, deflection, cracking , chemical disruption, weathering wear, fire, leakage, marine exposure.

TEXTBOOKS

1. M.S. Shetty. Concrete Technology-Theory and Practice, S.Chand and Company,2008.
2. Dr.B.Vidivelli.B, Rehabilitation ofConcreteStructuresStandardPublishesDistribution.1stedition 2009.

REFERENCE BOOKS

1. Denison Cambell, Allen and Harold Roper, Concrete Structures, materials, maintenance and repair, Long man, Scientific and technical UK 1991.

2. Santha Kumar A.R. Training Course Notes on Damage Assessment and Repair in Low Cost Housing, RHDC-NBO", Anna Univ July 91.

COURSE DESIGNERS

S.NO	COURSE INSTRUCTOR	DESIGNATION	NAME OF THE INSTITUTION	MAIL ID
1	Dr.S.P.Sangeetha	Vice Principal(Academics)	AVIT	sangeetha@avit.ac.in
2	Dr.T.Subramani	HOD-Civil	VMKVEC	tsm2007@rediffmail.com

MAPPING COURSE WITH NPTEL

Maintenance and Repair of Concrete Structures

	TRAFFIC ENGINEERING AND MANAGEMENT	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

Students will gain a thorough understanding of traffic surveys and studies, including volume counting, speed and delay analysis, origin and destination analysis, parking, pedestrian, and accident surveys. They will gain knowledge of the design of grade separated and at-grade intersections. Students will gain familiarity with various modes of traffic control and management.

PREREQUISITE

Highway Engineering and design

COURSE OBJECTIVES

1	To achieve knowledge on design of 'at grade' and 'grade separated' intersections.
2	To become familiar with various traffic control and traffic management measures
3	To give an overview of Traffic engineering
4	To know about the Various surveys to be conducted, traffic regulation, management and traffic safety

COURSE OUTCOMES

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

Co1. Analyse traffic problems and plan for traffic systems various uses	Understand
Co2. Speed and volume studies and their relationships	Understand
Co3.Enumerate the various road safety requirements	Understand
Co4. Design geometrics of intersections	Apply
Co5. Design the signal phasing and design a rotary	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Road Characteristics – Components of Traffic Engineering- Road, Traffic and Land Use Characteristics –Road user characteristics – Significance and scope, Characteristics of Vehicles and Road Users – PIEV theory – Vehicle Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Skid Resistance and Braking Efficiency (Problems)

TRAFFIC SURVEYS AND ANALYSIS

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Origin Destination Survey – Methods and presentation – Parking Survey – Type of Accident- Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting

TRAFFIC CONTROL

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

GEOMETRIC DESIGN OF INTERSECTIONS

Conflicts at Intersections, Classification of Intersections at Grade- Channelized and Non-Channelized Intersection - Grade Separators (Concepts only)- Traffic signs including VMS and road markings – Significant roles of traffic control personnel Principles of Intersection- Design

TRAFFIC MANAGEMENT

Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Coordination among different agencies
– Intelligent Transport System for traffic management, enforcement and education- Introduction to Intelligence Transport System (ITS)

TEXTBOOKS

1.Kadiyali.L.R."TrafficEngineeringandTransportPlanning",KhannaPublishers,Delhi,20132.IndianRoadsCongress(IRC)Specifications: GuidelinesandSpecialPublicationsonTraffic Planning andManagement.
2.Salter.R.IandHounsellN.B,"HighwayTrafficAnalysisanddesign",MacmillanPressLtd.1996
3. Garber and Hoel, Traffic and Highway engineering, Cengage publisher,SI Edition.

REFERENCEBOOKS

FredL.Mannering,ScottS.WashburnandWalterP.Kilareski,PrinciplesofHighwayEngineeringandTrafficAnalysis,WileyIndiaPvt.Ltd., NewDelhi,2011
GarberandHoel,"PrinciplesofTrafficandHighwayEngineering",CENGAGELearning,NewDelhi,2010
SP:43-1994,IRCSpecification,"GuidelinesonLow-costTrafficManagementTechniques" for UrbanAreas,1994

MAPPING COURSE WITH NPTEL

- Traffic Engineering

COURSE DESIGNERS:

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.D.Parthiban	Assistant Professor	CIVIL/AVIT	Parthiban.civil@avit.ac.in
2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	HYDROLOGY	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

It is the science that deals the movement, distribution, and management of water on Earth and other planets, including the water cycle, water resources, and the environmental sustainability of watersheds. A hydrologist is a person who practices hydrology.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	The mechanics of rainfall will be comprehended, as well as its spatial and temporal measurement and applications.
2	The mechanics of rainfall, its distribution and measurement of rainfall using Hydrograph.
3	Simple statistical analysis and application of rainfall and runoff probability distributions shall also be understood.
4	Student will also learn simple methods of flood routing and ground water hydrology.

COURSE OUTCOMES

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

Co1. Hydrological cycle and the measurement and analysis of rainfall data	Understand
Co2. Figure out the quantity of runoff generated from a catchment	Apply
Co3.Develop hydrographs to measure the stream flow	Apply
Co4. Estimate floods and propose suitable control measures	Apply
Co5. Suggest methods of Managing and conserving the surface and groundwater storage	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	L	M	-	-	-	L	S	L	-	-	-	M	L	L	-
CO2	S	M	L	L	-	-	S	-	-	-	-	M	L	L	-
CO3	S	M	L	L	-	-	M	-	-	-	-	L	L	L	-
CO4	S	M	-	L	-	-	S	-	-	-	-	L	L	L	-
CO5	L	-	L	-	-	L	M	L	L	L	-	L	L	L	-

S- Strong; M-Medium; L-Low

SYLLABUS

PRECIPITATION

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatialmeasurementmethods–Thiessen and Isohyetal methods-Temporalmeasurementmethods–Frequencyanalysisofpointrainfall–Intensity,duration,frequencyrelationship –Probable maximumprecipitation.

ABSTRACTION FROM PRECIPITATION

Losses from precipitation–Evaporation process, Horton's equation, pan evaporation measurements and evaporation suppression – Reservoir evaporation–Infiltration process–Infiltration capacity–Measuremen tofiltration–Infiltration indices–Effective rainfall.

HYDROGRAPHS

Factors affecting Hydrograph–Base flow separation–Unit hydrograph–Derivation of unit hydrograph–Unit hydrograph of different deviations- Synthetic Unit Hydrograph–Instantaneous unit hydrograph (IUH)

FLOOD AND DROUGHTING

Flood frequency analysis–Recurrenceinterval–Gumbel'smethod–Floodrouting–Reservoirfloodrouting–Muskingum'sChannelRouting–Floodcontrol-DroughtProne AreaProgramme (DPAP)

GROUNDWATERHYDROLOGY&MANAGEMENT

Origin-ClassificationandTypesofaquifers–Darcy'slaw–Dupuit'sassumptions–steadyand unsteadyflow-ConfinedAquifer–UnconfinedAquifer–Recuperationtest–Transmissibility–Specificcapacity–Pumpingtest – Steadyflowanalysisonly-artificialrecharge-RWHinruralandurbanareas.

TEXTBOOKS

1. Subramanya,K.,"EngineeringHydrology",TataMcGraw-HillPublishingCo.,Ltd.,2006
2. JayaramiReddy.P."Hydrology",TataMcGrawHill,2008.114
3. H.M Ragunath, Hydrology, principles, analysis and design, New age International publishers,Third Edition.

REFERENCEBOOKS

1. DavidKeithTodd."GroundwaterHydrology",JohnWiley&Sons,Inc.2007
2. VenTeChow,Maidment,D.R.andMays,L.W."AppliedHydrology",McGrawHillInternationalBookCompany,1998.
3. Raghunath,H.M,Hydrology:Principles,Analysis&Design,NewAgeInternational(P)Limited,Publishers.

MAPPING COURSE WITH NPTEL

- Engineering Hydrology

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.D.Parthiban	Assistant Professor	CIVIL/AVIT	Parthiban.civil@avit.ac.in
2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	DISASTER MANAGEMENT	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

This course deals with the various disasters and to expose the students about the measures, its effect against built structures, and Hazard Assessment procedure in India. This course also deals with the methods of mitigating various hazards such that their impact on communities is reduced.

PREREQUISITE

NIL

COURSE OUTCOMES

1	To Understand basic concepts in Disaster Management
2	To Understand Definitions and Terminologies used in Disaster Management
3	To Understand the Challenges posed by Disasters
4	To understand Impacts of Disasters

COURSE OUTCOMES

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

CO1. Understand the various types of disaster viz Hydrological, Coastal and Marine Disasters, Atmospheric Disasters, Geological, Mass Movement and Land Disasters, Wind and Water Driven Disasters.	Understand
CO2. Identify the potential deficiencies of existing buildings for Earthquake disaster and suggest suitable remedial measures.	Understand
CO3.Derive the guide lines for the precautionary measures and rehabilitation measures for Earthquake disaster.	Apply
CO4. Derive the protection measures against floods, cyclone, land slides	Apply
CO5. Understand the effects of disasters on built structures in India	Understand

Mapping With Programme Outcomes And Programme Specific Outcomes

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	-	L	-	-	-	-	-	-	-	-	L	-	-
CO2	M	M	L	L	-	M	-	-	-	-	-	-	L	-	-
CO3	S	M	S	M	-	L	-	M	-	-	-	-	M	L	-
CO4	S	M	S	-	L	-	-	-	-	-	-	-	M	L	-
CO5	L	L	-	L	-	-	-	-	-	-	-	-	L	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION:

Concept of disaster; Different approaches; Concept of Risk; Levels of disasters; Disaster phenomena and events (Global, national and regional); Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etcDos and Don'ts during various types of Disasters.

RISK ASSESSMENT AND VULNERABILITY ANALYSIS:

Response time, frequency and forewarning levels of different hazards; Characteristics and damage potential of natural hazards; hazard assessment ;Dimensions of vulnerability factors; vulnerability assessment; Vulnerability and disaster risk; Vulnerabilities to flood and earthquake hazards DISASTER MANAGEMENT MECHANISM: Concepts of risk management and crisis management ; Disaster management cycle ;Response and Recovery ; Development, Prevention, Mitigation and Preparedness; Planning for relief, Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster

DISASTER RESPONSE:

Mass media and disaster management; Disaster Response Plan; Communication, Participation, and Activation of Emergency Preparedness Plan; Logistics Management; Psychological Response; Trauma and Stress Management; Rumour and Panic Management ;Minimum Standards of Relief; Managing Relief; Funding.

DISASTER MANAGEMENT IN INDIA:

Strategies for disaster management planning; Steps for formulating a disaster risk reduction plan; Disaster management Act and Policy in India; Organisational structure for disaster management in India; Preparation of state and district disaster management plans, , Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake- holders

TEXT BOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423 2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.
Goswami, S. C. Remote Sensing Application in North East India, Purbanchal Prakesh, Guwahati, 1997.
Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.
Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
National Policy on Disaster Management, NDMA, New Delhi, 2009.
Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.

MAPPING COURSE WITH NPTEL

- Natural Hazards

Course Designers

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.S.Ispara Xavier	Assistant Professor	Civil / AVIT	isparaxavier.civil@avit.ac.in
2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	HOUSING PLANNING AND MANAGEMENT	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

This course work imparts knowledge required for understanding the general principles of building planning and services with the help of relevant codes, manuals and guidelines.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	An introduction to housing planning
2	Construction and financing of housing projects.
3	The course focuses on cost effective construction materials and methods.
4	Emphasis has also been given on the principles of sustainable housing policies and programmes.

COURSE OUTCOMES

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

CO1. Apply the general planning considerations and development control rules for different types of buildings.	Apply
CO2. Apply the principles of electrical and lighting services for different uses in buildings	Apply
CO3. Understand and apply the principles of plumbing services for domestic and industrial needs	Understand
CO4. Plan and design the requirements for HVAC systems, fire fighting and other necessary services for a various types buildings	Apply
CO5. Incorporate the integrated planning and designing of necessary building services for better usage of buildings	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO HOUSING:

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Policy and Public Intervention ,Principle of Sustainable Housing, All basic infrastructure consideration - Institutions for Housing at National, State and Local levels. Legal and Institutional Framework For housing

HOUSING PROGRAMMES:

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes,
Role of Public, Private and Non-Government Organisations. Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects

PLANNING AND DESIGN OF HOUSING PROJECTS:

Formulation of Housing Projects – Site Analysis, Layout Design, Planning for group housing Design of Housing Units (Design Problems) Building Byelawsand Rules,Zoning regulations – and Development Control Regulations CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS: New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation, Different types of housing standards – spatial standards, safety standards,

HOUSING FINANCE AND PROJECT APPRAISAL:

Evaluation of Housing Projects for sustainable principles, Appraisal of Housing Projects – Housing Finance, Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems)

TEXT BOOKS:

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House,Bombay, 1997.

REFERENCES:

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. Dhir,B.M,Construction Planning And Management , New Age International(P)Limited,Publishers.
3. Lal,A.K,Hand Book Of Low Cost Housing, New Age International(P)Limited,Publishers. Panchdhari,A.C,Water Supply & Sanitary Installations,New Age International(P)Limited,Publishers.
4. All housing policy of Government of India and states related to urban development.

MAPPING COURSE WITH NPTEL

- Housing Policy And Planning
- Urban Goverance and Development Management

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.S.Ispara Xavier	Assistant Professor	Civil / AVIT	isparaxavier.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	GROUND IMPROVEMENT TECHNIQUES	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

This course deals with the different ground improvement methods adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in- situ densification, consolidation and dewatering methods. This course enables the students to understand how reinforced earth walls can obviate the problems associated with conventional retaining walls. Also the students would be exposed to the concepts of grouting, soil stabilization and the use of geo textiles to improve the engineering performance of soils.

PREREQUISITE

Geotechnical Engineering

COURSE OBJECTIVES

1	Further he/she is in a position to decide various ways and means of improving the soil and implementing techniques of improvement.
2	About the drainage and dewatering techniques available
3	About the various treatments available for soil
4	About the reinforcement and grout techniques
5	Further he/she is in a position to decide various ways of ground improvements.

COURSE OUTCOMES

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

CO1. Enumerate the role of ground improvement and select appropriate ground improvement technique for the given subsoil condition.	Understand
CO2. Suggest appropriate dewatering technique for lowering the ground water table	Apply
CO3. Recommend suitable techniques for densifyingcohesionless soil deposit	Apply
CO4. Suggest appropriate techniques for consolidating cohesive deposits	Apply
CO5. Perform simple design of reinforced earth walls and illustrate the role of geo-textile in ground improvement	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1	S	M	L	---	---	L	---	L	---	---	---	---	S	M	L
CO2	S	M	L	---	L	M	---	L	---	L	L	---	S	M	L
CO3	S	M	L	---	L	M	---	L	---	L	---	---	S	M	L
CO4	S	M	M	---	L	---	---	L	---	L	---	L	S	M	M
CO5	S	M	M	---	---	---	---	M	---	M	L	---	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS
INTRODUCTION:

Role of ground improvement in foundation engineering - methods of ground improvement –Emerging Trends in Ground Improvement– Geotechnical problems in alluvial,laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition

.

DRAINAGE AND DEWATERING: Dewatering Techniques - Drainage techniques –Prefabricated Vertical drains- Well points - Vaccum and electroosmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple casesonly).

INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS:

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand compaction piles and deep compaction. - Preloading with sand drains and fabric drains – Stone columns – Case studies in stone columns-Lime piles - Simple design- Installation techniques only - relative merits of various methods and their limitations.

EARTH REINFORCEMENT:

Concept of reinforcement - Types of reinforcement material- laboratory behavior of reinforced soil-Reinforced earth wall – Mechanism, Simple design, stability analysis – Use in India- Applications ofreinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.

GROUT TECHNIQUES:

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring
-Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils, Impermeability grouting seepage control in soil under dams and for cut off walls- seepage control in rock under dams-stabilization grouting for under pinning

TEXT BOOKS:

1. Purushothama Raj. P, “Ground Improvement Techniques”, Lakshmi Publications, 2nd Edition, 2016.
2. Koerner, R.M. “Construction and Geotechnical Methods in Foundation Engineering”, McGraw Hill, 1994. 3. Nihar Ranjan Patra, “Ground Improvement Techniques”, Vikas Publishing House, First Edition, 2012.
3. Mittal.S, “An Introduction to Ground Improvement Engineering”, Medtech Publisher, First Edition, 2013.

REFERENCES:

1. Das, B.M., “Principles of Foundation Engineering” (seventh edition), Cengage learning, 2010.
2. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt.Ltd. New Delhi, 2011.
3. Koerner, R.M., “Designing with Geosynthetics” (Sixth Edition), Xlibris Corporation, U.S.A, 2012.
4. Foundation Analysis and Design by J.E. Bowles, MacGraw Hill, 1996
5. Principles of Geotechnical Engineering by B. M. Das, Thomson Publications.

MAPPING COURSE WITH NPTEL

Ground Improvement Techniques

COURSE DESIGNERS

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1	Ms.S.Ispara Xavier	Assistant Professor	Civil / AVIT	isparaxavier.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	ELECTRONIC SURVEYING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The aim of the course is to understand the working of EDM equipment and solve the surveying problems with EDM equipment

PREREQUISITE

Engineering Surveying

COURSE OBJECTIVES

1	The student will posses knowledge about Electronic surveying
2	About the propagation of electromagnetic waves and its main principles
3	Various implementations of surveying
4	The student will Study about different EDM instruments and Total Station.
5	Methods of measuring distance, historical development

COURSE OUTCOMES

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

CO1. Compute the linear measurement in chain surveying and angular measurements in compass surveying.	Apply
CO1.. To understand the basics, classifications, and Applications of Electronic Surveying	Apply
CO2. To study the Electromagnetic wave	Understand
CO3. To study the EDMS and its application	Apply
CO4. To study the EDMS Instruments, 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	M	L	---	---	L	---	L	---	---	---	---	S	M	L
CO2	S	M	L	---	L	M	---	L	---	L	L	---	S	M	L
CO3	S	M	L	---	L	M	---	L	---	L	---	---	S	M	L
CO4	S	M	M	---	L	---	---	L	---	L	---	L	S	M	L
CO5	S	M	M	---	---	---	---	M	---	M	L	---	S	L	M

S- Strong; M-Medium; L-Low

SYLLABUS
FUNDAMENTALS :

Methods of measuring distance, historical development, basic principles of EDM, classifications, applications and comparison with conventional surveying ,Component of EDM,Operation of EDM

BASIC ELETRONICS :
Fundamentals of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phase difference, reflectors and power sources.

PROPAGATION OF ELECTROMAGNETIC WAVES :
Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies.Refractiveindex,factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index, first velocity correction,computation or refractive index for microwaves, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

ELECTROMAGNETIC DISTANCE MEASURING SYSTEM :
Electro-optical system, measuring principle, working principle,sources of error,Advantages, Infrared EDM instruments Types, Laser EDM instruments and total station. Microwave system, measuring principle, working principle, sources of error, microwave EDM instruments, comparison with Electrooptical system, care and maintenance of EDM instruments, Modern Positioning Systems.EDM traversing, trilateration and base line measurement using EDM.

FIELD STUDIES :,

Study of different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement using EDM.

TEXT BOOKS:

1. Satheesh Gopi,K.Sathikumar,"Advanced Surveying"Dorling Publication,2008
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3. Burnside, C.D., Electromagnetic distance measurement, Crosby Lock wood staples, U.K., 1971

REFERENCE BOOKS:

1. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983..Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement,Adam Hilger Ltd., 1967.

MAPPING COURSE WITH NPTEL

Modern Surveying Techniques

COURSE DESIGNERS:

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.S.Ispara Xavier	Assistant Professor	Civil / AVIT	isparaxavier.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	AIR POLLUTION MANAGEMENT	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The course work offers the basic knowledge on various sources of air pollutants and their possible effects on local, regional and global environment. It provides various techniques for sampling and analyzing he pollutants. Also, it deals with the principles and design of control of particulate/gaseous air pollutants and its emerging trends to fulfil the legal aspects of air pollution to have a sustainable environment for future generation. In addition.

PREREQUISITE

Environmental engineering and Design

COURSE OBJECTIVES

1	About noise pollution and the methods of controlling the same.
2	The student is expected to know about source inventory and control mechanism.
3	To impart knowledge on the sources, effects of air pollution
4	The control techniques of air pollutions and preventive measures
5	The study about noise pollution and the effects and control measures

COURSE OUTCOMES

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

CO1. Identify the sources of air pollution, impacts of air pollutants and their measurements	Apply
CO2. identify the significance of meteorological factors in pollutants dispersion and to predict the pollutant concentration	Understand
CO3. Suggest preventive and control measures for air pollution.	Apply
CO4. Suggest locations for industries and appropriate city planning tips for the effective air pollution management of a city	Apply
CO5. The course offers the basic knowledge on various sources of air pollutants and their possible effects on local, regional and global environment.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	L	---	L	---	L	---	---	---	---	M	M	S
CO2	S	M	L	L	L	M	---	L	---	L	L	---	M	M	S
CO3	S	M	L	L	L	M	---	L	---	L	---	---	M	M	S
CO4	S	M	M	S	L	---	---	L	---	L	---	L	M	M	S
CO5	S	M	M	S	---	---	---	M	---	M	L	---	S	L	S

S- Strong; M-Medium; L-Low

SYLLABUS

SOURCES AND EFFECTS OF AIR POLLUTANTS :

Structure and composition of Atmosphere, Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility – Particulates and gaseous pollutants – Sources of air pollution –
– global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

DISPERSION OF POLLUTANTS :

Global winds, Headley cells, , Effects of terrain and topography on winds, maximum mixing depths, Effects of meteorology on Air Pollution – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence
Plume rise – Dispersion of pollutants – Dispersion models – Applications.

AIR POLLUTION CONTROL :

Air pollution monitoring and regularity control- Air Pollution control- at source -Factors affecting Selection of Control Equipment, Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - Operational Considerations. - Working principles advantages and disadvantages, design criteria and examples

AIR QUALITY MANAGEMENT:

Sources, types and control of indoor air pollutants- sick building syndrome and Building related illness- Air quality standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

NOISE POLLUTION:

Basics of acoustics-Sources of noise pollution – Effects – Assessment – Noise Standards and limit values–Noise instrumentation and monitoring procedure- Control methods –Noise indices- Prevention-Case studies

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017.
3. Anjaneyulu. Y, “Air Pollution and Control Technologies“ , Allied Publishers (P) Ltd., India 2002
4. Martin Crawford, Air Pollution Control Theory, TMH Publ.

REFERENCE BOOKS:

1. David H.F. Liu, Bela G. Liptak, “Air Pollution”, Lweis Publishers, 2000. 2. Arthur C. Stern, “Air Pollution (Vol.I – Vol.VIII)”, Academic Press, 2006.
2. Wayne T.Davis, “Air Pollution Engineering Manual”, John Wiley & Sons, Inc, 2000.
3. M.N Rao and HVN Rao, “Air Pollution”,Tata Mcgraw Hill Publishing Company limited,2007.
4. C.S.Rao, “Environmental Pollution Control Engineering”,New Age International(P) Limited Publishers,2006.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.S.Ispara Xavier	Assistant Professor	Civil / AVIT	isparaxavier.civil@avit.ac.in
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	BRIDGE STRUCTURES	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

Bridge is a structure built to span physical obstacles without closing the way underneath such as a body of water, valley, or road, for the purpose of providing passage over the obstacle. There are many different designs that each serve a particular purpose and apply to different situations. Designs of bridges vary depending on the function of the bridge, the nature ofthe terrain where the bridge is constructed and anchored, the material used to make it, and the funds available to build it. To introduce the students to basic theory and concepts of design of steel, reinforced concrete and pre stressed concrete bridge design for IRC loading conditions. It aims at determination of safe as well as economical section using different kinds of material used in construction and Maintenance

PREREQUISITE

Design of steel structures

COURSE OBJECTIVES

1	Understand the design concepts of Road bridges and loading standards as per IRC Specification.
2	Study about the design concepts of Pratt type truss girder highway bridges and plate girder railway bridges.
3	Understand the performance of composite members.
4	Study the design concepts of reinforced concrete girder bridges.
5	Be acquainted with the design techniques involved in prestressed concrete bridges.

COURSE OUTCOMES

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

CO1. Identify the type of bridge and its basic requirements for particular location	Understand
Co2. Design the culverts and Plate girder slab bridges	Apply
Co3. Design reinforced concrete bridges for IRC loading.	Apply
Co4. Design reinforced concrete tee beam bridges and balanced cantilever bridges.	Apply
CO5. Design the components of the prestressed concrete bridges such as girder section, end block etc	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	S	---	L	S	L	---	---	---	---	S	S	L
CO2	S	S	S	S	L	M	S	L	---	L	L	---	S	S	L
CO3	S	S	S	S	L	M	S	L	---	L	---	---	S	S	L
CO4	S	S	S	S	L	---	S	L	---	L	---	L	S	S	L
CO5	S	S	S	S	---	---	S	M	---	M	L	---	S	S	L

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION :

Types of bridges – suitability of different types of bridges for various spans – - IRC formula IRC Specifications for Road Bridges, Standards live loads, other forces on bridges - selection of bridge site – approaches- Loading Standards - Pre-design considerations Design of stringers, crossgirders and main girders - Design of deck type steel highway bridges for IRC loading.

STEEL BRIDGES :

General – Railway loadings – dynamic effect – Railway culvert with steel beams
– Plate girder bridges – Box girder bridges – Truss bridges – Vertical and Horizontal stiffeners.

REINFORCED CONCRETE SLAB BRIDGES :

Types of bridges and loading standards - Choice of type
- I.R.C. specifications for road bridges – Design of RCC solid slab bridges -analysis and design of slab culverts , Tee beam and slab bridges

REINFORCED CONCRETE GIRDERS BRIDGES

Design principles of continuous girder bridges, box

girder bridges, balanced cantilever bridges – Arch bridges – Box culverts. Design of articulation.

PRESTRESSED CONCRETE BRIDGES :

Design of prestressed concrete bridges - Preliminary dimensions
- Flexural and torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder – Check forstresses at various sections - Check for diagonal tension - Diaphragms Design of end block- Short term and long term deflections.

TEXT BOOKS:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co. New Delhi, 2007
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 2008
3. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013

REFERENCE BOOKS:

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
2. V. N. Vazirani, M. M. Ratwani, M. G. Aswani, Design of Concrete Bridges, Khanna Publishers.
3. Rajagopalan. N. "Bridge Superstructure", Alpha Science International, 2006

MAPPING COURSE WITH NPTEL

1.Bridge Engineering

COURSE DESIGNERS

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2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	TALL BUILDINGS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The aim of the course is to understand the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure).

PREREQUISITE

Design of Steel structures

COURSE OBJECTIVES

1	Understand the various aspects of planning of Tall buildings.
2	Know the different types of loads considered in the analysis of Tall structures.
3	To introduce various structural systems for medium rise buildings with their behaviour and analysis
4	Impart knowledge about the stability analysis of various structural systems.
5	Understand the concepts of approximate analysis of Structural system.

COURSE OUTCOMES

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

Co1. Describe the various structural systems used in the construction of Tall structures	Understand
Co2. The students should have knowledge about the designing tall buildings	Understand
Co3. Rudimentary principles of designing tall buildings as per the existing codes.	Apply
Co4. Analysis of Bearing Wall Buildings ,The Cross Wall Structure	Apply
CO5. Explain the importance of High-Rise Suspension Systems, Pneumatic High -Rise Buildings	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	M	---	L	M	L	S	---	---	---	S	S	L
CO2	S	M	L	M	L	M	M	L	S	L	L	---	S	S	M
CO3	S	M	L	S	L	M	M	L	---	L	---	---	S	S	L
CO4	S	M	M	S	L	---	M	L	S	M	---	L	S	S	L
CO5	S	M	M	M	---	---	M	M	---	M	L	---	S	S	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION:

The Tall Building and its Support Structure -Development of High Rise Building Structures - advantages and disadvantages - Vertical city concepts - essential amenities - fire safety - water supply -drainage and garbage disposal - service systems - structural and foundation systems. Factors affecting height, growth and form - Human comfort criteria

LOADS AND MATERIALS:

General Planning Considerations -Gravity loading - Dead and Live load - calculation - Impact and construction loads. Wind loading - static and dynamic approach - Analytical and wind tunnel experimental method. Earthquake loading - Equivalent lateral force, Modal analysis - combination of loading in various design philosophies. Materials for tall buildings - High strength concrete - Light weight concrete - Fibre reinforced concrete Composite Materials.

HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD:

The Bearing Wall Structure -Factors affecting growth, height and structural form. - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Belt Trusses - Tubular Systems- Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift EfficientBuilding Forms
- The Counteracting Force or Dynamic Response.

APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS:

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading and Lateral Loading - Approximate Design of Rigid Frame Buildings- Lateral Deformation of Rigid Frame Buildings - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

ADVANCED TOPICS :

Structural systems for future generation buildings – Expert systems for consultations – Economics – Research needs in tall building materials, systems and designs. .

TEXT BOOKS:

1. WOLFGANG SCHUELLER " High - rise building Structures", John Wiley and Sons.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 2015
3. Gupta.Y.P.,(Editor), Proceedings of National Seminar on High Rise Structures – Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi,2015.
4. Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications. Hel wany, S. (2007)

REFERENCE BOOKS:

1. Beedle.L.S., “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 2016.
2. LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers", John Wiley, 1994.
3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
4. Taranath.B.S., Structural Analysis and Design of Tall Buildings, Mc Graw Hill 1998.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.R.Abirami	Assistant Professor	Civil / AVIT	abirami.civil@avit.ac.inv
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	STRUCTURAL DYNAMICS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The purpose of the course is to understand how to arrive the dynamic forces and structures

PREREQUISITE

Structural analysis

COURSE OBJECTIVES

1	Understand the concepts involved in finding the response of Structures for Dynamic forces.
2	To learn about the discritization of various structures and degree of freedom
3	To understand about the seismic design of various structures
4	They also be able to interpret the results.
5	To learn how to idealise analyse these systems for the forces.

COURSE OUTCOMES

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

CO1 Find out the natural frequencies and the mode shapes of structures under dynamic loading.	Understand
CO2. Solve problems of single degree of freedom (SDOF) systems	Apply
CO3. Solve dynamic problems in multi-degree of freedom (MDOF) systems	Apply
CO4. Apply structural dynamic principles to the analysis of structures for seismic and wind loading	Apply
CO5. Design earthquake resistant structures and adopt appropriate vibration control techniques.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PRINCIPLES OF DYNAMICS :

Difference between static loading and dynamic loading – Nature of dynamic loads –Wind, Earthquake and Impact Loads – Energy and Damping – Types of Damping- Viscous and structural damping – Degrees of freedom– Formulation of equation of motion – Newton's Law and D'Alembert's principles –.

SINGLE DEGREE FREEDOM SYSTEMS :

Undamped and damped free vibration systems, Natural frequency of physical systems. Response to harmonic loading, response to ground motion and vibration isolation, Transmissibility, Response to periodic loading, concept of response spectrum, Response to impulse loadings – Numerical evaluation of Duhamel's integral.

MULTIDEGREE OF FREEDOM SYSTEMS :

MDOF systems equation of motion– examples- Free vibration analysis of MDOF system, Natural mode, orthogonality condition, stiffness equations for shear buildings. Forced vibration of MDOF system using modal analysis.
SUPERPOSITION PRINCIPLES:
Principle of mode superposition (principle only) for dynamic analysis – vibration isolation – vibration measuring instruments.

DESIGN FOR WIND AND EARTHQUAKE:

Introduction, Cause, Earthquake waves Intensity, Magnitude, Earthquake Parameters, Seismographs and strong motion devices, Accelerogram and Seismogram- Effect of wind eon structures – Principles of aseismic design – Methods of Vibration control – codal provisions for design for wind and earthquake (explanation of Provisions only – no design)- Important points in mitigating effects of earthquake on structures.

TEXT BOOKS:

1. Mario Paz," Structural Dynamics Theory and Computation", Van Nostrand Reinhold, 2004
2. Anil K.Chopra, "Dynamics of Structures Theory and Applications to Earthquake Engineering" Pearson Education., 2003.
3. S.R.Damodarasamy, S.Kavitha "Basics of Structural dynamics and Aseismic Design", PHI Learning Private Limited., 2009.
4. Pankaj Agarwal, "Earthquake Resistant Design of Structures", Prentice Hall of India, 2007

REFERENCE BOOKS:

1. Clough R.W. and Penzien, J., Dynamics of Structures, McGraw-Hill, 1990
2. Craig R.R. Jr., Structural Dynamics – An Introduction to Computer Methods, John Wiley and Sons, 1981
3. Madhujit Mukhopdhyay, " Structural Dynamics, Vibrations and Systems", Anne Books India, 2006.
4. IS 1893 part 1 2002 Indian standard criteria for earthquake resistant design of structures.

MAPPING COURSE WITH NPTEL

Dynamics of Structures

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.R.Abirami	Assistant Professor	Civil / AVIT	abirami.civil@avit.ac.in
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	WIND ENGINEERING	Category	L	T	P	Credit
		EC-PS	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	Understand the basic concepts of wind generation and flow.
2	Understand the response of different type of structures to wind pressure.
3	Understand about the seismic design of various structures
4	Study the design concepts of towers and roof trusses
5	Get exposure to wind tunnel experiments.

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. Design the structure for the given wind force condition as per the codal provisions	Apply
CO3. Identify and evaluate factors affecting wind energy development	Apply
CO4. Analyse the siting conditions for wind power development	Apply
CO5. Describe how the structural models can be tested in the wind tunnel and its uses.	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	L	S	S	S	---	L	S	L	---	---	L	---	S	M	S
CO2	L	S	S	S	L	M	S	L	---	L	L	---	S	M	S
CO3	S	S	S	S	L	M	L	L	---	L	---	---	M	S	S
CO4	L	S	L	S	L	---	S	L	---	L	---	L	M	S	S
CO5	S	S	S	S	---	---	S	M	---	L	L	---	S	S	S

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION:

Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift- Local winds, Building codes, Terrains different types- Design wind speed and wind pressure.

EFFECT OF WIND ON STRUCTURES:

Static effect – Dynamic effect – Wind shear-Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only)..

EFFECT ON TYPICAL STRUCTURES:

Tail buildings – Low rise buildings -Stack Hight wind pressure – Roof and cladding – Chimneys, towers and bridges

APPLICATION TO DESIGN:

Design forces on high rise building, towers and roof trusses.

INTRODUCTION TO WIND TUNNEL:

Types of models (Principles only) –Applications- Basic considerations – Examples of tests and their use. Losses in the wind tunnel circuit.

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
3. IS 875 : Part 3 : 1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures - Part 3 : Wind Loads.
4. Cook N J, Design Guides to wind loading of buildings structures. Part I and II, Butterworths, don, 1990.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

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

PREAMBLE

To get exposed to the design of industrial structures and its functional requirements.

PREREQUISITE

Design of steel structures

COURSE OBJECTIVES

1	Familiarize with planning and layout of buildings and its components.
2	Know about the functional requirements of industries.
3	Understand about the design of Steel structures.
4	Design and optimization involved in prefabricated structures.
5	Study the general principles of prefabrication and the functional requirements for Precast concrete units.

COURSE OUTCOMES

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

CO 1. Describe the general requirements for industries like cement, chemical and steel plants.	Understand
CO 2. Describe the functional requirements such as lighting, ventilation and fire safety of industries.	Understand
CO 3. Design the steel storage structures like bunkers and silos.	Apply
CO 4. Design the RCC storage structure like bunkers and silos	Apply
CO 5. Describe the functional requirements of Precast concrete units.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	-	L	S	M	-	M	M	M	-	-	L	-	L
CO2	S	S	-	L	S	M	-	M	M	M	-	-	L	-	L
CO3	S	S	-	L	S	M	-	M	M	M	-	-	L	L	L
CO4	S	S	-	M	S	M	-	M	M	M	-	-	L	-	L
CO5	S	S	-	L	S	M	-	M	M	M	-	-	L	L	L

S- Strong; M-Medium; L-Low

SYLLABUS

SYLLABUS

PLANNING:

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

FUNCTIONAL REQUIREMENTS:

Lighting – Ventilation – Protection Against Noise and Vibration - Accounts – Fire safety – Guidelines from factories act

DESIGN OF STEEL STRUCTURES:

Industrial roofs – Crane girders – Mill buildings – Types of power Plants and Containment Structures – Transmission Towers

DESIGN OF R.C. STRUCTURES:

Design of Silos and bunkers – Design of Chimneys and Cooling Towers- Principles of folded plates and shell roofs.

PREFABRICATION:

Principles of prefabrication –Need for Prefabrication - modular coordination - advantages and limitations -Prestressed precast roof trusses- Functional requirements for Precast concrete units- - beams - columns - walls - roof trusses - footings - joints in prefab elements

TEXT BOOKS:

1. N. Subramanian,"Design of Steel Structures: Theory and Practice,Oxford University Press, Incorporated, Mar-2011
2. P.Dayaratnam - Design of Steel Structure - S. Chand and Company, 2008.
Krishna Raju, "Advanced Concrete Structures", McGraw Hill, New Delhi, 2000

REFERENCES:

1. Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995
2. Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of IndianStandards, New Delhi 1990
3. IS:3483-1965, "Code of practice for noise reduction in industrial buildings", BIS, 1965 IS:1642- 1989, Code of practice for fire safety of buildings (general): Details of construction, BIS, 1989 .
4. IS:8640- 1977, "Recommendations for dimensional parameters for industrial building", BIS, 1977

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	FINITE ELEMENT TECHNIQUES	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The purpose of the course is to understand &analyses linear elastic structures, that has been studied about in core courses, using finite element method.

PREREQUISITE

Structural analysis

COURSE OBJECTIVES

1.	To analyze linear elastic structures that he has studied about in core courses using finite element method.
2.	To know about the concepts of finite element analysis of one-dimensional problems
3.	To understand about the concepts of finite element analysis of two-dimensional problems
4.	To deals with finite element analysis of isoperimetric problems and its applications with software packages

COURSE OUTCOMES

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

CO1. Analyzing with the use of FE Method	Analyze
Co2. Analysis of one dimensional problems with the use of FE Method	Analyze
Co3. Analysis of two dimensional problems with the use of FE Method	Analyze
Co4. Formulate and analyses isoparametric elements	Analyze
Co5. Formulate two and three dimensional solid finite element using software	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	M	-	M	-	M	-	M	L	M	-
CO2	S	S	-	L	S	M	-	-	M	M	-	-	M	M	-
CO3	S	S	-	L	S	M	-	M	-	M	-	-	M	M	-
CO4	S	S	-	L	S	M	-	M	-	M	-	-	-	M	L
CO5	S	S	-	L	S	M	-	M	L	M	-	-	M	S	L

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION – VARIATIONAL FORMULATION

Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method-Galerkin method, sub domain method, method of least square and collocation method, numerical problems.

FINITE ELEMENT ANALYSIS OF ONE-DIMENSIONAL PROBLEMS

General procedure of FEM, skeletal and continuum structures, descritization of domain, basic types of elements- truss, beam, triangular, quadrilateral and brick elements- shape functions, Rayleigh and Ritz method, formulation of element stiffness matrices -Isoparametric elements.One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanic-heat transfer through simple fins, composite wall, bending of beams.

FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS

Global and natural coordinates-Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – boundary conditions – solution techniques-problems on bending of plates and heat transfer in two dimensions.

ISOPARAMETRIC ELEMENTS AND FORMULATION

Natural coordinates in 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS

Equations of elasticity – plane elasticity problems – axisymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow. Three dimensional problems, use of software packages.

Text Books

Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall, India, 2003

S.S.Rao, “The Finite Element Method in Engineering”, Pergaman Press, 2003.

Reference Books

1. J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill, Intl. Student Edition, 1985.
2. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4/e, McGraw-Hill, Book Co.Rao.S.S, “Finite Element Methods in Engineering”, Pregamon Press, 1989.
3. Krishnamoorthy.C .S, “ Finite Element Analysis - Theory a n d Programming ”, Tata McGraw-Hill Publishing Co, 1987.
4. NPTEL - Finite Element Method - By Prof. Biswanath Banerjee, Prof. Amit Shaw - IIT Kharagpur

COURSE DESIGNERS

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1	Mrs.P.Subathra	Assistant Professor	Civil / AVIT	subathra@avit.ac.in
2	Mr.C.Kathirvel	Associate Professor	CIVIL/VMKVEC	kathirvel@vmkvec.edu.in

	GROUND WATER ENGINEERING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The purpose of the course is to understand the ground improvement techniques and quality of ground water.

PREREQUISITE

Environmental engineering and Design

COURSE OBJECTIVES

1.	To know the types of aquifers
2.	To understand the surface and subsurface investigation in detail
3.	To integrate the fundamental and basic knowledge of ground water movement
4.	To introduce the different model studies.

COURSE OUTCOMES

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

CO1. Analyzing the types of aquifers	Analyze
Co2. Analysis of the surface and subsurface investigation in detail	Analyze
Co3. Analysis of ground water movement	Analyze
Co4. Analyzing different model studies	Analyze
Co5. Understand the Management of Ground water flow.	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	S	-	L	S	M	-	M	-	M	-	M	M	-	-
CO2	S	S	-	L	S	M	-	-	-	M	-	-	L	M	-
CO3	S	S	-	L	S	M	-	M	-	M	-	-	L	M	-
CO4	S	S	-	L	S	M	-	M	-	M	-	-	-	L	-
C05	S	S	-	L	S	M	M	M	-	M	-	-	-	L	-

S- Strong; M-Medium; L-Low

SYLLABUS

HYDROGEOLOGICAL PARAMETERS

Introduction to hydrological cycle-origin and age of ground water-vertical distribution of ground water - Water bearing Properties of Rock - Properties of aquifer - Transmissivity and storage coefficient - Problems in Specific yield - specific capacity -Darcy's law and permeability - Methods of Estimation - Ground water table fluctuation and its interpretations - Type of aquifers - Groundwater development and Potential in India - groundwater legislation, GEC norms.

EVALUATION OF AQUIFER PROPERTIES

Darcy's equation - governing equation of ground water flow - steady and unsteady flow equations for confined and unconfined aquifer - water table aquifer –coefficient of Transmissibility and storage-Determination of hydraulic conductivity Dupit Forchheimer assumption - one dimensional flow - well hydraulics - hydrogeological boundaries - concept of image - image well - well theory - interference of wells - partial penetration of well- multiple well system. GROUNDWATER HYDRAULICS AND

EXPLORATION

Geological methods - Geophysical - electrical resistivity - seismic refraction - water wells classification - drilling of deep wells - well design, construction and maintenance-steady unidirectional flow-radial flow in confined and unconfined acquifer - well development. Pumping test analysis - well characteristics - draw down test - Tracer tests.-slug test- automatic water level recorder-jacob's method

GROUNDWATER QUALITY AND MOVEMENT

Measures of water quality-chemical analysis-graphical representation –physical analysis-Ground water chemistry - Origin, movement and quality - Water quality standards - Remediation of saline intrusion - Remediation schemes - Artificial recharge techniques - Ground water Pollution and legislation.

GROUNDWATER MANAGEMENT

Concepets of basin -Need for management model - database for groundwater management-water laws and policies type of groundwater models-simulation of two and three dimensional groundwater system-MODFLOW 2000 - protection zone delineation groundwater balance. Introduction

TEXT BOOKS

1. Todd D. K.," Ground water hydrology", John Wiley & Sons, 3rd Edition , 2005
2. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010. 3. Bouwer H., "GroundwaterHydrology", Tata Mc Graw Hill, Company Ltd, Indian Edition 1978
3. David K Todd and Larry W. Mays (2013), Groundwater Hydrology, Third Edition, JohnWiley & Sons Singapore.

REFERENCE BOOKS

1. Health R. C. and Trainer F.W., "Introduction of Ground water Hydrology", John Wiley and sons, 1985.Rastogi R K, Applied groundwater hydrology, (2011).
2. NPTEL - Ground Water Hydrology, by Dr. Rajib K. Bhattacharjya IIT Guwahati

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1	Mrs.P.Subathra	Assistant Professor	Civil / AVIT	subathra@avit.ac.in
2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	CONTRACT LAWS AND REGULATIONS	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

To study the various types of construction contracts and their legal aspects and provisions. To study the of tenders, arbitration, legal requirement, and labour regulations.

PREREQUISITE

Nil

COURSE OBJECTIVES

1.	To study the various types of construction contracts and their legal aspects, provision and policies
2.	To study the tenders, arbitration, legal requirement, and labour regulations.

COURSE OUTCOMES

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

Co1. To know about the construction contracts	Understand
Co2 . To Study about the tender documents.	Apply
Co3. To Know about the rules of evidence of contract.	Apply
Co4. To Study the planning about legeal requirements.	Apply
CO5. To Understand about the labour requirements	Understand

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

CONSTRUCTION CONTRACTS

Functions of Contracts in engineering- Introduction to Contract agreements, Terms involved in Contract agreements- Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability –Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts.

TENDERS

Tendering Process - tender documents – requirements for tendering –Methods of inviting tenders -Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

ARBITRATION

Earnest Money Deposit (EMD) – Security deposits -Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence –Enforcement of Award – Costs.

LEGAL REQUIREMENTS

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land –Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and theirInfluence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law– Local Government Laws for Approval – Statutory Regulations.

LABOUR REGULATION

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes,Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act –Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws.

Text Books

1.Gajaria G.T., Laws Relating to Building and Engineering Contracts in India,
2.Jimmie Hinze, Construction Contracts, McGraw Hill, 2001.
3.Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000.
4.Oxley Rand Posicit, "Management Techniques applied to the Construction Industry", Granda Publishing Ltd., 2000.

Reference Books

1. Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., Fundamentals of ConstructionManagement and Organisation, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay,1982.
2. Patil. B.S, Civil Engineering Contracts and Estimates, Universities Press (India) PrivateLimited, 2006.
Tamilnadu PWD Code, 1986
3. NPTEL - Advanced Contracts, Tendering and Public Procurement By Prof. Sairam Bhat - National Law School of India University.

COURSE DESINERS

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1	Mrs.P.Subathra	Assistant Professor	Civil / AVIT	subathra@avit.ac.in
2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	SOLID WASTE MANAGEMENT	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

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

PREREQUISITE

Nil

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

Co1. To know about the types of waste & Sources	Understand
Co2 . To Study the on site Storage & Processing	Apply
Co3. To study about the collection & transfer the waste	Apply
Co4. To Study the process of off site processing	Apply
CO5. To know about the solid waste disposal	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

SOURCES AND TYPES OF MUNICIPAL SOLID WASTES

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

ON-SITE STORAGE & PROCESSING

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspectsof storage – options under Indian conditions – Critical Evaluation of Options – Case Studies Under Indian Condition

COLLECTION AND TRANSFER

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

OFF-SITE PROCESSING

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions- cradle to grave management concept, Prevailing laws of hazardous waste management- Thermal processing options - Risk assessment.

DISPOSAL

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment.

TEXT BOOKS

George Tchobanoglous et.al., “Integrated Solid Waste Management”, McGraw-HillPublishers, 2002.
B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, “Waste Management”,Springer, 1994.
Charles A. Wentz; "Hazardous Waste Management", McGraw-Hill Publication, Latest publication, (1992).

REFERENCE BOOKS

1. R.E.Landreth and P.A.Rebers, “Municipal Solid Wastes – problems and Solutions”, Lewis Publishers, 1997.Bhide A.D. and Sundaresan, B.B., “Solid Waste Management in Developing Countries”, INSDOC, 1993.
2. Handbook of Solid Waste Management by Frank Kreith, George Tchobanoglous, McGraw Hill Publication, (2002).Bagchi, A., Design, Construction, and Monitoring of Landfills, (2nd Ed). Wiley Interscience, ISBN: 0-471-30681-9. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development,
3. Government of India, New Delhi, (2000).
4. NPTEL – Municipal Soild Waste Management by Prof. Ajay Kalamdhad – IIT Guwahati.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mrs.P.Subathra	Assistant Professor	Civil / AVIT	subathra@avit.ac.in
2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	CONSTRUCTION PLANNING AND SCHEDULING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The purpose of this course is to learn about the Construction plan and construction method. To develop the knowledge about Quality control and safety during construction

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Plan construction projects
2	Schedule the activities using network diagrams
3	Control the cost of the project by creating cash flows
4	Budgeting and how to use the project information as an information and decision making tool.

COURSE OUTCOMES

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

CO1.	Study the Basic concepts in the development of construction plans	Apply
CO2.	Study the Scheduling Procedures And Techniques	Understand
CO3.	Know to Cost Control Monitoring And Accounting	Apply
CO4.	Understand the Quality Control And Safety During Construction	Apply
CO5.	Understand the Organization And Use Of Project Information	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	S	M	L	M	S	M	M	S	S	S	-	-	L		-
CO2	S	M	L	-	-	-	-	S	S	S	-	-		L	-
CO3	S	M	M	-	-	-	-	S	-	S	-	-	L		-
CO4	S	M	M	-	-	-	-	S	S	S	-	-		L	M
CO5	S	M	M	-	-	-	-	L	-	L	-	L	L		-

S- Strong; M-Medium; L-Low

SYLLABUS

CONSTRUCTION PLANNING:

Basic concepts in the development of construction plans-choice of Technology and Construction Method-Defining Work Tasks-Definition- Precedence relationships among activities- Collection of field data
- Preliminary estimates - Approval and sanction of estimates- Budget provisions - Relationships between management and labour

SCHEDULING PROCEDURES AND TECHNIQUES:

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads- Use of PERT -- Scheduling In Poorly Structured Problems - Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost tradeoffs -Improving the Scheduling Process- Introduction to application software

COST CONTROL MONITORING AND ACCOUNTING:

The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows- Planning for network construction - Modes of network construction - Work breakdown structure Hierarchies. Schedule control-Schedule and Budget updates-Relating cost and schedule information.

QUALITY CONTROL AND SAFETY DURING CONSTRUCTION:

Quality and safety Concerns in Construction- Organizing for Quality and Safety-Work and Material Specifications- Inspection of materials and machinery - Quality audits- Statistical quality control - Tools - Control chart – Site management with regard to safety

ORGANIZATION AND USE OF PROJECT INFORMATION:

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow

TEXT BOOKS:

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., “Pert and CPM Priniples and Applications “, Affiliated East West Press, 2001

REFERENCES:

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
2. Hinze, Jimmie, Construction Planning and Scheduling, Pearson Prentice Hall.2012
3. Mubarak, S., Construction Project Scheduling and Control, Pearson Education, Inc. 2015
4. Sharma, J.L, “Construction Management and accounts” Satya Publications, 2013.

MAPPING COURSE WITH NPTEL

- Construction Planning and Management

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Mr.R.SanjayKumar	Assistant Professor	Civil Engineering/AVIT	Sanjay.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	CONCRETE TECHNOLOGY	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

The aim of the course is to impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	To understand the properties of ingredients of concrete.
2	To know about the chemical & mineral admixtures used in concrete.
3	To study about the concrete design mix.
4	To study the behavior of concrete at its fresh and hardened state.
5	To understand special concrete and their uses

COURSE OUTCOMES

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

CO1. To identify suitable materials to be used in the cement concrete, aggregates and water for making concrete by conducting various tests as per BIS code.	Understand
Co2. The effect of admixtures on properties of concrete	Understand
Co3. The concept and procedure of mix design as per IS method	Apply
Co4. The properties of concrete at fresh and hardened state	Understand
CO5. The importance and application of special concretes.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

CONSTITUENT MATERIALS

Cement — Different types — Chemical composition and Properties — Hydration of cement — Bogue's compound — Tests on cement — IS Specifications — Aggregates — Classification — Mechanical properties and tests as per BIS — Grading requirements — Water — Quality of water for use in concrete.

CHEMICAL AND MINERAL ADMIXTURES

Accelerators — Retarders — Plasticizers — Super plasticizers — Water proofers — Air entraining admixtures — Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline — Effects on concrete properties.

PROPORTIONING OF CONCRETE MIX

Principles of Mix Proportioning — Properties of concrete related to Mix Design — Physical properties of materials required for Mix Design — Design Mix and Nominal Mix — BIS Method of Mix Design — Design of high strength concrete. — Mix Design Examples

FRESH AND HARDENED PROPERTIES OF CONCRETE

Workability — Tests for workability of concrete — Segregation and Bleeding — Determination of strength Properties of Hardened concrete — Compressive strength — split tensile strength — Flexural strength — Stress-strain curve for concrete — Modulus of elasticity — durability of concrete — water absorption — permeability — corrosion test — acid resistance.

SPECIAL CONCRETES

Light weight concretes — foam concrete — self compacting concrete — vacuum concrete — High strength concrete — Fibre reinforced concrete — Ferro cement — Ready mix concrete — SIFCON — Shotcrete — Polymer concrete — High performance concrete — Geopolymer Concrete.

Text Books

1. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
2. Bhavikatti.S.S, " Concrete Technology", I.K. International Publishing House Pvt. Ltd., New Delhi, 2015
3. Santakumar A.R., "Concrete Technology", Oxford University Press, New Delhi.

REFERENCE BOOKS

1. Nevile," Properties of Concrete", Longman Publishers.
2. Gambhir. M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
4. Job Thomas, "Concrete Technology", Cengage Learning India Pvt. Ltd., Delhi, 2015.
5. Advanced Concrete Technology By Zongjin Li, 2011

MAPPING COURSE WITH NPTEL

- Advanced Concrete Technology

COURSE DESINERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms.C.Vaidevi	Assistant Professor	Civil Engineering/AVIT	vaidevi.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	PRESTRESSED CONCRETE	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear.

PREREQUISITE

Design of Reinforced Concrete Elements

COURSE OBJECTIVES

1.	To understand the behaviour of prestressed elements.
2.	To identify the possible stress occurrence due to prestressing
3.	To determine the appropriate methods of prestressing for various cases.
4.	To develop a prestressed concrete element for the given loading conditions.

COURSE OUTCOMES

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

CO1. Calculate, moment capacity, crack width and deflections for various tendon profile.	Apply
CO2. Design type I and type II post-tensioned and pre-tensioned beams and check for strength and shear as per codal provisions.	Apply
CO3. Evaluate Short term, long term deflection, capacity of anchorage zone for pre-tensioned beams.	Apply
CO4. Analyse and design of composite beams, secondary moments for continuous beams.	Apply
CO5. Design tension and compression members and understand the concept of partial prestressing.	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	S	M	M	L	-	-	-	-	-	-	-	-	-	-
CO2	M	M	S	S	L	-	-	-	-	-	-	-	-	-	-
CO3	L	M	S	M	M	-	-	-	-	-	-	-	-	-	-
CO4	M	S	M	M	M	-	-	-	-	-	-	-	-	-	-
CO5	M	M	M	L	L	-	-	-	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION – THEORY AND BEHAVIOUR

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections – Losses of prestress–Estimation of crack width.

DESIGN FOR FLEXURE AND SHEAR

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Principles-design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design procedure for shear based on I.S. 1343 Code.

DEFLECTION AND DESIGN OF ANCHORAGE ZONE

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by IS1343 code procedure– Design of anchorage zone reinforcement.

COMPOSITE BEAMS AND CONTINUOUS BEAMS

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments– Concordant cable and linear transformation – Calculation of stresses – Principles of design.

MISCELLANEOUS STRUCTURES

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Circular Prestressing - methods of achievingpartial prestressing, merits and demerits of partial prestressing.

TEXT BOOKS

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012.
2. Pandit.G.S. and Gupta.S.P., " Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

REFERENCE BOOKS

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.

MAPPING COURSE WITH NPTEL

Prestressed Concrete Structures

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr.P.S.Aravindraj	Associate Professor	CIVIL/AVIT	Aravindraj.civil@avit.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

	PREFABRICATED STRUCTURES	Category	L	T	P	Credit
		EC-PS	3	0	0	3

Preamble

To study and understand the prefabricated structural elements

Prerequisite

Nil

Course Objectives

1	To Study the design principles, analysis and design of elements
2	To familiarize the students in the field of prefabricated structures
3	To study the Types of floor slab**,** Stairs and Roofs.
4	At the completion of the course the students would have knowledge on types of wall joints and load bearing walls

Course Outcomes

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

Co1. To know about the design principles	Apply
Co2 . To Study about the Reinforced Concrete	Apply
Co3. To get the knowledge about floors, Slabs & Roofs	Apply
Co4. To Study about the Walls	Apply
CO5. To know about the design of industrial building	Apply

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

PREFABRICATED COMPONENTS

Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Beams-Columns – Shear walls

DESIGN PRINCIPLES

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

JOINT AND CONNECTIONS IN STRUCTURAL MEMBERS

Types of joints - Joints based on action of forces and based on functions- – Dimensions and detailing – Design of expansion joints - Types of structural connections

DESIGN FOR ABNORMAL LOADS

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TEXT BOOKS

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.
3.Prefabricated Structures by Dr. Jebamalar from Magnus Publications 2018

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr.R.Divahar	Associate Professor	AVIT	divahar.civil@avit.ac.ac.in
2	Mr.Senthilkumar	Assistant Professor	CIVIL/VMKVEC	senthilkumar@vmkvec.edu.in

INDUSTRY OFFERED AND DESIGNED COURSES

DEPARTMENT OF CIVIL ENGINEERING

BUILDING DESIGN WITH OPEN BUILDINGS DESIGNER PART-1

(INDUSTRY DESIGNED /OFFERED COURSE, 45 HOURS)

Unit 1 - Introduction

Introduction to Modeling Structural Frames for OpenBuildings Designer - Setting Up New Project - Modeling Structural Columns –

Unit 2 - Modeling Structural Frames

Modeling Beams and Bracing - Floor Manager - Grid Systems - Place Standard Structural Frame - Modeling Structural Frames for OpenBuildings Designer

Unit 3 – Modelling Building elements

Introduction to Modeling Slabs and Foundations for OpenBuildings Designer - Modeling Concrete Slabs - Insert Floor - Modeling Concrete Foundations

Unit 4 – Drawings and Reports

Introduction to Creating Structural Drawings - Create and Manage Drawings - Drawing Rules - Schedules - Set Up Sheet Index

Unit 5 – BIM Management for OpenBuildings

Installing OpenBuildings Designer to Point to a Network Location - Setting Up the Organization and WorkSpace folders - Creating a WorkSet Template - Migrating Ss6 Standards and Dataset Extensions to the OpenBuildings WorkSpace - Moving the WorkSets toa Separate Drive - Creating an Organization Dataset - Creating Additional WorkSpaces and WorkSets - Using the Configuration Explorer to Redirect the Default Seed Files

INDUSTRY OFFERED AND DESIGNED COURSES

DEPARTMENT OF CIVIL ENGINEERING

BUILDING DESIGN WITH OPENBUILDINGS DESIGNER PART-2

(INDUSTRY DESIGNED /OFFERED COURSE, 45 HOURS)

Unit 1 - SYNCHRO 4D Scheduling

Why 4D? Section - User Interface, Navigation and Options - 3D Interoperability and 3D Models - Filtering - Scheduling Basics - Assigning Resources - Subdividing 3D - Animating Equipment - Exporting Animations - SYNCHRO 4D Project Template – Layouts -

Unit 2 - SYNCHRO Scripts

User Fields, Formulas, Rules and Scripts - SYNCHRO Scripts - Resource Loading, Cost Loading and Earned Value - Resource Units and Usage Graph - Introduction to Iray Rendering - SYNCHRO 2020 Features

Unit 3 - SYNCHRO Control

Introduction to SYNCHRO Control – Administration - Setting Up a Control Project – Documents - Forms

Unit 4 - SYNCHRO Field

Introduction to SYNCHRO Field Course - Projects & Home - My Tasks – Create –Documents – Inspections – More - 3D/4D Workflow

Unit 5 – Practical Learning of SYNCRO

4D planning and scheduling in your construction projects - import and edit 3D models and schedules - link using color coding and growth simulations - review and update construction sequencing – Video simulations - Printable reports. Using SYNCHRO Field & Control; gain access, manage, collaborate, and analyze construction data in the cloud, in the field, and in the context.

INDUSTRY OFFERED AND DESIGNED COURSES

DEPARTMENT OF CIVIL ENGINEERING

AECOSIM BUILDING DESIGNER

(INDUSTRY DESIGNED /OFFERED COURSE, 45 HOURS)

Unit 1 – Modelling Architectural Elements

Modeling Walls, Doors and Windows - Modeling Interior Floors - Creating Architectural Drawings and Schedules - Modeling Structural Frames - Modeling Slabs and Foundations - Creating Structural Drawings

Unit 2 – Modelling Additional Elements

Modeling Equipment and Ductwork - Modeling Diffusers, Grilles, and Branches - Creating Mechanical Drawings - Design File Setup and Symbol Placement - Symbol Arrangement and Raceways - Generating Drawings and Reports

Unit 3 – Special and Custom modelling

Creating a Massing Model - Creating a Stacking Model - Spaces and Grids - Creating a Curved Facade - Creating a User-Defined Node Type

Unit 4 – Structural BIM

Floors and Grids - Concrete Foundations - Structural Frame - Structural Walls - Structural Data Management and Reporting

Unit 5 – Practical Learning of AECOsim Building Designer

3D building information modeling environment - utilizing views - floor manager - getting an understanding of the information systems - drawing composition model - create a floor plan - - building section of a small commercial building - create a Finish Schedule for the same building.

INDUSTRY OFFERED AND DESIGNED COURSESDEPARTMENT OF CIVIL ENGINEERING

PROSTRUCTURES

(INDUSTRY DESIGNED /OFFERED COURSE, 45 HOURS)

Unit 1 –ProConcrete:3D Modeling Fundamental

Introduction about ProConcrete - Part Families and MKN Practice - Piece Marking and MarkFlags - Fabrication DetailStyles.

Unit 2 – ProConcrete: 2D Detailing Deneral

Material Take Offs - DetailCenter Environment - DetailStyles - 2D Drawing Creation andEditing.

Unit 3 - ProConcrete: Creating the Models

Templates and Configuration - Creating a Workframe and Shape Insertion - Managing Views - Modeling Plates - Modification Tools.

Unit 4 – ProConcrete: Detailing the Models

Grouping, Drilling, Bolting and Welding - Parametric Elements - Parametric Connections -User Shapes and Native Exports.

Unit 5 – Practical Learning of ProConcrete

Workframes - create and edit concrete beams - columns – footings – slabs - creation of astructure using the ProConcrete Elements - concrete solid overlay – Import structures.

CERTIFICATION COURSE ON GREEN BUILT ENVIRONMENT

B.E CIVIL/ MECHANICAL/ ELECTRICAL/ ARCHITECTURAL/ ENVIRONMENTAL

Course Duration	**45 Hours**
Credits	-

Course objectives:

- **Impart knowledge on Green concepts in design, construction & operation of buildings**
- **Exposure to the latest Green Building trends & technologies**

Unit -1: Sustainable Architecture & Sites (6 hours)

- Integrated Approach for Green Building design: Factors for Site selection, Understanding Site Ecology & Site Analysis
- Soil erosion & pollution control measures: types of Soil Erosion, strategies to Mitigate Land Degradation, Design Techniques & Challenges
- Microclimate: Factors affecting microclimate & heat Islands, Strategies to handle heat island in built environment, Designing Green Spaces and Enhancing Biodiversity in built environment
- Universal Design: Key accessibility issues and Design guidelines

Unit-2: Water Management (8 hours)

- Water Balance and approach for water efficiency: 3R Approach for water efficiency – Reduce, Reuse/ Recycle and Recharge
- Water efficient plumbing fixtures, Standards & Codes
- Efficient irrigation practices – Hydrozoning, Control devices for water supply, Irrigationsystems – Drip & Sprinklers
- Wastewater treatment & reuse, wastewater treatment technologies: Physical, Biological and Natural
- Rainwater harvesting and utilisation, Groundwater recharge techniques: Design considerations

Unit-3: Energy Management (10 hours)

- Introduction, Performance Evaluation and Approach for Energy Efficiency in Buildings
- Energy Efficiency Standards & Codes: ECBC 2017 & EPI, ASHRAE 90.1, ASHRAE 62.1,ASHRAE 55, ASHARE 170, ISHRAE 1001, Star labelling for appliances
- Efficient Building Envelope: Heating loads in buildings, Building orientation and form,Envelope Heat Transfer & Material Specifications – Wall, Roof & Fenestration
- Air Conditioning: Types of air conditioning systems, Design Considerations and controlsystems
- Lighting in Building: Daylighting & Artificial Lighting, Methods to determine ECBC compliance for interior lighting and Lighting Controls
- Renewable Energy systems and technologies

Unit-4: Sustainable Building Materials (6 hours)

- Attributes of Sustainable Building Materials: Recycled content, Regional material, Renewable material, Embodied energy, Embodied carbon, Material performance, Recyclability, Elimination of hazardous materials
- Ecolabeling of Products: Types of Ecolabels – Type I, II & III
- Sustainable Materials for Green Buildings: Ready mix concrete, Construction Blocks, Glass, Steel TMT Bars, Construction Chemicals, Insulation Materials, Cement, Paints
- Waste management during construction & post-occupancy: Segregation strategies, Types of waste management – organic, inorganic, e-waste, hazardous waste

Unit-5: Indoor Environmental Quality (10 hours)

- Indoor Air quality: Codes and Standards, Fresh air requirements, Designconsiderations
- Approach for improving Indoor air quality: Measures to reduce sick building syndrome, Demand control ventilation, CO2 monitoring in buildings, Air quality monitoring
- Enhancing occupants' Comfort, Health and Wellbeing: Thermal Comfort, Visual Comfort, Acoustics, Ergonomics, Olfactory Comfort.

Course outcomes:

At the end of the course the student will be able to:

- **Students would be Industry ready for in their careers in green built environment**
- **Opportunity to get accredited as 'IGBC AP - Associate'**

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Guide on Green Built Environment	IGBC	IGBC	2021
2	IGBC Green New Buildings rating system	IGBC	IGBC	2016
3	IGBC Green Homes rating system	IGBC	IGBC	2019
Reference Books				
1	National Building Code	Bureau of Indian Standards	Bureau of Indian Standards	2016
2	ECBC	Bureau of Energy Efficiency	Bureau of Energy Efficiency	2017
3	ASHRAE 90.1, 62.1, 55	ASHRAE	ASHRAE	2010

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

PREAMBLE

Commercialization of innovation and new products in fast-paced, high-tech markets and matchingtechnological innovation to market opportunities.

PREREQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

Pre-launch, during launch and Post launchpreparations;

SYLLABUS:

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

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

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

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

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

Text Book:

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

Reference Books:

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

COURSE DESIGNERS:

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

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

PREAMBLE

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

PREREQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

STARTING NEW VENTURE: Opportunity identification - Search for new ideas - Sources of innovative ideas - Techniques for generating ideas - Entrepreneurial imagination &creativity - The role of creative thinking - Developing your creativity - Impediments to creativity.

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

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

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

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

Text Book:

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

Reference Books:

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

COURSE DESIGNERS:

S.No	Name of the faculty	Designation	Department	E-Mail Id
1	A. Mani	Associate Professor	Management Studies	mani@vmkvec.edu.in
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	SOCIAL ENTREPRENEURSHIP	Category	L	T	P	Credit
		OE-IE	3	0	0	3

PREAMBLE

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

PREREQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

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

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

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

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

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

Text Book:

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

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

Reference Books:

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

COURSE DESIGNERS:

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1	A. Mani	Associate Professor	Management Studies	mani@vmkvec.edu.in
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	ENGINEERING STARTUPS AND ENTREPRENEURIAL MANAGEMENT	Category	L	T	P	Credit
		OE-IE	3	0	0	3

PREAMBLE:

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

PREREQUISITE: NIL

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

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

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

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

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

Startup Capital Requirements and Legal Environment:

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

Text Book:

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

Reference Books:

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

COURSE DESIGNERS:

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	INTELLECTUAL PROPERTY RIGHTS	Category	L	T	P	Credit
		OE-IE	3	0	0	3

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

PREREQUISITE: NIL

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

Unit 1 - Overview of Intellectual Property

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design –

Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.

Unit 2 - Patents & Copyright

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

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

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

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

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

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

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

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

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

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

UNIT – V: Legislation of IPRs and Alternate Dispute Resolution

Legislation of IPRs: The Patent Act of India, Patent Amendment Act (2005), Design Act, Trademark Act, Geographical Indication Act, Bayh- Dole Act - Patent Ownership and Transfer, Patent Infringement, International Patent Law

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

Text Books:

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

Reference Book:

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

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	Mail ID
1	P. S. Balaganapathy	Associate Professor	Management	dydirectormanagementstudies@avit.ac.in
2	A. Mani	Associate Professor	Management	mani@vmkvec.edu.in

	GREEN POWER GENERATION SYSTEMS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

The course presents the various sources of renewable energy including wind, solar, and biomass as potential sources of energy and investigates the contribution they can make to the energy profile of the nation. The technology used to harness these resources will be presented. Discussions of economic, environment, politics and social policy are integral components of the course.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	Understand the nexus between energy, environment, and sustainable development
2	Appreciate energy ecosystems and its impact on environment
3	Learn basics of various types of renewable and clean energy technologies
4	Serve as bridge to advanced courses in renewable energy

COURSE OUTCOMES

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

CO1: Explain renewable energy sources & systems.	Understand
CO2: Apply engineering techniques to build solar, wind, tidal, geothermal, biofuel, fuel cell, Hydrogen, and sterling engine.	Apply
CO3: Analyze and evaluate the implication of renewable energy. Concepts in solving numerical problems pertaining to solar radiation geometry and wind energy systems.	Analyze
CO4: Demonstrate self -learning capability to design & establish renewable energy systems.	Analyze
CO5: Conduct experiments to assess the performance of solar PV, solar thermal and biodiesel 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	-	L	L	-	-	-	-	M	-	-
CO2	S	M	S	L	M	-	L	M	-	M	-	-	-	-	-
CO3	S	-	-	-	M	-	-	M	M	-	-	-	L	-	-
CO4	S	-	-	-	M	-	L	-	-	-	-	M	-	-	-
CO5	S	M	S	L	M	-	L	M	-	M	M	-	M	L	-
CO6	S	-	-	-	M	-	L	L	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

ENERGY

Introduction to the nexus between energy, environment and sustainable development, Energy sources overview and classification, sun as the source of energy, fossil fuel reserves and resources - overview of global/ India's energy scenario. Energy consumption models – Specific Energy Consumption

ECOLOGY AND ENVIRONMENT

Concept and theories of ecosystems, - energy flow in major man-made ecosystems- agricultural, industrial and urban ecosystems - sources of pollution from energy technologies and its impact on atmosphere - air, water, soil, and environment - environmental laws on pollution control, The environmental protection act: Effluent standards and ambient air quality, innovation and sustainability, eco-restoration: Phyto-remediation.

RENEWABLE SOURCES OF ENERGY

Solar Energy: Solar radiation: measurements and prediction. Indian's solar energy potential and challenges, solar energy conversion principles and technologies: Photosynthesis, Photovoltaic conversion, and Photo thermal energy conversion. Wind Energy: Atmospheric circulations, atmospheric boundary layers, classification, factors influencing wind, wind shear, turbulence, wind energy basics and power Content, wind speed monitoring, Betz limit, wind energy conversion system: classification, characteristics, and applications. Ocean Energy: Ocean energy resources-ocean energy conversion principles and technologies: ocean thermal, ocean wave & ocean tide

BIOENERGY

Biomass as energy resources; bio-energy potential and challenges, Classification, and estimation of biomass; Source and characteristics of biofuels: Biodiesel, Bioethanol, Biogas. Types of biomass energy conversion systems - waste to energy conversion technologies

OTHER ENERGY SOURCES AND SYSTEMS

Hydropower, Nuclear fission, and fusion-Geothermal energy: Origin, types of geothermal energy sites, site selection, geothermal power plants; hydrogen energy, Magneto-hydro-dynamic (MHD) energy conversion – Radioisotope Thermoelectric Generator (RTG), Bio-solar cells, battery & super capacitor, energy transmission and conversions.

TEXTBOOKS:

1. Energy and the Environment, Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A., 2nd Edition, John Wiley, 2006,
2. Energy and the Challenge of Sustainability, World Energy assessment, UNDP, N York, 2000.

REFERENCE BOOKS:

1. Ocean Energy: Tide and Tidal Power by R. H. Charlier and Charles W. Finkl, Springer 2010
2. Introduction to Electrodynamics (3rd Edition), David J. Griffiths, Prentice Hall, 2009

COURSE DESIGNERS

S. No.	Name of the Faculty	Designation	Department	Mail ID
1	Dr. R. Devarajan	Professor	EEE	devarajan@vmkvec.edu.in
2	Mr. R. Sathish	Assistant Professor	EEE	sathish@vmkvec.edu.in
3	Mr. V.Rattankumar	Assistant Professor	EEE	rattankumar@avit.ac.in

	INDUSTRIAL DRIVES AND AUTOMATION	Category	L	T	P	C
		OE-EA	3	0	0	3

Preamble

To introduce foundation on the principles of drives & automation and their elements with the implementation.

PREREQUISITE : NIL

COURSE OBJECTIVES

1	To explore the various AC,DC & Special Machine Drives for industrial Application
2	To study about the various Open loop and closed loop control schemes for drives
3	To know about hardware implementation of the controllers using PLC
4	To study the concepts of Distributed Control System
5	To understand the implementation of SCADA and DCS

COURSE OUTCOMES

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

CO 1	To understand working principles of various types of motors, differences, characteristics and selection criteria.	Understand
CO 2	To apply the knowledge in selection of motors, heating effects and braking concepts in various industrial applications	Apply
CO 3	To explain control methods of special drives	Understand
CO 4	To carry out programming using PLC and use of various PLCs to Automation problems in industries.	Understand
CO 5	To discuss supervisory control and data acquisition method and use the same in complex automation areas	Understand
CO6	To understand and use logical elements and use of Human Machine Interfacing devices to enhance control & communication aspects of Automation	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	S	L	-		S	S	-		L	-	-	-	-	L
CO2	M	-	M	-	S	L	M	-	M	L	-	-	L	-	-
CO3	M	-	M	-	S	L	M	-		L	-	-	-	M	-

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

SYLLABUS

INTRODUCTION

Working principle of synchronous, Asynchronous & stepper motors, Difference between Induction and servo motors, Torque v/s speed characteristics, Power v/s. Speed characteristics, Vector duty induction motors, Concepts of linear and frameless motors, Selection of feedback system, Duty cycle, , V/F control, Flux Vector control.

INDUSTRIAL DRIVES

Electric drive – Definition – Parts – Types -Individual – Group – Multi motor. Stepper motor – Definition – Step angle – Slewing rate -Types -Variable reluctance -Hybrid – Closed loop control of stepper motor – Drive system(any one) – logic sequencer – Optical encoder. Servo motor – Definition – Types -DC servo motor – Permanent magnet DC motors – Brushless motor – AC servo motor -Working of an AC servo motor in control system – Induction motors – Eddy current drive for speed control of induction motors.

PROGRAMMABLE LOGIC CONTROLLER

Definition Conventional Hard wired logic Relays- Features of PLC- Advantages of PLC over relay logic – Block diagram of PLC -Programming basics of PLC – Ladder logic -Symbols used in ladder logic – Logic functions – Timers – Counters – PLC networking – Steps involved in the development of Ladder logic program – Program execution and run operation by PLC – Ladder logic diagram for liquid level operation. List of various PLCs and their manufactures.

DISTRIBUTED CONTROL SYSTEM

Evolution of distributed control system -Definition of DCS – Functional elements of DCS – Elements of local control unit -Interfaces-Types of information displays – Architecture of anyone commercial DCS – Advantages of DCS -Selection of DCS – List of various DCS and their manufactures.

SUPERVISORY CONTROL & DATA ACQUISITIONS

Introduction to Supervisory control & data Acquisitions, distributed Control System (DCS): computer networks and communication in DCS. different BUS configurations used for industrial automation – GPIB, HART and OLE protocol, Industrial field bus – FIP (Factory Instrumentation Protocol), PROFIBUS (Process field bus), Bit bus. Interfacing of SCADA with controllers, Basic programming of SCADA, SCADA in PC based Controller / HMI.

TEXTBOOK

1. 1. G.K.Dubey, Fundamentals of Electrical Drives', Narosa Publication,2002.
2. Frank D.petruzellaprogrammable logic controlsthird edition TATA mc graw-hill edition 2010.
3. M.S.Berde, Electric Motor Drives Khanna publishers.2008

REFERENCES

1. Pradheep kumar srivastava, Programmable logic controllers with applications', BPB publications.2004.
2. John W.Webb, Ronald A.Reis, Programmable logic controllers-Principles and Applications', Fifth Edition, Prentice Hall of India.
3. Michel P.Lukas, Distributed Control system', van Nostrand Reinhold Co, 1986
4. R.Srinivasan Special electrical Machines lakshmi publication.2012
5. Process Control Instrumentation Technology, Johnson Curties, Prentice hall of India, 8th edition
6. Andrew Parr, Industrial drives, Butterworth – Heineaman

COURSE DESIGNERS

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1	Dr.L.Chitra	Professor	EEE/AVIT	chitra@avit.ac.in
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	PRINCIPLES OF BIOMEDICAL INSTRUMENTATION	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

To enable the students to develop knowledge of principles, design and applications of the Biomedical Instruments.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To know about bioelectric signals, electrodes and its types.
2	To know the various Biopotential recording methods.
3	To study about patient monitoring concept and various Physiological measurements methods.
4	To study the principle of operation blood flow meter, blood cells counter.
5	To study about bio chemical measurements and details the concept of biotelemetry and patient safety.

COURSE OUTCOMES

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

CO1. Explain the different Bio signal or biopotential.	Understand
CO2. Discuss the working principles of diagnostic and therapeutic equipments.	Understand
CO3. Examine the various instruments like as ECG, EMG, EEG, X-ray machine.	Apply
CO4. Illustrate medical instruments based on principles and application used in hospital.	Analyze
CO5. Analyze and calibrate fundamental biomedical instrumentation used in hospital.	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	--	--
CO2	M	--	--	--	--	--	--	--	L	--	--	L	M	--	--
CO3	S	S	M	S	M	--	--	--	M	--	--	M	M	M	S
CO4	S	M	M	M	L	--	--	L	S	L	--	S	M	S	S
CO5	S	S	M	M	L	M	--	L	S	L	--	S	M	S	S

S- Strong; M-Medium; L-Low

SYLLABUS

BIOELECTRIC SIGNALS AND ELECTRODES

Basic medical instrumentation system, Origin of Bioelectric Potential, Recording electrodes – Electrode Tissue interface, Electrolyte – skin interface, Polarization, Skin contact impedance, motion artifacts. Electrodes – Silver – silver chloride electrodes, electrodes for ECG, electrodes for EEG, electrodes for EMG, Electrical conductivity of electrode jellies and creams, Microelectrodes.

BIO AMPLIFIER AND BIOMEDICAL RECORDERS

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

PATIENT MONITORING SYSTEM AND NON ELECTRICAL PARAMETERS MEASUREMENTS

System concepts of patient monitoring system, Bedside patient monitoring system, central monitors, Blood pressure measurement, Measurement of temperature, Respiration rate measurement, cardiac output measurement, Measurement of pulse rate, Plethysmography technique.

BLOOD FLOW METERS, BLOOD CELL COUNTERS

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

BIO- CHEMICAL MEASUREMENTS AND BIOTELEMETRY AND PATIENT SAFETY

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

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.

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

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1	Dr. N.Babu	Professor	BME	babu@vmkvec.edu.in
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	BIOSENSORS AND TRANSDUCERS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

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

PREREQUISITE – Nil

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

S- Strong; M-Medium; L-Low

SYLLABUS

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

TRANSDUCERS:

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

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

PREAMBLE

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

PREREQUISITE – NIL

COURSE OBJECTIVES

1	Students will recognize the types and differences between existing energy resources, understand their procurement and utilization, and their impacts on society and the environment
2	Students will be knowledgeable of the existing and potential future sources of renewable energy, and be able to intelligently analyze reported aspects of the energy and renewable energy fields.

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

OVERVIEW OF BIOFUELS

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

BIODIESEL

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

BIOETHANOL

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

BIOMETHANE AND BIOHYDROGEN

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

OTHER BIOFUELS

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

TEXT BOOKS:

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

REFERENCES:

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

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

PREAMBLE

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

PREREQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO FOOD BIOTECHNOLOGY

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

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

BIOTECHNOLOGY METHODS IN FOOD PROCESSING:

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

HURDLE TECHNOLOGY :

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

FOOD SAFETY & SECURITY:

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

TEXT BOOKS:

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

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

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

REFERENCES:

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

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

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

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	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

This syllabus is intended for the Engineering students and enable them to lean about Artificial Intelligence. This syllabus contains intelligent agent, Knowledge Representation and Game playing. Thus, this syllabus focuses on to know about AI and its concepts .

PREREQUISITE

NIL

COURSE OBJECTIVES

1.	To introduce the basic principles, techniques, and applications of Artificial Intelligence.
2.	To have knowledge of generic problem-solving methods in Artificial Intelligence.
3.	To design software agents to solve a problem.
4.	Apply the knowledge of algorithms to solve arithmetic problems.
5.	Assemble an efficient code for engineering problems.

COURSE OUTCOMES

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

CO1:. Identify the different agent and its types to solve the problems	Understand
CO2: know about the problem solving technique in Artificial Intelligence.	Apply
CO3: Construct the normal form and represent the knowledge.	Apply
CO4: to know about extension of condition probability and how to apply in the real time environment.	Apply
CO5: To lean about Information Retrieval and Speech Recognition	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

INTRODUCTION

What is AI? – AI Problems – What is an AI technique – Defining the problem as a state space search – Production system - Production system – Characteristics – Problem Characteristics?

HEURISTIC SEARCH TECHNIQUES

Generate and test – Hill Climbing – Best first Search – Problem Reduction – Constraints satisfaction – Means end analysis.

KNOWLEDGE REPRESENTATION

Propositional Logic-First Order Predicate Logic-Prolog Programming-Unification-Forward Chaining- Backward Chaining-Ontological Engineering-Categories and Objects-Events-Mental Events and Mental Objects.

REPRESENTING KNOWLEDGE USING RULES

Procedural versus – Declarative Knowledge – logic Programming – Forward versus Backward Reasoning – Matching

GAME PLAYING

The Minimax search procedure – Adding Alpha Beta cut offs – Addition Refinements – Waiting for Quiescence – Secondary Searches – Using Book moves.

TEXT BOOKS

1. S. Russell and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2015
Bratko, I., Prolog Programming For Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th Edition, 2011..

REFERENCES

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: A Logical Approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies For Complex Problem Solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A New Synthesis", Elsevier Publishers, 1998.

COURSE DESIGNERS

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	INTRODUCTION TO INTERNET OF THINGS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

Introduction to IoT for statistical data manipulation and analysis. It was inspired by and is most compatible with the statistical language.

PREREQUISITE

NIL

COURSE OBJECTIVES

1.	To learn Introduction to IoT
2.	To Study methodology of IoT
3.	To Develop IoT applications using Arduino and Intel Edition

COURSE OUTCOMES

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

CO1: To Understand the basics in Introduction to IoT in terms of constructs, control statements, string functions	Understand & Apply
CO2: know about the problem solving technique in Artificial Intelligence.	Understand & Apply
	Understand & Apply
CO2: To Understand the use of Introduction to IoT fundamentals.	Understand & Apply
CO5: To lean about Information Retrieval and Speech Recognition	Understand & Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUSINTRODUCTION to IoT

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

IoT & M2M

Machine to Machine, Difference between IoT and M2M, Software define Network

Network & Communication aspects

Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

Domain specific applications of IoT

Design challenges, Development challenges, Security challenges, Other challenges

Reflection, Low-Level Programming

Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

TEXT BOOKS

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

REFERENCES

1. Macro Schewartz, "Internet of Things with the Arduino Yun" Packet Publishing, 2014.

COURSE DESIGNERS

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	CYBER SECURITY	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

To understand the need for Cyber Security in real time and to study techniques involved in it.

PREREQUISITE : NIL

COURSE OBJECTIVES

1.	To understand the fundamentals of Cyber Security and issues
2.	To study various cyber crimes and legal remedies
3.	To apply various privacy and security
4.	To study E-Commerce and digital payments
5.	To study the basic security aspects related to Computer and Mobiles

COURSE OUTCOMES

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

CO1: able to understand the concept of Cyber security and issues and challenges associated with it.	Understand
CO2: able to understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures	Apply
CO3: able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.	Apply
CO4: able to understand the basic concepts related to E-Commerce and digital payments.	Apply
CO5: able to understand the basic security aspects related to Computer and Mobiles.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION TO CYBER SECURITY **9 hours**
Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.
CYBER CRIME AND CYBER LAW **9 hours**
Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.
SOCIAL MEDIA OVERVIEW AND SECURITY **9 hours**
Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.
E - C O M M E R C E AND DIGITAL PAYMENTS **9 hours**
Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payament Settlement Act,2007.
DIGITAL DEVICES S E C U R I T Y , TOOLS AND TECHNOLOGIES FOR CYBER SECURITY **9 hours**
End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.
REFERENCES
1. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011) 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001) 4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd. 5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers. 6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd. 7. Fundamentals of Network Security by E. Maiwald, McGraw Hill

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	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

Industry 4.0 and Industrial Internet of Things is the pioneer of today's modern technology. To match the engineering skills with the industry skills this subject will induce and impart the knowledge among the young professionals.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Industry 4.0 concerns the transformation of industrial processes through the integration of modern technologies such as sensors, communication, and computational processing.
2	Technologies such as Cyber Physical Systems (CPS), Internet of Things (IoT), Cloud Computing, Machine Learning, and Data Analytics are considered to be the different drivers necessary for the transformation.
3	Industrial Internet of Things (IIoT) is an application of IoT in industries to modify the various existing industrial systems.
4	IIoT links the automation system with enterprise, planning and product lifecycle.
5	Real case studies

COURSE OUTCOMES

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

CO1. Apply & Analyzing the transformation of industrial process by various techniques.	Analyze
CO2. Evaluate the transformation technologies are considered to be the different drivers.	Apply
CO3. Existing industrial systems will adopt the applications of IIoT.	Apply
CO4. Intensive contributions over automation system with enterprise, planning and product life cycle	Analyze
CO5. Analyze of various Real time case studies.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	S	S	M	-	M	-	-	-	-	-	-	M	S	M	-
CO2	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO3	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO4	S	S	S	M	M	-	-	-	-	-	-	M	S	M	M
CO5	S	S	S	S	M	-	-	-	-	-	-	M	S	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO INDUSTRY 4.0 ANDINDUSTRIAL INTERNET OF THINGS Introduction: Sensing & actuation, Communication-Part I, Part II, Networking-Part I, Part II.Industry 4.0: Globalization, The Fourth Revolution, LEAN Production Systems, Cyber Physical Systems and Next Generation Sensors, Collaborative Platformand Product Lifecycle Management

INDUSTRIAL INTERNET OF THINGS& IT'S LAYERS

Cybersecurity in Industry 4.0, Basics of Industrial IoT: Industrial Processes-Part I, Part II, IndustrialSensing & Actuation. IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT- Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II, Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II.

IIoT COMMUNICATION

Communication-Part I, Industrial IoT- Layers: IIoT Communication, IIoT Networking-Part I, Part II, Part III. Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Industrial IoT

IIoT BIG DATA & SDN APPLICATIONS

Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II, Industrial IoT- Application Domains. Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

APPLICATIONS & REAL TIME CASE STUDIES

Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies - Virtual reality lab, Manufacturing industries – part one, Manufacturing industries – part two, Milk processing and packaging industries, Steel technology lab, Student projects – part one, Student projects – part two

TEXT BOOKS:

1. Anandarup Misra, Sudip | Roy, Chandana | Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0, CRC press, 2003.

REFERENCE BOOKS:

1. Gilchrist, Alasdair, "Introduction to IoT", Apress, 2016 2.Gilchrist, Alasdair "IIoT Reference Architecture", Apress, 2016

COURSE DESIGNERS

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

	DESIGN OF ELECTRONIC EQUIPMENT	Category	L	T	P	Credit
		OE-EA	3	0	0	3

PREAMBLE

The objective of this course is to sensitise a registrant to various aspects of an electronics product. Specifically on non-Electrical aspects like mechanical design and detailing. Starting from a need translated into specifications, leading to design and prototyping and ending up in a manufacturable physical prototype.

PREREQUISITE – BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OBJECTIVES

1	To understand the various Concept of Industrial Design process.
2	To apply the basic Concept of electronic Product designs methodology.
3	To classify the Concept of Ergonomics & aesthetics in product design.
4	To understand the Knowledge regarding the design of product packaging and working environment.
5	To understand the Knowledge of different industrial standard and value analysis.

COURSE OUTCOMES

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

CO1. Visualize the concept for product design with respect to ergonomics and aesthetics.	Remember
CO2. Analyze, design and implement control panels of electronic equipment	Apply
CO3. Apply creativity in the design of system by formulating architecture with proper placement of components.	Apply
CO4. Apply the concept of visual communication techniques in product design.	Apply
CO5. Apply the process of value analysis in existing product.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

MODULE 1: INTRODUCTION

Introduction to industrial design, Role of industrial design in the domain of industry, Generic product development process, ID process, Product innovations, tools and methods.

MODULE 2: PRODUCT PROTOTYPES

Management of ID process, Product architecture, Structure: standard and non-standard structures. Product prototypes.

MODULE 3: PRODUCT DESIGN AND PLANNING

Electronic product design and development Methodology, Creativity techniques, brainstorming documentation.

Product planning: Defining the task, scheduling the task and its execution. Costing and Pricing of Industrial design,

MODULE 4: ERGONOMICS

Ergonomics: Ergonomics of electronic equipment, Ergonomics of control panel design. Use of ergonomics at work places and plant layout. Aesthetics: Elements of aesthetics, aesthetics of control panel design.

MODULE 5: CASE STUDIES

Value engineering, Product quality and design management. Industrial standards, Graphics and packaging

TEXTBOOKS:

1. Carl T. Ulrich, Steven. D. Eppinger," "Product Design and Development", McGraw Hill Companies.

REFERENCE BOOKS:

1. Ernest J Mccormick ,"Human factors in Engineering and Design" -, McGraw-Hill Co.

2. Yammiyavar P," Control Panel Design and Ergonomics", CEDT/IISc Publication.

3. Murrell K, Chapman," Ergonomics: Man in his Working Environment", &Hall. London. Flurschiem C H, "Industrial Design and Engineering Design ", Council, London and Springer Verlag, 1983

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mail ID
1	Mr.Rajat Kumar Dwibedi	Assistant Professor	ECE	rajatkumar.ece@avit.ac.in
2	Dr. L.K.Hema	Prof. & Head/ ECE	ECE	hodece@avit.ac.in
3	Mr.G.Murali	Assistant Professor	ECE	muralig@vmkvec.edu.in

	3D PRINTING AND ITS APPLICATIONS	Category	L	T	P	Credit
		OE-EA	3	0	0	3

Preamble

The course is designed to impart knowledge and skills related to 3D printing technologies its type applications.

Prerequisite – NIL

Course Objective

1	To Know the importance of 3D printing in Manufacturing
2	To know about Vat Photo Polymerization & Material Jetting.
3	To know about binder jetting material extrusion & sheet lamination
4	To know about the methods for powder bed fusion & direct energy deposition.
5	To know about the applications of 3D Printing.

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

CO1.	Importance of 3D printing in Manufacturing	Remember
CO2.	Vat Photo Polymerization & Material Jetting.	Understand
CO3.	Binder jetting material extrusion & sheet lamination	Understand
CO4.	Powder bed fusion & direct energy deposition.	Understand
CO5.	Applications of 3D Printing.	Understand

Mapping with Programme Outcomes and Programme Specific Outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	M	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	M	L	M	-	S	M	M	-	-	-	-	-	M	M-	M
CO3	M	L	M	-	S	M	M	-	-	-	-	-	M	M-	M
CO4	M	L	M	-	S	M	M	-	-	-	-	-	M	M-	M
CO5	M	L	L	-	-	-	-	-	-	-	-	-			

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION

Need - Development of AM systems – AM process chain -Classification of AM processes- Applications- Advantages of AM and Types of materials for AM.Introduction to STL format, Pre & Post-processing of STL files, Various slicing methods, Part orientation and support generation, Support structure design, Tool path generation

VAT PHOTO POLYMERIZATION & MATERIAL JETTING

Vat Photo polymerization - Stereo lithography process, working principle, advantages and disadvantages, Material Jetting - process, working principle, advantages and disadvantages.

BINDER JETTING-MATERIAL EXTRUSION & SHEET LAMINATION

Binder Jetting- process, working principle, advantages and disadvantages. Material Extrusion –Fused Deposition Modeling process, working principle, advantages and disadvantages. Sheet Lamination – Laminated Object Manufacturing process, working principle, advantages and disadvantages.

POWDER BED FUSION & DIRECT ENERGY DEPOSITION

Powder Bed Fusion – Selective Laser Sintering process, working principle, advantages and disadvantages, Direct Energy Deposition- process, working principle, advantages and disadvantages.

APPLICATIONS OF 3D PRINTING

Applications for 3D Printing - Use of 3D Printing-Limitations of 3D Printing and Further Development of Medical 3D Printing Applications. Use of Multiple Materials in 3D Printing-Embedded Component 3D Printing, Commercial Applications Using Multiple Materials, Future Directions, Business Opportunities and Future Directions.

Text Books

1	Ian Gibson, David Rosen, and Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, New York, NY, 2015.
2	Venuvinod, Patri K., and Weiyin Ma. Rapid prototyping: laser-based and other technologies. Springer Science & Business Media, 2013.

Reference Books

1	Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2003.
2	Ali K. Kamrani, Emand Abouel Nasr,"Rapid Prototyping: Theory & Practice", Springer, 2006.
3	Kumar, L. Jyothish, Pulak M. Pandey, and David Ian Wimpenny, eds. 3D printing and additive manufacturing technologies. Singapore: Springer, 2019.

Course Designers

Sl.No	**Faculty Name**	**Designation**	**Department/ Name of the college**	**Email id**
1	S.Kalyanakumar	Assistant Professor Gr II	Mech / AVIT	kalyanakumar@avit.ac.in

		Category	L	T	P	Credit
	INDUSTRIAL ROBOTICS	**OE-EA**	**3**	**0**	**0**	**3**

Preamble

The objective of this course is to impart knowledge about industrial robots for their control and design.

Prerequisite :

NIL

Course Objective

1	To introduce basic concepts, parts of robots and types of robots
2	To learn about Robot kinematics and dynamics
3	To learn different types of sensors used in robots and its control
4	To understand the different types of actuation systems used in robots
5	To understand the robot control Systems, programming of robots and its Applications.

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

CO1.	Understand the basic configurations and kinematic systems of robots	Understand
CO2.	Solve problems of robot kinematics and dynamics	Apply
CO3.	Understand the different types of sensors used in robot systems and their applications, different types of control systems used in robots	Understand
CO4.	Understand and applications of the different types of actuators used in robot systems	Understand
CO5.	Understand the Robot Applications in various fields	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**	**L**	**-**	**-**	**L**	**-**	**-**	**-**	**-**	**-**	**-**	**S**	**-**	**L**
CO2	**S**	**S**	**M**	**M**	**-**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**S**	**-**	**L**
CO3	**S**	**M**	**M**	**M**	**-**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**S**	**-**	**L**
CO4	**S**	**S**	**M**	**M**	**-**	**L**	**-**	**-**	**-**	**-**	**-**	**-**	**S**	**-**	**L**
CO5	**S**	**S**	**L**	**S**	**-**	**S**	**-**	**-**	**-**	**-**	**-**	**-**	**S**	**-**	**L**

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO ROBOTICS

Introduction to Automation and Robotics– Basic concepts, Need, Law, History, Anatomy, specifications classification, present and future applications. Components of the Industrial Robotics: common types of arms. Components, Architecture, degrees of freedom, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

ROBOT ARM KINEMATICS

Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation. Control of robot manipulators – Point to point, Continuous Path Control

GRIPPERS AND SENSORS FOR ROBOTICS

Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics, Selections of sensors. Necessity for sensors and vision system in the working and control of a robot.

ROBOT ACTUATION SYSTEMS

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools

ROBOT APPLICATIONS

Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection. Applications in Medical, Household, Entertainment, Space, Underwater, Defense, Disaster management. Micro and Nano robots, Future Applications.

Text Books

1	Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2	Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
3	Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill.

Reference Books

1	Ghosal, A., "Robotics", Oxford, New Delhi, 2006.
2	Niku Saeed B., "Introduction to Robotics: Analysis, Systems, Applications", PHI, New Delhi.
3	Steve Heath, "Embedded System Design", 2nd Edition, Newnes, Burlington, 2003
4	Merzouki R., Samantaray A.K., Phathak P.M. and Bouamama B. Ould, "Intelligent Mechatronic System: Modeling, Control and Diagnosis", Springer.

Course Designers

S.No	Faculty Name	Designation	Department/Name of the College	Email id
1	P.KUMARAN	AP-II	MECH/AVIT	kumaranp@avit.ac.in

	BIOMOLECULES – STRUCTURE AND FUNCTION	Category	L	T	P	C
		OE-EA	3	0	0	3

PREAMBLE

Biomolecules like carbohydrates, proteins, fat are vital components of any living system. Basic knowledge about them helps in maintaining a healthy lifestyle, free of sickness and a general awareness about hygiene.

PREREQUISITE NIL

COURSE OBJECTIVES

1	To give an overview of importance of biomolecules
2	To elaborate the structure of proteins and nucleic acids and its role in disease.
3	To enumerate the role of carbohydrates and their cellular function in physiology and pathology
4	To enumerate the role of lipids and their cellular function in physiology and pathology.
5	To briefly cholesterol and its role in diseases

COURSE OUTCOMES

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

CO1. Relate the basics of biomolecules in and around him	Understand
CO2. Understand the structure of biomolecules such as proteins and nucleic acids	Understand
CO3. Discover the role of carbohydrates in healthy and diseased conditions	Apply
CO4. Relate disfunctioning of lipids with disease	Analyse
CO5. Criticize the role of cholesterol in diseases.	Evaluate

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PROTEINS

Protein – Structure – primary, secondary, tertiary. Types of proteins and their function. Role of each type of Protein in Health and Disease.

NUCLEIC ACIDS

Nucleic Acids – Components of nucleic acids, Conformational parameters. Nucleic acids – Types of DNA and RNA. DNA Polymorphism, Circular DNA, Supercoil DNA, DNA-Protein interactions. Role of nucelic acids in Health and disease

CARBOHYDRATES

Carbohydrates – Introduction. Types – monosaccharide, disaccharide, oligosaccharide and polysaccharides. Structure of each type. Artificial sugars. Role of carbohydrates in Health and Disease

FATTYACIDS AND LIPIDS

Fatty acids- Introduction, nomenclature, types - Saturated and unsaturated fatty acids, Essential and non-essential fatty acids.

Lipids – Introduction, Classification - simple and compound lipids, phospholipids, Cholesterol and its role in health and disease, Micelles and Liposomes : Applications in biology and medicine

CELL MEMBRANE AND CELL SIGNALING

Cell membrane - components and architecture, Various membrane models including Fluid-mosaic model. Ion channels, Receptors, Signaling molecules, Signaling mechanism, Role of cell signaling in Health and Disease. Inter-relationship of biomolecules.

TEXTBOOKS

1. Biophysical Chemistry, Part II, Techniques for the study of biological structure and function, by Cantor C.R. and Schimmel P R., W.H. Freeman and Company, 1980.

2. Nucleic Acids in chemistry and Biology, by Blackburn G.M. and gait M.J., IRL Press, 1990.

3. Biochemistry, by Voet D. and Voet J.G., John Wiley and sons, 1995.

4. Physical Biochemistry, by Freifelder D., W.H. Freeman and company, 1976-1982.

COURSE DESIGNERS

S.No.	Name of theFaculty	Designation	Department	Mail ID
1	Dr.P.David Annaraj	Assistant professor	Pharmaceutical Engineering	davidannaraj@vmkvec.edu.in
2	Ms.S.Sowmiya	Assistant Professor	Pharmaceutical Engineering	sowmiya.vmkvec@vmrf.edu.in

	PHARMACOGENOMICS	Category	L	T	P	C
		OE-EA	3	0	0	3

PREAMBLE

Pharmacogenomics involves the study of the relationship between an individual's genetic makeup and hisor her response to a drug. Pharmacogenetics, a component of pharmacogenomics, is the study of the relationship between a single gene and its response to a drug.

PREREQUISITE – NIL

COURSE OBJECTIVES

1	Discuss about the basic knowledge about pharmacogenomics and drug design using genomicapplications for drug action and toxicity.
2	Perform how individualization of drug therapy can be achieved based on a person's genetic makeupwhile reducing unwanted drug effects.
3	Outline the Pharmacogenomics studies on how genetic differences between individuals can affectresponses to various drugs.
4	Formulate on medicine skills acquired by the student and his action in different pathologies
5	Develop acquire knowledge about the influence of genetic alterations on the therapeutic effect andadverse reactions of the drugs, from a perspective of individualized therapy.

COURSE OUTCOMES

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

CO1.Recognize the effect of genetic differences between individuals in the outcome of	Remember
CO2. Describe the role of single nucleotide polymorphism as a biomarker for the	Understand
CO3. Utilize and manage the new genomics based tools as they become available as	Understand
CO4. Examine the applications of genomics principles in drug action and toxicology	Analyze
CO5. Validation of case studies related to pharmacogenomics	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PHARMACOGENOMICS AND PERSONALIZED MEDICINE

Pharmacogenetics - Roots of pharmacogenomics and it is not just pharmacogenomics, Genetic drug response profiles, the effect of drugs on Gene expression, pharmacogenomics in drug discovery and drug development. Concept of individualized drug therapy, Drivers and the promise of personalized medicine, Strategies for application of pharmacogenomics to customize therapy,Barriers.

HUMAN GENOME

Expressed sequence Tags (EST) and computational biology, Microbial genomics, computational analysis of whole genomes, computational genome analysis, Genomic differences that affect the outcome of host pathogen interactions, Protein coding genes, repeat elements, genome duplication, analysis of proteome, DNA variation, Biological complexity. Single nucleotide polymorphisms (SNP's) in Pharmacogenomics - approaches, number and types of SNPs, Study design for analysis, Analytical issues, Development of markers.

ASSOCIATION STUDIES IN PHARMACOGENOMICS

Viability and Adverse drug reaction in drug response, Multiple inherited genetic factors influence the outcome of drug treatments, Association studies in pharmacogenomics, Strategies for pharmacogenomics Association studies, Benefits of Pharmacogenomics in Drug R & D.

GENOMICS APPLICATIONS FOR DRUG ACTION, TOXICITY AND DESIGN

Platform technologies and Pharmaceutical process, its applications to the pharmaceutical industry, Understanding biology and diseases, Target identification and validation, Drug candidate identification and optimization, safety and toxicology studies. The need of protein structure information, protein structure and variation in drug targets-the scale of problem, Mutation of drug targets leading to change in

the ligand binding pocket.

PHARMACOGENOMICS – CASE STUDIES

Study of pharmacogenomics of human P-Glycoprotein, drug transporters, lipid lowering drugs, chemotherapeutic agents for cancer treatment.

TEXT BOOKS

1. Martin M. Zdanowicz, M.M. “Concepts in Pharmacogenomics” Second Edition, American Society of Health-System Pharmacists, 2017.
2. Licinio, J and Wong, Ma-Li. “Pharmacogenomics: The Search for the Individualized Therapies”, Wiley-Blackwell, 2009.
3. Yan Q, “Pharmacogenomics in Drug Discovery and Development” Humana Press, 2nd Edition, 2014.

REFERENCES

1. Brazeau, D.A. and Brazeau, G.A. “Principles of the Human Genome and Pharmacogenomics” American Pharmacist Association, 2011
2. Werner, K., Meyer, U.A., Tyndale, R.F. “Pharmacogenomics”, Second Edition, Taylor and Francis, 2005.
3. Langman, L.J. and Dasgupta, A. "Pharmacogenomics in Clinical Therapeutics", Wiley – Blackwell, 2012

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	Ms. R. Jaishri	Assistant Professor	Pharmaceutical Engineering	jaishri@vmkvec.edu.in

Course Code	Course Title	Category	L	T	P	C
	YOGA AND MEDITATION	**AC**	**0**	**0**	**2J**	**0**

OBJECTIVES:

Yoga is derived from a Sanskrit word 'yuj' which loosely means 'union.' It is a path through which an individual unites with the entire existence. Sounds heavy, right? It basically means how you are not a separate entity but part of a greater energy. It increases your consciousness and makes you realize your true self-clearing the clutter of all that you imbibed as part of your culture, family, and education. It makes you realize that there is something more than what you see around. It is a deeply spiritual practice that is part philosophy, religion, science, and exercise.

COURSE CONTENT

- Surya namaskar,Padmasana, Uttakatasana
- Surya pranayama, BrahmariPranayama
- Anjalimudra, Mahamudra, Chin Mudra
- Kapalabathikriya,Bhastrika, Tratakkriya
- Simple Meditation,YogaBreath awareness meditation,.

OUTCOMES :

- It incorporates breathing exercises, meditation and poses designed to encourage relaxation and reduce stress.
- Practicing yoga is said to come with many benefits for both mental and physical health.
- Yoga is known for its ability to ease stress and promote relaxation.
- Many people begin practicing yoga as a way to cope with feelings of anxiety.
- Could Improve Heart Health
- Improves Quality of Life.
- Could Promote Sleep Quality.
- Improves Flexibility and Balance.
- Could Help Improve Breathing.
- Promotes Healthy Eating Habits.
- Can Increase Strength.

TEXT BOOK:

YogacharyaSundaram, *Sundra Yoga Therapy*, Asana Publications, 2009

REFERENCES:

1. Dr.V.Krishnamoorthy, *Simple Yoga for Health*, Sri MathiNilayam, 2012.
2. Dr.AnandaBalayogiBhavanani, *A Primer of Yoga Theory*, Dhivyananda Creations,2008.
3. Dr.S.Hema, Easy *Yoga for Beginners*, Tara yoga Publications,2008.

4. Dr.AsanaAndiappan, *Ashtanga Yoga*, Asana Publications, 2009.
5. Dr.JohnB.Nayagam, *MudumaikkuMutrupulliVaikkumMuthiraigal*, SaaruPrabha Publications, 2010.

Course Code	Course Title	category	L	T	P	C
	INDIAN CONSTITUTION	**AC**	**2**	**0**	**0**	**0**

Course Objectives:

On completion of this course, the students will be able:

1 To understand the nature and the Philosophy of the Constitution.

2 To understand the outstanding Features of the Indian Constitution and Nature of the Federal system.

3 To Analyse Panchayat Raj institutions as a tool of decentralization.

4 To Understand and analyse the three wings of the state in the contemporary scenario.

5 To Analyse Role of Adjudicatory Process.

5 To Understand and Evaluate the recent trends in the Indian Judiciary.

Course Content

UNIT I

The Constitution - Introduction

The Historical background and making of the Indian Constitution –Features of the Indian Constitution- Preamble and the Basic Structure - Fundamental Rights and Fundamental Duties –Directive Principles State Policy

UNIT II –Government of the Union

The Union Executive- Powers and duties of President –Prime Minister and Council of Ministers - Lok Sabha and Rajya Sabha

UNIT III –Government of the States

The Governor –Role and Powers - Cheif Minister and Council of Ministers- State Legislature

UNIT IV – Local Government

The New system of Panchayats ,Municipalities and Co-Operative Societies

UNIT V – Elections

Powers of Legislature -Role of Chief Election Commissioner-State Election Commission

TEXTBOOKS AND REFERENCE BOOKS:

1 Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008

2 The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)

3 Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Fourth 2020 edition Suggested

Total Hours:30 hours

Software/Learning Websites:

1. https://www.constitution.org/cons/india/const.html

2. http://www.legislative.gov.in/constitution-of-india

3. https://www.sci.gov.in/constitution

4. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-ofindia/

Alternative NPTEL/SWAYAM Course:

S.NO	NPTEL ID	NPTEL Course Title	Course Instructor
1	12910600	CONSTITUTION OF INDIA AND ENVIRONMENTAL GOVERNANCE: ADMINISTRATIVE AND ADJUDICATORY PROCESS	PROF. M. K. RAMESH NATIONAL LAW SCHOOL OF INDIA UNIVERSITY

COURSE DESIGNER				
S.NO	**NAME OF THE FACULTY**	**DESIGNATION**	**NAME OF THE INSTITUTION**	**MAIL ID**
1	Dr.Sudheer	Principal	AV School of Law	Sudheersurya18@gmail.com

Course Code	Course Title	Category	L	T	P	C
	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	**AC**	**2**	**0**	**0**	**0**

Course Objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day to day life

Course Outcomes:

At the end of the Course, Student will be able to:

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. Illustrate the various enactments related to the protection of traditional knowledge.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Explain the importance of Traditional knowledge in Agriculture and Medicine.

UNIT-I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT-2:

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT-3:

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT-4:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT-5:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Text Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

Web Links:

1.https://www.youtube.com/watch?v=LZP1StpYEPM

Subject Code _____	Gender Equity and Law (Common to all Branches)	Category	L	T	P	Credit
		AC	2	0	0	0

Gender Equity is the provision of fairness and justice in the distribution of benefits and responsibilities between ,Men, Women, Transgender, and Gender non-binary individuals. Gender equity is important because, historically, societies around the world have deemed females, transgender people, and nonbinary people as "weaker" or less important than males.Gender equity emphasizes respecting individuals without discrimination, regardless of their gender. There are legal provisions thataddress issues like inequalities that limit a person's ability to access opportunities to achieve better health, education, and economic opportunity based on their gender.

PREREQUISITE: NIL

COURSE OBJECTIVES

1	To sensitize the students regarding the issues of gender and thegender inequalities prevalent in society.
2	To raise and develop social consciousness about gender equity among thestudents.
3	To build a dialogueand bring a fresh perspective on transgender and gender non-conforming individuals.
4	To create awareness among the students and to help them face gender stereotype issues.
5	To help the studentsunderstand the various legal provisions that are available in our society.

COURSE OUTCOMES

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

CO1.Understand the importance of gender equity	Understand
CO2.Initiate the awareness and recognize the social responsibility with regards to gender equity.	Apply
CO3.To develop a sense of inclusiveness and tolerance towards various genders without any discrimination.	Apply
CO4. To evaluate the social issues and apply suitable gender-related regulations for inclusive living.	Evaluate
CO5.To identify and analyze the existing gender inequality problems faced in various institutions.	Analyse

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT –I INTRODUCTION TO GENDER AND SEX

6hrs

Definition of Sex – Definition of Gender - Sex Vs. Gender - Social Construction of Gender and Gender Roles – GenderStereotypes - Gender Division of Labour - Patriarchy, Masculinity and Gender Equality -Feminism and Patriarchy.

UNIT –II - GENDER BIAS

6 hrs

Introduction to Gender Inequality in India - Gender Bias in Media - Misleading Advertisement And
Poor Portrayal of Women and gender non-conforming individuals- Objectification of Women, Transgender, and gender non-conforming individuals - Differential Treatment of Women, Transgender, Exploitation Caused by Gender Ideology - Female Infanticide - Honor Killing.

UNIT –III GENDER SENSITIZATION AND INTERNATIONAL CONVENTIONS 6 hrs

Gender Sensitization -Need and Objective - Gender Sensitivity Training at Workplace – GenderSensitization in Judiciary - Gender Sensitization in School Curriculum.

UNIT-IV - SEXUAL OFFENCES AGAINST WOMEN 6 hrs

Indian Penal Code, 1860 - S., 304B, 354, 354C, 354d, 376, 498A & 509 - The ImmoralTrafficPrevention Act 1986 - The Sexual Harassment of Women at Workplace (Prevention,Prohibition and Redressal) Act, 2013 - Protection of Women from Domestic Violence Act, 2005- Indecent Representation of Women Act, 1986**.**

UNIT-V ROLE OF GOVERNMENT FOR INCLUSIVE DEVELOPMENT

6hrs

Initiatives of NCERT -Role of Ministry of Women and Child Development - Governmental Initiatives: Beti BachaoBeti Padhao (BBBP) - Ujjawala Scheme - Working Women Hostels (WWH), National Council for Transgender Persons.

TEXT BOOKS

1. IGNOU: Gender Sensitization: Society, Culture and Change (2019) BGSE001, New Delhi IGNOU
2. Jane Pilcher and Imelda Whelehan (2005): Fifty Key Concepts in Gender Studies

REFERENCES:

1. Women’s Empowerment & Gender Parity: @Gender Sensitization, Dr. Shikha Bhatnagar, Repro Books (2020).

2. Gender Sensitization: Issues and Challenges, Anupama Sihag Raj Pal Singh, Raj Publications (2019).

3. Violence Against Women: Current Theory and Practice in Domestic Abuse, Sexual Violence, andExploitation (Research Highlights in Social Work), Jessica Kingsley Publishers (2012).

4. Gill, Rajesh, Contemporary Indian Urban Society- Ethnicity, Gender and Governance, BookwellPublishers, New Delhi (2009).

5. Sexual Violence Against Women: Penal Law and Human Rights Perspectives, Lexis Nexis (2009) 6. Chatterjee, Mohini, Feminism and Gender Equality, Aavishkar, Jaipur,2005.

7. Mies, Maria, Indian Women and Patriarchy, Concept Publishing Company, New Delhi, 2004.

COURSE DESIGNERS

S.No.	Name of the Faculty	Mail ID
1.	Gnana Sanga Mithra.S	sangamithra@avil.edu.in
2.	Aarthy.G	aarthy@avil.edu.in

	SURFACE AND GROUND WATER HYDROLOGY	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This course is to introduce the students about the surface and groundwater hydrology and enabling the students to work professionally in the environmental engineering sector and other related industry.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	To understand the influence of meteorology in hydrology
2	To understand the hydrological processes in surface and groundwater hydrology
3	To determine various components of aquifer characteristics
4	To determine various reservoir characteristics
5	At the end of this course students will be aware of hydrological cycle and its processes.

COURSE OUTCOMES

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

CO1. The students know the various methods of rainwater and runoff harvesting. Then apply the knowledge of soil erosion and sedimentation to estimate the life of the reservoir	Apply
CO2. Students are able to understand aquifer properties and its dynamics after the completion of the course. It's imparts exposure towards well design and practical problems of ground water aquifers.	Apply
CO3. Analyze the influence of meteorology in hydrology	Analyze
CO4. Calculate the components of aquifer characteristics	Apply
CO5. Analyze the reservoir capacity	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	--	--	--	--	M	--	--	--	--	M	--	--
CO2	M	M	L	--	--	--	--	--	--	--	--	--	--	S	M
CO3	S	-	M	--	--	--	--	--	--	--	--	--	L	--	M
CO4	S	-	M	--	--	--	--	M	--	--	--	--	L	M	--
CO5	S	M	M	--	--	--	--	--	--	--	--	--	--	L	L

S- Strong; M-Medium; L-Low

SYLLABUS

HYDROLOGY AND ITS IMPORTANCE : Definition - Branches of hydrology - Role in water resources - Meteorological and Geological parameters influencing hydrology - National Water Policy

SURFACE HYDROLOGY: Hydrology cycle - Precipitation and its abstractions - Processes, measurements and analysis of precipitation, infiltration, evaporation and evapotranspiration

RUNOFF: Process - Components - Measurement of flow - Hydrograph - Unit hydrograph - Simple models for run off estimation - Stream gauging

GROUND WATER: Aquifers - Geological formations influencing ground water - Darcy's law - Permeability Conductivity - Transmissivity - Well hydraulics - Pump tests

RESERVOIRS: Types - Storage capacity and yield estimation - Rule curve of operation - Design flood and PMF

TEXT BOOKS:

1. Garg S.K. Hydrology and Water Resources Engineering, 9th Edition, Khanna Publications, 1996.

2. Linsley R.K. and Franzini J.B., Water Resources Engineering, McGraw Hill Book Co., Inc., New York, 1990.

3. Raghunath H.M., Hydrology, Wiley Eastern Limited, New Delhi, 1985.

REFERENCE BOOKS

1. Todd,D.K., Ground Water Hydrology 2nd Edition, Wiley Eastern Limited,1985.

2. Ven Te Chow, Hand book of Applied Hydrology, McGraw Hill Book Co., Inc., New York 1964

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mrs.Subathra	Assistant Professor	Civil/AVIT	subathra@avit.ac.in
2	Mr.C. Kathirvel	Associate Professor	Civil / VMKVEC	geologykathir@gmail.com

	ENVIRONMENTAL IMPACT ASSESSMENT OF IRRIGATION PROJECTS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to environmental impact assessment and enabling the students to conduct and implement EIA studies in the agricultural sector and other related industry for the betterment of society

PREREQUISITE

Irrigation Engineering

COURSE OBJECTIVEGS

1	Understand the EIA studies and help in carrying out the EIA studies at various hydro and irrigation projects
2	Obtain essential skills to understand, critically read and evaluate, review and begin to conduct impact assessments and to balance and integrate environmental, social and economic needs
3	Apply Knowledge and skills in relation to the framework and procedures of environmental impact assessment
4	Use basic knowledge and skills to practice a number of selected methods used in Environmental impact Assessments
5	Understand the basic critical information to guide decisions about whether some hydro and irrigation projects and policies should be rejected

COURSE OUTCOMES

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

CO1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment in water resources development	Apply
CO2. The student will appreciate the importance of environment in water resources development and understand current methods of environmental assessment.	Apply
Co3. Students will become aware of future challenges facing water resources management	Analyze
Co4. Calculate the components of environmental impacts	Apply
Co5. Analyze the environmental issues	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	-	M	M	-	M	-	-	-	-	-	-	-
CO2	M	M	L		-	-	S	S	-	-	-	-	L	M	S
CO3	S	L	L	--	M	M	-	-	-	-	-	-	-	-	L
CO4	S	M	M		-	-	-	-	-	-	-	-	L	M	-
CO5	S	M	M	-	-	-	-	-	-	-	-	-	L	L	M

S- Strong; M-Medium; L-Low

SYLLABUS

ENVIRONMENTAL ISSUES: Water resources development and environmental issues – Environmental regulations and requirements - The EIA (Environmental Impact Assessment) notification

EIA FUNDAMENTALS: Environmental Impact Assessment (EIA) – EIA in Project Cycle – Legal and Regulatory aspects in India according to Ministry of Environment and Forests – Types and limitations of EIA – Participation of Public and Non-Governmental Organizations in environmental decision making

ENVIRONMENTAL IMPACTS: Hydrological and water quality impacts – Ecological and biological impacts – Social and cultural
impacts – Soil and landscape changes – Agro economic issues – Human health impacts – Ecosystem changes.

METHODS OF EIA : EIA team formation– Development of scope, mandate and study design – Base line survey – Check lists – Ad hoc procedures – Network and matrix methods – Semi-quantitative methods – ICID checklist – Economic approaches – Environmental Impact Statement (EIS) preparation.

ENVIRONMENTAL MANAGEMENT PLAN: In-stream ecological waterrequirements - Public participation inenvironmental decision making – Sustainable water resources development – Ecorestoration – Hydrology and globalclimate change – Human ecology – Ecosystem services – Environmental monitoring programs.

TEXT BOOKS:

1. L.W. Canter, "Environmental Impact Assessment", McGraw-Hill Book Company, 1995
2. Liu and Liptak, "Environmental Engineer's Handbook", CRCnet Base, 2008
3. Anjaneyulu and Valli Manickam, "Environmental Impact Assessment Methodologies", BS Publications, 1998.

REFERENCES:

1. Barthwal, R.R., Environmental Impact Assessment. New Age International Publishers, NewDelhi. 2002.
2. .Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell ScienceLondon. 1999.
3. Lawrence, D.P., Environmental Impact Assessment– Practical solutions to recurrent problems, Wiley-InterScience, New Jersey. 2003.
4. Arnel, N., Hydrology and global environmental change. Prentice Hall, Harlow. 2002.
5. Chari. B., Richa Sharma and S.A. Abbasi, Comprehensive Environmental Impact Assessment of Water Resources Projects : With Special Reference to Sathanur Reservoir Project (Tamil Nadu)/K. Discovery Pub., New Delhi, 2005.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mr.R.Johnson Daniel	Assistant Professor	Civil / AVIT	johnsondaniel@avit.ac.in
2	Mr.C. Kathirvel	Associate Professor	Civil / VMKVEC	geologykathir@gmail.com

	WATERSHED CONSERVATION AND MANAGEMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to surface and groundwater hydrology and enabling the students to work professionally in the environmental engineering sector and other related industry.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	To understand concept of need for Water conservation .
2	To analyze degradation of soil and water resources
3	To perform of the measures for soil and water conservation.
4	To provide a comprehensive treatise on the engineering practices for watershed management.
5	To acquire knowledge on national programs on watershed conservation and soil degradation

COURSE OUTCOMES

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

CO1. Students are able to develop and apply numerical model for various application along with better understanding aquifer characteristics.	Apply
CO2. Students are able to understand aquifer properties and its dynamics after the completion of the course. It's imparts exposure towards well design and practical problems of ground water aquifers.	Apply
Co3. Analyze the watershed management	Analyze
Co4. Calculate the components of aquifer characteristics	Apply
Co5. Analyze the wasteland development	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	-	-	-	-	-	-	-	-	-	M	-	-
CO2	M	M	L		-	-	-	-	-	-	-	-	M	L	-
CO3	S	M	M	--	-	-	-	-	-	-	-	-	-	M	L
CO4	S	M	M		-	-	-	-	-	-	-	-	-	-	-
CO5	S	M	M	-	-	-	-	-	-	-	-	L	L	M	L

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Watershed concept - Classification - Characteristics – Land use classifications.

SOIL CONSERVATION: Water eristic - Types of erosion - Estimation of soil loss - Conservation measures - Agricultural land, wastelands, gulley - Mechanical and agronomical options - Design details - Wind erosion and its effects - Estimationof soil loss - Prevention measures Silting of reservoirs - Catchment treatment.

WATERSHED MANAGEMENT: Basics of remote sensing technique - Data collection - Preparation of overlays use of GIS for data processing - Drought prone area program - Integrated watershed management

WATER CONSERVATION : Need for water conservation - Augmentation - Water harvesting in agricultural land and Urban lands - Traditional and new concepts

WASTELAND DEVELOPMENT : Degradation of land - Role of human and cattle - Waste land development program in India - Role of NGO - Participatory approach - Case studies

TEXT BOOKS:

1. Datta S.K., Soil Conservation and Land Management, International Book distribution, Dehra Dun, India, 1986.
2. Glenn O.Schwab et al., Soil and Water Conservation Engineering, John Wiley and Sons, New York, 1981

REFERENCES:

1. Garde R.J., Reservoir Sedimentation, INCOH Secretariat, National Institute of Hydrology, Roorkee, 1995.
2. Murthy JVS., Watershed Management in India, Wiley Eastern Limited, 1995.
3. Report of the High Level Committee on Waste Land, Development Department of Waste Land development, Ministry of Rural Areas and Employment, GOI, New Delhi, 1995

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mrs.Subathra	Assistant Professor Gr II	Civil/AVIT	subathra@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	IRRIGATION SYSTEMS MANAGEMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to surface and groundwater hydrology and enabling the students to work professionally in the environmental engineering sector and other related industry.

PREREQUISITE

Irrigation Engineering

COURSE OBJECTIVES

1	To inculcate the different types of irrigation systems and their performance based on service oriented approach
2	To acquire knowledge on advancements in irrigation systems
3	To analyze various irrigation system practices
4	To perform irrigation scheduling
5	To develop participatory irrigation system

COURSE OUTCOMES

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

CO1 Students will understand the concept of soil-water-plant relationship and can apply it to schedule irrigation. Students can design surface, drip and sprinkler irrigation systems for various crops	Apply
CO2 Students can design surface, drip and sprinkler irrigation systems for various crops	Apply
Co3. To understand the climate change phenomenon and its related issues on water, irrigation and its social implications.	Analyze
Co4. To orient towards the global climate change and its impact on water resources.	Apply
Co5. Analyse the wasteland development	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3
CO1	M	M	L	S	S	-	-	-	-	-	-	-	-	M	M
CO2	M	M	L		-	-	-	-	-	-	M	-	L	L	-
CO3	S	M	M	S	S	-	-	-	L	-	-	-	-	-	S
CO4	S	M	M		-	-	-	-	-	M	M	-	-	L	-
CO5	S	M	M	-	-	-	L	-	-	-	-	L	M	S	-

S- Strong; M-Medium; L-Low

SYLLABUS

IRRIGATION DEVELOPMENT IN INDIA : Importance of Irrigation in Agriculture - Historical evolution of irrigation in India – Irrigation development during pre-colonisation – Colonisation and post-colonization – Different types of Irrigation prevalent in India: Warabandi, Shejpali and South Indian systems - Focus of Irrigation in India – Command area development approach and farmers participation.

IRRIGATION SYSTEMS AND PERFORMANCE INDICATORS : Systems classification - Institutions for irrigation management–Diagnostic Analysis of Irrigation Systems -Rehabilitation and modernization – Performance indicators – Improving system performance – Conjunctive management – constraints faced.

MAIN SYSTEM MANAGEMENT : Main system components – Reservoir allocation rule, Operating rule and optimization methods to improve main system performance - irrigation scheduling – Constraints

COMMAND AREA DEVELOPMENT AND PARTICIPATORY IRRIGATION MANAGEMENT: Command area development principles – Participatory Irrigation Management and Irrigation management transfer – Constraints – Case studies

IRRIGATION POLICY AND INSTITUTIONS: Present status of irrigation policy and institutions – Irrigation related conflicts – Institutional transformation needed – Constraints in effecting institutional transformation – Irrigation financing – Water pricing – Water market – Policy changes.

TEXT BOOKS:

5. Rakesh Hooja, Management of Water for Agriculture: Irrigation, Water sheds and Drainage Rawat Publications, New Delhi, 2006.
6. Kijne, J.W., Barker, R and Molden, D, Water Productivity in Agriculture; Limits and Opportunities for improved, CABI Publishing, Walling ford, U.K, 2003.

REFERENCES:

1. Giodano. M and Villbolth K.G, The Agricultural Ground Water Revolution -Opportunities and threats to development, CABI Publishing, Walling ford, U.K, 2007

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mr.R.Johnson Daniel	Assistant Professor	Civil / AVIT	johnsondaniel@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	COMPUTATIONAL METHODS IN IRRIGATION MANAGEMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To understand the knowledge of necessary information about the location of records, media upon which records are stored, methods of protection, and the value of individual records.

PREREQUISITE

Nil

COURSE OBJECTIVES

1	To acquire basic knowledge on various computational methods
2	To execute various models used for irrigation engineering
3	To simulate irrigation practices using computed based software
4	Application of advanced simulation techniques for irrigation practices
5	To acquire basic knowledge about estimating water quality using current methods

COURSE OUTCOMES

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

CO1 Students would have knowledge of soils and crops, which they can beneficially use as specialists in irrigation water management.	Apply
CO2 Students could relate water quality and its dependence on sources of water pollution.	Apply
Co3. Students would understand and interpret water quality data for beneficial uses and in water quality models.	Analyze
Co4. On completion of this course the students will be able to solve various problems in the field of engineering employing probability and statistical methods.	Apply
Co5. Students will able to estimate water quality using current methods and make evaluation of it for beneficial uses.	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

ADVANCED COMPUTING TECHNIQUES: Computing methods in water resources -Computing techniques - Solution to ordinary and partial
differential equation using Finite difference and Method of Characteristics- Numerical integration and differentiation Design of digital models - Visual programming

ARTIFICIAL INTELLIGENCE: Principle of Artificial Neural Network (ANN), Fuzzy Logic concepts and Applications –Genetic Algorithms-Heuristic Optimization techniques -Application of Artificial Intelligence to Hydrology and Crop Water Requirement model.

DIGITAL DATA MANAGEMENT: Data base structure -Data acquisition -Data warehouse -Data retrieval-Data format Attribute -RDBMS -Data analysis -Network data sharing -Statistical Analysis (SYSTAT) -Regression -factor analysis -
histogram -scatter diagram -Goodness of fit

SIMULATION SOFTWARE IN WATER RESOURCES: Surface water models (HMS) -Storm Water Management Models (SWMM) – culvert hydraulic design(HY) – River Analysis system models (HEC-RAS)-Ground Water Flow models

SIMULATION MODELS IN IRRIGATION WATER MANAGEMENT : Soil water assessment simulation models (SWAT) -Basin simulationmodels (MITSIM, VASIM) Real time operation models -Water Resources Information System, Management Information System. Decision support system for Irrigation management.

TEXT BOOKS:

4. Aliev R. A, and Aliev Rashad "Soft Computing and its Applications"World Scientific Publications Co. Pvt. Ltd. Singapore, 2001.
5. Janusz Kacprzyk Applied Decision with Soft Computing Springer, 2003

6. Carlos A. Coello, David A Van Veldhuizen, Gary B Lamont, "Evolutionary Algorithms for Solving Multi-objective problems", Springer, 2002.
7. Tayfur Gökmen "Soft computing in water resources engineering", WIT Press, Great Britain, UK, 2012.

REFERENCES:

1. Remson I, Hornberger G.M. and Moiz F.J., "Numerical methods in Sub-Surface Hydrology". Wiley Inter Science, 1985
2. Kazda, I., "Finite element Techniques in ground water flow studies (with Applications in Hydraulic and Geotechnical Engineering)", Else vier, 1990.
3. Abbott M.B, and Minns A.W. "Computational hydraulics"Ashgate, London, UK, 2007.
4. Loucks Daniel P., Jery R Stedinger and Douglas, A. Haith, Water Resources systems Planningand Analysis. Prentice Hall Inc., Englewood Clifts, New Jersey, 1981

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Ms.P.Subathra	Assistant Professor	Civil / AVIT	subathra@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	AGRICULTURAL ECONOMICS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to computational methods in irrigation management and enabling the students to work professionally in the agricultural sector and other related industry.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand nature and scope of agricultural economics
2	To infer Monetary policy , Money supply and economic activity
3	To determine demand and supply; its applications to agricultural goods, Theory and cost of production
4	To acquire knowledge on consent of farm management and whole farm planning.
5	To understand the Role of welfare economics, welfare economics in comparison with agricultural economics.

COURSE OUTCOMES

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

CO1 To provide an overall exposure on the use of economic concepts in irrigation development.	Apply
CO2 To impart knowledge on economic planning so as to enable viable allocation of resources in the irrigation sector.	Apply
Co3. The students will understand the economic concepts useful for overall irrigation development based on the current trends of production, consumption and farm economics.	Analyze
Co4 The students will acquaint themselves in the allocation of resources and financial analysis in the irrigation sector.	Apply
Co5. To enable the students to understand application of the latest information technology to water resources engineering	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION : Definition – Nature and scope of agricultural economics – Basic skills of Agricultural economist

MACRO – ECONOMICS: Monetary policy – Money supply and economic activity – Inflation and deflation – Fiscal policy – Agricultural policy – Discounting techniques

MICRO – ECONOMICS: Demand and supply; its applications to agricultural goods – Concept of elasticity – Money and financial market – Market supply function – Price determination – Theory and cost of production – Production function – Production management – Conditions of competition.

WELFARE ECONOMICS: Role of welfare economics – Welfare economics in comparison with agricultural economics – Social welfare function – Economy stabilization – Income redistribution – regional development.

FARM ECONOMICS: Concept of farm management – Whole farm planning – Farm records and budgeting – Uncertainty in farming – Farm business analysis

TEXT BOOKS:

3. Allan C.Deserpa., Micro – economic theory – Issues and applications Allyn and Bacon, Inc. Massachusetts, 1985.
4. Mithani D.M., Macro-economics-Analysis and Policy Oxford and IBH Publishing Co., New Delhi, 1981

REFERENCES:

1. Douglas James L and Robert R.Lee., Economics of Water Resources Planning McGraw Hill Co., New Delhi, 1994.

2. John W.Goodwin and Evan Drummond H.,Agricultural Economics Reston Publishing Co., Virginia, 1982.
3. Ronald D.Kay., Farm Management, Planning, control and Implementation-McGraw Hill Co., 1981.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	MODERNIZATION OF IRRIGATION SYSTEMS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to modern irrigation methods and enabling the students to work professionally in the irrigation technology and agricultural sector and other related industry.

PREREQUISITE

Irrigation Engineering

COURSE OBJECTIVES

1	To study about the nature of system modernization and rehabilitation
2	To know about the essential of system maintenance.
3	To study about the history of inflow, Operational constraints, Management constraints, Resource constraints
4	To know about deferred maintenance-causes-criteria used for taking rehabilitation.
5	To study about the case study of rehabilitation and modernization of old projects

COURSE OUTCOMES

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

CO1: Understand various irrigation methods and techniques	Understand
CO2: Apply modern technique in irrigation management	Apply
CO3: Construct and maintain various water bodies for irrigation purposes	Apply
CO4: Posses knowledge on the various scenario for water management for irrigation purpose	Understand
CO5 : Understand case study of rehabilitation and modernization of old projects	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	-	-	-	-	-	-	-	-	-	-	S	L	-
CO2	S	M	-	-	M	-	-	-	-	-	-	-	S	M	-
CO3	S	-	S	M	-	-	-	-	-	-	-	-	S	-	S
CO4	S	-	-	M	-	-	-	-	-	-	-	-	S	-	-
CO5	S	-	-	M	-	-	-	-	-	-	-	-	S	-	-

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Irrigation system-Classification-Nature of system modernization and rehabilitation

SYSTEM MAINTENANCE: Maintenance - Essential, Catch up, Preventive and normal- Diagnostic analysis of flow, seepage, participatory rural appraisal- Rapid rural appraisal- Walk through survey- Development of maintenance program-Kudimaramath- Turnover to WUA

PROBLEM IDENTIFICATION: System Performance- History of inflow, cropping pattern , system alterations, distribution performance-Operational constraints –Management constraints-Resource constraints

REHABILITATION: Base line survey-Deferred maintenance-Causes-Criteria used for taking rehabilitation programs-software and hardware improvements-prioritization-Role of WUA-Monitoring and evaluation

CASE STUDIES: Rehabilitation and modernization programs- Periyar Vaigai Project- Walawe Project-Tank modernization project-Water resources consolidation project.

TEXT BOOKS:

1. Base Line Survey of Irrigation Command, Centre for Water Resources, Anna University, Chennai-25, 2000.

   Diagnostic analysis of Irrigation Systems, Volume2, Evaluation Techniques, Water Management Synthesis Project, Colorado State University, 1984.
2. Improving Irrigation (performance through the use of MIS). The case of Mahi Kadana Gujarat, India.
3. International Irrigation Management Institute and WALMI, Gujarat, 1994.

REFERENCES:

1. Lecture Notes Sixth Training of Trainers Course,volume 2 Centre for water Resources, Anna University, Chennai-25, 1997.
2. Phase II Extension Tank Modernization Project with EEC Assistance, Monitoring and Evaluation Final Report, Centre for Water resources, Anna University, Chennai, November 2000.
3. Planning and Mobilization of Farmers Organization and Turnover- Tamil Nadu Water Resources Consolidation Project –Centre for Water Resources and Ocean Management, Anna University, Chennai-25, 1997.
4. Tank Modernization Project with EEC assistance – Monitoring and Evaluation: Final Reports-Centre for Water Resources, Anna University, Chennai, November, 2000.

COURSE DESIGNERS

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1	Dr.R.Divahar	Associate Professor	Civil / AVIT	divahar.civil@avit.ac.in
2	Mr.C. Kathirvel	Associate Professor	Civil / VMKVEC	geologykathir@gmail.com

	IRRIGATION ENGINEERING DRAWING LABORATORY	Category	L	T	P	Credit
		EC-SE	0	0	4	2

PREAMBLE

To introduce the students to modern irrigation methods and enabling the students to work professionally in the irrigation technology and agricultural sector and other related industry.

PREREQUISITE

NIL

LIST OF EXPERIMENT

1	Design and Drafting of Canal Regulator
2	Design and Drafting of Trapezoidal Tunnel
3	Design and Drafting of Under Tunnel
4	Design and Drafting of a Sluice Taking off
5	Design and Drafting of Surplus Weir

	ADVANCED SYSTEM DYNAMICS MODELING IN TRANSPORTATION ENGINEERING	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To provide advanced level of knowledge in System Dynamics Modeling in Transportation Engineering

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To gain knowledge the simulation techniques in System Dynamics Modeling in Transportation Engineering
2	To learn subsystems modelling
3	To learn system dynamic modelling
4	Learn alternative view of dynamic modelling
5	To analyze case studies on dynamic modeling of transport systems.

COURSE OUTCOMES

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

CO1. Students would have understood the simulation techniques used in Transportation Engineering	Understand
Co2. Students would have understood subsystems modelling	Apply
Co3. Students would have understood system dynamic modelling	Apply
Co4. Students would have understood alternative view of dynamic modelling	Apply
CO5. Students would have analyses case studies on dynamic modeling of transport systems	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

COMPLEXITY AND SYSTEMS THINKING: Change – Complexity and Interdependency – Systems thinking – Floundering – Level of abstractions - Tools and Transitions in Systems Thinking – Synthesis and Organizational Learning

ADVANCED MODELING EFFORTS: Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity – Harmonic Analysis.Steady State Modeling – Discrete vs. Continuous – Generic infrastructures –Subsystems – Sensitivity parametering - Case Studies

ADVANCED SIMULATING TECHNIQUES: Graphical Bulletin function – Conveyor flows – Converter – Flow substitutes – Connector – Normalizing Inputs – Generic flow activities – Case Studies

MODELING PROCESS: System Dynamics Modeling challenges – Steps in Modeling Process – Guidelines – Model Boundary– Modeling soft variables – Quantification vs. Measurement

SOPHISTICATED DYNAMICS MODELING: Need – Isolation Process – Demand Expansions – Cycle functions – Sensitivity Analysis – Alternative view of Dynamic Modeling

TEXT BOOKS:

1. Pratab Mohapatra K.J. et al., "Introduction to System Dynamics Modeling", University Press, Hyderabad, 1994
2. Thirumurthy A.M., Environmental Facilities and Urban Development in India – A System Dynamics Model for Developing Countries, Academic Foundations, India, 1992

REFERENCES:

1. Technical Manual on An Introduction to Systems Thinking – STELLA Research Software, High Performance Systems Inc., Hannover, 1996
2. Advanced Manual on An Introduction to Systems Thinking – STELLAII Research Software, High Performance Systems Inc., Hannover, 2002

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Mr.Sanjay Kumar	Assistant Professor	Civil / AVIT	sanjay.civil@avit.ac.in

	ENVIRONMENTAL IMPACT ASSESSMENT OF TRANSPORTATION PROJECTS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To expose the students to the need, methodology, documentation and requirements of environmental and social impact assessment of Transportation Projects..

PREREQUISITE – NIL

COURSE OBJECTIVES

1	Provides an exposure to various Environmental Laws and importance of EIA on Transportation Projects with respect to noise, air pollution, visual intrusion etc
2	Students would have understood the impact of Transportation projects on the environment and are able to develop and implement mitigation measures.
3	They will also know about the legal requirements of Environmental Assessment for projects
4	Students would have understood Impact of Traffic on Environment and Energy Efficiency strategies
5	Students would have understood Measures for Air and Noise Pollution Policies

COURSE OUTCOMES

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

CO1. Provides an exposure to various Environmental Laws and importance of EIA on Transportation Projects with respect to noise, air pollution, visual intrusion etc.,	Analyze
CO2. Students would have understood the impact of Transportation projects on the environment and are able to develop and implement mitigation measures	Analyze
CO3. They will also know about the legal requirements of Environmental Assessment for projects	Apply
CO4. Students would have understood Impact of Traffic on Environment and Energy Efficiency strategies	Apply
CO5. Students would have understood Measures for Air and Noise Pollution Policies	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

ENVIRONMENTAL STANDARDS IN URBAN AREAS AND EIA Laws concerned with protection of the environment such as Environmental Protection Act, Air and Noise Pollution Act, Motor Vehicle Act, Town and Country Planning Act, Development Control Regulation, Coastal Regulation Zone

MEASUREMENT AND POLLUTION PREDICTION: Stability and equilibrium of plane frames - perfect frames - types of trusses - analysis of forces in truss members - Method of joints - Method of tension coefficients - Method of section Measurement of Air and Noise Pollution, Land Acquisition, Rehabilitation, Collection, Compilation and Presentation of Pollution and Impact Data, Measuring Impact before construction, at the time of construction and after construction, Prediction, Modeling and Validations.

ENVIRONMENTAL QUALITY AND MANAGEMENT Importance of EIA, Environmental Appraisal, EIA Statement, Vehicle and Traffic Noise, Ambient Noise Level, Heath Effects, Vibration – Damage to building, Exhaust Emission – Pollutant, Health effects, Air Pollution, Urban Ambient Air Quality Standards, Effects on Human being

ENVIRONMENTAL MAINTENANCE AND LEGAL SYSTEMS: Impact of Traffic on Environment – Network Pattern, Urban Growth Indicators of Environmental Quality, Energy use, Fuel Economy in Transportation, Energy Efficiency strategies

MITIGATIVE MEASURES AND POLICIES Mitigate Measures for Air and Noise Pollution Policies and Strategies, Involvement of Stakeholders, Public Participation, And Institutional Arrangements.

TEXT BOOKS:

6. Larry W Canter, "Environmental Impact Assessment", McGraw Hill Publishers, 1996.
7. RaoV.Kolluru; "Environmental Strategies Handbook", McGraw Hill Publishers, 1994.
8. David Banister; "Transport Policy and Environment" E&FN Spain, 1999

REFERENCES:

10. World Bank; "the Impact of Environmental Assessment – A Review of World Bank Experience, Washington, 1997.
11. World Bank; Road and the Environment, Washington, 1997.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mr.C. Kathirvel	Associate Professor	Civil / VMKVEC	geologykathir@gmail.com
2	Dr. D. S. Vijayan	Assistant Professor II	Civil / AVIT	vijayan@avit.ac.in

	INTELLIGENT TRANSPORTATION SYSTEMS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

- To learn the fundamentals of ITS.
- To study the ITS functional areas
- To have an overview of ITS implementation in developing countries

PREREQUISITE – NIL

COURSE OBJECTIVES

1	The Students should be able to Understand the sensor and communication technologies.
2	The Students should be able to Apply the various ITS methodologies
3	The Students should be able to Define the significance of ITS under Indian conditions
4	The Students should be able to understand Dynamic Traffic Assignment
5	The Students should be able to understand advanced traveler and information system

COURSE OUTCOMES

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

CO1. The Students should be able to Understand the sensor and communication technologies.	Understand
CO2. The Students should be able to Apply the various ITS methodologies	Apply
CO3. The Students should be able to Define the significance of ITS under Indian conditions	Understand
CO4. The Students should be able to Understand the Dynamic Traffic Assignment	Understand
CO5. The Students should be able to Understand the advanced traveler and information system	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO INTELLIGENT TRANSPORT SYSTEM Definition – Role and Responsibilities – Advanced Traveler Information System – Fleet Oriented ITS Services – Electronic Toll Collection – Critical issues – Security – Safety

ITS ARCHITECTURE AND HARDWAREITS Architecture Framework – Hardware Sensors – Vehicle Detection – Techniques –Dynamic Message Sign – GPRS – GPS – Toll Collection.

INTERSECTION MANAGEMENT: Video Detection – Virtual Loop - Cameras - ANPR – IR Lighting – Integrated Traffic Management –Control Centre – Junction Management Strategies

ADVANCED TRANSPORT MANAGEMENT SYSTEM: ATMS – Route Guidance – Issues - Travel Information – Pre Trip and Enroute Methods – Historical –Current – Predictive Guidance – Data Collection – Analysis – Dynamic Traffic Assignment (DTA) –Components – Algorithm

ADVANCED TRAVELLER AND INFORMATION SYSTEM: ATIS Concepts – Smart Route System – Data Collection – Process – Dissemination to Travelers – Evaluation of Information – Value of Information – Business Opportunities

TEXT BOOKS:

1. Intelligent Transport Systems, Intelligent Transportation Primer, Washington, US, 2001
2. Henry F.Korth, and Abraham Silberschatz, Data Base System Concepts, McGraw Hill, 1992
3. E.Turban, ”Decision Support and Export Systems Management Support Systems", Maxwell Macmillan, 1998

REFERENCES:

1. Sitausu S.Mittra, "Decision Support Systems – Tools and Techniques", John Wiley, New York, 1986
2. Cycle W.Halsapple and Andrew B.Winston, "Decision Support Systems – Theory and Application‟, Springer Verlog, New York, 1987

COURSE DESIGNERS

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1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr. D. S. Vijayan	Assistant Professor II	AVIT	vijayan@avit.ac.in

	LOGISTICS IN TRANSPORTATION ENGINEERING	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To Provide an understanding on Freight Transport, Modeling, Location of the Facility and its Management

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Provides an understanding on Freight Transport, Modeling, Location of the Facility and its Management
2	Students will have a knowledge on the principles and practice of Freight Transport Modeling and provision of the Facilities
3	Students will have a knowledge on the Distribution System, Vehicle Routing and Scheduling
4	Students will have a knowledge on the Intermodal Transportation
5	Students will have a knowledge on the Toll Plaza Analysis

COURSE OUTCOMES

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

CO1. Provides an understanding on Freight Transport, Modeling, Location of the Facility and its Management	Understand
CO2. Students will have a knowledge on the principles and practice of Freight Transport Modeling and provision of the Facilities	Apply
CO3. Students will have a knowledge on the Distribution System, Vehicle Routing and Scheduling	Understand
CO4. Students will have a knowledge on the Intermodal Transportation	Understand
CO5. Students will have a knowledge on the Toll Plaza Analysis	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

LOGISTICS: Introduction – Trade Logistics Service, Freight Costs – Freight Demand Models

FREIGHT TRANSPORT: Econometric Models for Freight Forecasting – Input Output Models – Regional Network Systems – Graph Theory Application in Network Planning

DISTRIBUTION MANAGEMENT: Supply Chain – Warehousing – Facility Location, Inventory – Mode Choice – Distribution System, Vehicle Routing and Scheduling

LOGISTICS MANAGEMENT: Logistics out sourcing – IT Application in Freight Logistics – Technology in Logistics Management – Intermodal Transportation

APPLICATION IN FREIGHT TRANSPORT: Commercial Fleet Management, Toll Plaza Analysis

TEXT BOOKS:

1. Blanchard ST.Benjamen, "Logistics Engineering and Management", Prentice Hall, Inc, Eaglewood Cliffs, New Jersey 07632, 1986
2. Coyle J.J.Bardi JE, "The Management of Business Logistics", West Publishing Company, New York, 1984
3. Daganzo F.C and Newell FG, Vol.19B, No.5, pp.397-407, Physical Distribution from a Warehouse; Vehicle Coverage and Inventory Levels, Transportation Research, 1985
4. Edwin Bacht J.A., "Geography of Transportation and Business Logistics", Wm C Brown Company Publishers, Dubuque, IOWA, 1970
5. Herron P.David, "Managing Physical Distribution for Profit", Harvard Business Review, 1979

REFERENCES:

1. Khanna K.K., "Physical Distribution Management", Logistical Approach, Himalaya Publishing House, Bombay, 1985
2. Planning Commission, Government of India, Total Transport System Study – Report on Commodity Flows, Railways, Highways and Coastal Shipping, (Interim) by RITES, New Delhi, 1987
3. Shapiro D. Roy and Heskett L.James, "Logistics Strategy-Cases and Concepts", Wesg Publishing Company, New York, 1985

COURSE DESIGNERS

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1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr. D. S. Vijayan	Assistant Professor	AVIT	vijayan@avit.ac.in

	PAVEMENT MANAGEMENT SYSTEM	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the concepts of design, evaluation and performance of existing and new flexible and rigid pavements with due emphasis on systems approach and performance prediction models.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To introduce the concepts of design, evaluation and performance of existing and new flexible and rigid pavements with due emphasis on systems approach and performance prediction models.
2	Students will have a knowledge on the evaluation of pavement performance
3	Students will have a knowledge on the design objectives and constraints
4	Students will have a knowledge on the Techniques for developing prediction models
5	Students will have a knowledge on the Repair of pavement defects

COURSE OUTCOMES

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

CO1. Students will have a knowledge on the concepts of design, evaluation and performance of existing and new flexible pavements with due emphasis on systems approach and performance prediction models.	Understand
CO2. Students will have a knowledge on the evaluation of pavement performance	Apply
CO3. Students will have a knowledge on the design objectives and constraints	Understand
CO4. Students will have a knowledge on the Techniques for developing prediction models	Apply
CO5. Students will have a knowledge on the Repair of pavement defects	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PAVEMENT MANAGEMENT PROCESS Historical background – general nature and applicability of systems methodology – basic components of Pavement Management System –Network and Project level of PMS - PMS functions-planning pavement investments

EVALUATION AND PERFORMANCE: General concepts – economic and functional evaluation – evaluation of pavement performance – evaluation of structural capacity – pavement distresses – condition surveys – safety evaluation

DESIGN STRATEGIES: Framework for pavement design – design objectives and constraints – basic structural response models – characterization of physical design inputs – generating alternative pavement design – economic evaluation of alternative design – analysis of alternative design strategies – selection of optimal design strategy.

PERFORMANCE PREDICTION MODELS: Techniques for developing prediction models – AASHO, CRRI and HDM models – computer applications – Identification of alternatives –deterioration modeling- priority programming Methods

REHABILITATION : Repair of pavement defects – maintenance of flexible and rigid pavements – bituminous and cement concrete overlays – system analysis,

TEXT BOOKS:

1. Ralph Haas, W.Ronald Hudson and John Zaniewski, Modern Pavement Management, Kreigar Publishing Company, New York, 1994

2. M.Y.Stalin, Chapman and Hall Pavement Management for Airports, Roads and Parking Lots , New York, 1992

REFERENCES:

1. Michael Sargious, Pavements and Surfacing for Highways and Airports, AppliedScience Publishers Limited, London, 1975

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mrs.J.Srija	Assistant Professor	Civil / AVIT	srija.civil@avit.ac.in
2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	REMOTE SENSING AND GIS IN TRANSPORTATION DEVELOPMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Introduce the students, the recent techniques of Remote Sensing and GIS and I Its application in Traffic and Transportation Engineering

PREREQUISITE

NIL

COURSE OBJECTIVES

1	The Students would have knowledge on the basics of remote sensing
2	The Students would have knowledge on the basics of gis techniques and their application in the transport sectors
3	The Students would have knowledge on the data structures and analysis
4	The Students would have knowledge on the basic applications in transportation
5	The Students would have knowledge on the Advanced Traveler Information System

COURSE OUTCOMES

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

CO1. The Students would have knowledge on the basics of remote sensing	Apply
CO2. The Students would have knowledge on the basics of gis techniques and their application in the transport sectors	Apply
CO3. The Students would have knowledge on the data structures and analysis	Analyze
CO4. The Students would have knowledge on the basic applications in transportation	Apply
CO5. The Students would have knowledge on the Advanced Traveler Information 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	-	-	-	-	-	M	M	-	-	M	L	S
CO2	S	M	-	-	-	M	-	-	-	-	-	-	M	-	-
CO3	S	M	-	-	-	-	-	L	-	-	-	-	L	L	-
CO4	S	L	M	M	-	-	-	L	-	L	-	-	L	-	M
CO5	S	M	M	-	-	-	-	-	-	-L	-	L	-	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO REMOTE SENSING: Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Electromagnetic Radiation – EMR Spectrum

INTRODUCTION TO GIS: Basic Concept and Components – Hardware, Software – Data Spatial and non-spatial – Geo-referencing – Map Projection – Types of Projection – Simple Analysis – Data retrieval and querying **DATA STRUCTURES AND ANALYSIS:** Database – Raster and Vector data structures – Data storage – Run length, Chain and Block coding – Vector data storage – Topology – GIS Modelling - Raster and Vector data analysis – Buffering and overlaying techniques – Network Analysis – Spatial Analysis

BASIC APPLICATIONS IN TRANSPORTATION: Highway and Railway Alignment, location of transport terminals and roadside facilities, bus stops – Route optimization – Bus route rationalization – Accident analysis – Applications of Aerial Photography and Satellite Imageries

ADVANCED APPLICATIONS: GIS as an integration technology – Integration of GIS,GPS and Remote Sensing Techniques – Advanced Traveler Information System (ATIS) – Automatic Vehicle Location System (AVLS)

TEXT BOOKS:

3. Anji Reddy, "Remote Sensing and Image Interpretation", John Wiley and Sons Inc. New York, 1987.

1. M.G.Srinivas, "Remote Sensing Applications", Narosa Publishing House, 2001.

2. Burrough P.A, "Principles of GIS for Land Resources Assessment", Oxford Publication, 1994.

REFERENCES:

1. Jeffrey Star and John Ester, Geographical Information System – An Introduction, Prentice Hall Inc., Englewood Cliffe, 1990.

2. Marble, D.F, Calkins, H.W and Penquest, Basic Readings in GIS, Speed System Ltd., New York, 1984.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in

	URBAN TRANSPORTATION INFRASTRUCTURE– PLANNING AND DESIGN	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Helps in Design of Intersections, Interchanges, Parking and Terminal Facilities to be provided inan urban area

PREREQUISITE – NIL

COURSE OBJECTIVES

1	Helps in Design of Intersections, Interchanges, Parking and Terminal Facilities to be provided inan urban area
2	The students would have gained knowledge on Rail Infrastructure Management
3	The students would have gained knowledge on Design of Grade Separators and intersections
4	The students would have gained knowledge on Design of Multi-Storey and Surface Parking facility
5	The students would have gained knowledge on Design and Case Studies of Inter Modal Transfer Facilities

COURSE OUTCOMES

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

CO1. The students would have gained knowledge on Rail Infrastructure Planning, Operation and Management.	Apply
CO2. The students would have gained knowledge on Rail Infrastructure Management.	Understand
CO3. The students would have gained knowledge on Design of Grade Separators and intersections	Apply
CO4. The students would have gained knowledge on Design of Multi Storied and Surface Parking facility	Apply
CO5. The students would have gained knowledge on Design and Case Studies of Inter Modal Transfer Facilities	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

PRINCIPLES OF INTERSECTION DESIGN: Basic considerations – simplicity – uniformity – Manoeuvre Elements – Separation of conflict points – Design Elements – Design Speed – Intersection Curves – Super elevation for curves at Intersection – Intersection Sight Distance

DESIGN OF AT-GRADE INTERSECTIONS: Capacity and LOS, Design of Rotary and Signalised Intersections, Vehicle Actuated Signals, Signal Co-ordination, Area Traffic Control System (ATCS), Pedestrian Planning at Grade Intersections

DESIGN OF GRADE SEPARATED INTERSECTIONS: Design of Grade Separators – Principles , Design Criteria – Layout Design, GAD Preparation – Pedestrian Foot Over-bridge and Subway Design – Pedestrian Planning for Grade Separated Intersections

PARKING FACILITIES : Parking – Demand – Characteristics – Space Inventory – Accumulation – Duration – Turn over – Index – Design of Multi Storey and Surface Parking facility

DESIGN OF TERMINAL FACILITIES: Bus Terminus – Design Principles – Design Elements – Design and Case Studies of Inter Modal Transfer Facilities – Design – Case Studies of Bus and Rail Terminals.

TEXT BOOKS:

1. Robert F Baker, (Edition) "Hand Book of Highway Engineering, Van Nostrand Reinhold Company, New York, 1975

2. Kanna, S.K. and Justo, C.E.G. "Highway Engineering, Nemchand.

REFERENCES:

1 .New Jersy, "Transportation and Traffic Engineering Hand Book, Institute of Transportation Engineers, Prentice Hall, INC, 1982

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in
2	Dr.R.Divahar	Associate Professor	Civil / AVIT	divahar.civil@avit.ac.in

	CAD IN TRANSPORTATION ENGINEERING LABORATORY	Category	L	T	P	Credit
		EC-SE	0	0	4	2

PREAMBLE

To introduce the students to modern irrigation methods and enabling the students to work professionally in the irrigation technology and agricultural sector and other related industry.

PREREQUISITE

NIL

LIST OF EXPERIMENT

1	Scaling and Drafting of Road lines connecting Cities
2	Design and Drafting of Bridges as per IRC loading
3	Smart Cities

	PRINCIPLES OF VALUATION	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the importance and need of valuation, concepts of valuers and appraisers, to know about the depreciation, the market value and depreciated replacement cost

PREREQUISITE : Nil

COURSE OBJECTIVES

1	To learn about the importance, need and advantages of valuation.
2	To develop the knowledge regarding concept of land and property.
3	To understand about the different types of assets and properties.
4	To know about the price, cost, market and value.
5	To study about the Depreciated Replacement Cost (DRC)

COURSE OUTCOMES

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

CO1 Remember the importance, need and advantages of valuation.	Remember
CO2 Understand the knowledge regarding concept of land and property.	Understand
CO3 Understand about the different types of assets and properties.	Understand
CO4 Remember the price, cost, market and value.	Remember
CO5 Remember the Depreciated Replacement Cost (DRC)	Remember

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Importance Of Valuation – Need Of Valuation – Do's And Don'ts In Valuation – Advantages Of Valuation.

LAND AND PROPERTY CONCEPTS: Valuation of Land – Property - personal property - Property Valuers - Asset Valuers – Appraisers - Price changes over time result from specific and general effects of economic and social forces.

REAL ESTATE, PROPERTY, AND ASSET CONCEPTS: Real Estate - Real Property - Personal Property- Current Assets - Non-Current Assets - Property, Plant, and Equipment - Other Non-Current Assets – Depreciation.

PRICE, COST, MARKET AND VALUE : Price – Cost – Market and Value - Professional , Valuers - The Market Value**VALUATION APPROACHES :**Valuation Approaches - Cost Approach - Sales Comparison Approach- 3 Income Capitalization Approach- Depreciated Replacement Cost (DRC

TEXT BOOKS:

1. Principles of Valuation Paperback – Import, 27 May 2009 by John Armatys,Phil Askham &Mike Green
2. Valuation of Real Properties, PB by Rangwala.

REFERENCES:

1. Economics and Property, by Danny Myer
2. Advanced Valuation for Secured Lending by Banks and Financial Institutions, by Syamales Datta
3. Valuation of Immovable Properties under Direct Taxes, by Girish C. Gupta
4. Real Estate Investment: A Strategic Approach, by Andrew Baum.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in
2.	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	REAL ESTATE MANAGEMENT & ECONOMICS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the concept of management in real-estate and implementation procedure, how to use real estate in urban development, regulatory laws and about the developers and promoters and how to do management of housing and Ownership and tenancies in real estate.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To understand about the Concept of management in real-estate development and administration.
2	To learn about the Housing Finance Development Corporation and other financial institutions.
3	To understand about the developers and promoters and regulatory laws for construction.
4	To study about the Management of different types of housing and public buildings.
5	To learn about the Ownership and tenancies in real estate.

COURSE OUTCOMES

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

CO1.Understand about the Concept of management in real-estate development and administration.	Understand
CO2.Remember about the Housing Finance Development Corporation and other financial institutions.	Remember
CO3.Understand about the developers and promoters and regulatory laws for construction	Understand
CO4.Remember about the Management of different types of housing and public buildings	Remember
CO5.Remember about the Ownership and tenancies in real estate.	Remember

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Concept of management in real-estate development and administration; aims, objects and practices renewal of leases and alternate methods for efficient estate management.

REAL ESTATE IN URBAN DEVELOPMENT: Urban development finance with particular reference to real-estate: role of Housing Finance Development Corporation and other financial institutions and agencies.

DEVELOPERS, PROMOTERS AND LAWS: Private development enterprises by developers and promoters; regulatory laws for construction of multi-storied buildings, transfers and administration.

MANAGEMENT OF HOUSING: Management of co-operative housing, apartment housing, corporate housing and public buildings

OWNERSHIP IN REAL ESTATE: Ownership and tenancies in real estate: effect of rent control and other laws. Methods of fixing rent, rigidity and flexibility

TEXT BOOKS:

1) Michael Thorncroft, Principles of Estates Management

2) W.A Leach, Urban Estates Management Vol. I and II

REFERENCES:

1) John P. Macey, Housing Management, Estate Gazettes.

2) Lichfield, Economics of Planning development

COURSE DESIGNERS

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1.	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in
2.	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	REAL ESTATE HUMAN RESOURCE MANAGEMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the strategic HRM, human resource environment, recruitment and retention strategies, performance management strategies and global HR strategies

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To study about the various types of strategies and HR plans and policies
2	To understand about the Global environment; Global competition and Global sourcing of labour
3	To learn about the recruitment process outsourcing, employee empowerment and employee involvement
4	To study about the performance management strategies
5	To know about the global HR strategies

COURSE OUTCOMES

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

CO1. Remember the various types of strategies and HR plans and policies	Remember
CO2. Understand about the Global environment; Global competition and Global sourcing of labor	Understand
CO3. Remember the recruitment process outsourcing, employee empowerment and employee involvement	Remember
CO4. Remember the performance management strategies	Remember
CO5. Understand the global HR strategies	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO STRATEGIC HRM: Definition, need and importance; Introduction to business and corporate strategies; Integrating HR strategies with business strategies; Developing HR plans and policies.

HUMAN RESOURCE ENVIRONMENT : Technology and structure; Workforce diversity; Demographic changes Temporary and contract labour; Global environment; Global competition Global sourcing of labour; WTO and labour standards

RECRUITMENT AND RETENTION STRATEGIES: Online recruitment; Employee referrals; Recruitment process outsourcing Head hunting; Executive education; Flexi timing; Telecommuting Quality of work life; Work - life balance; Employee empowerment Employee involvement; Autonomous work teams

PERFORMANCE MANAGEMENT STRATEGIES Defining key result areas (KRA); Result based performance Linking performance to pay; Merit based promotions

GLOBAL HR STRATEGIES: Introduction to global HR strategies; Developing HR as a value added function

TEXT BOOKS:

1. Strategic HRM – Jeffery Mello, Thompson publication, New Delhi

2. Strategic HRM – Charles Greer, Pearson education Asia, New Delhi

3. Strategic HRM - Michael Armstrong, Kogan page, London

REFERENCES:

1. Strategic HRM – Agarwal, Oxford university press, New Delhi

2. Human resource management – Garry dessler, PHI, New Delhi

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	Dr.R.Divahar	Associate Professor	Civil / AVIT	divahar.civil@avit.ac.in
2.	Mr.M.Senthil kumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	LAWS FOR ACQUISITION AND CONTRACT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the Legislative laws and its application, Salient features of the Indian Constitution, features of local Government, types of contract and its application and Land Acquisition Act.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To study about laws, Legislative enactments and Judicial precedents.
2	To understand about features of the Indian Constitution, legal system and fundamental rights.
3	To learn about types of Government, revenue system, etc.
4	To study about types of contract and its guidelines, valuation etc.
5	To learn about the contract and conveyance, Land Acquisition Act and Rent control laws.

COURSE OUTCOMES

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

CO1. Understand the laws and Judicial precedents	Understand
CO2. Understand about the Indian Constitution, legal system and fundamental rights.	Understand
CO3. Learn about types of Government, revenue system, etc.	Remember
CO4. Understand about types of contract and its guidelines, valuation etc.	Understand
CO5. Remember about the contract and conveyance, Land Acquisition Act and Rent control laws.	Remember

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

S- Strong; M-Medium; L-Low

SYLLABUS

ELEMENTARY JURISPRUDENCE: Law – its origin, source and ramifications. Legislative enactments – subordinate legislation – Judicial precedents.

INDIAN LEGAL SYSTEM: Salient features of the Indian Constitution, fundamental rights: directive principles of the state policy. Executive, Legislature and the judiciary Centre – State relationship.

LOCAL GOVERNMENT: Types – Rural and Urban, constitutional provisions, powers and functions Sources of revenue: Tax and fee, Municipal Finance, essential civil service.

CONTRACT AND TORT: Laws of contract and tort: formation of a contract, parties; void, voidable and unenforceable contract; contingent contract; misrepresentation and fraud-effect thereof termination of contract; remedies for breach; performance of contract; indemnity and guarantee; law of agency; general principles of tort; tort affecting valuation.

CONVEYANCING: Outline procedure for sale of immovable property: contract and conveyance; preliminary inquiries open contract; contract by correspondence. Acquisition and requisition of immovable property – enactments. Land Acquisition Act, 1894 (1 to 1894). Provisions for acquisition of land under the municipal laws. Law of arbitration and conciliation: salient features. Rent control laws.

TEXT BOOKS:

1) M.J.Sethna, Jurisprudence, Lakhani Book Depot. Lamington Road, Bombay – 400 007

2) Durga Das Basu, Introduction to Constitution of India, Lakshmi Publications (P) Ltd., (1998), Kolkatta

3) B.S. Sinha, Law of Torts, Eastern Book Company, 34 Lal Baugh, Lucknow – 226 001.

REFERENCES:

1) N.M. Tripathi, Indian Contract Act (Students Edition), Mulla Publishers, Princess Street, Bombay 400 002.

2) Building Bye-law of Muncipal Corporation of Ahmedabad, Bombay, Delhi & Madras.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	Dr.S.P.Sangeetha	Professor	Civil / AVIT	sangeetha@avit.ac.in
2.	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	REAL ESTATE FINANCE & MARKETING	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the financial management, capital budgeting: process and techniques, market-led strategic management, strategic marketing analysis and application to different business sectors.

PREREQUISITE- NIL

COURSE OBJECTIVES

1	To study about the evolution of finance, business ethics and social responsibility, time value of money concept.
2	To learn about the decisions, process and techniques of capital budgeting
3	To study about the relationship with corporate vision of marketing strategy
4	To understand about the identification of attractive markets and industry or business analysis
5	To study about the application to different business sectors and constraints in marketing strategy

COURSE OUTCOMES

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

CO1 Understand the evolution of finance, business ethics and social responsibility, time value of money concept.	Understand
CO2 Remember the decisions, process and techniques of capital budgeting	Remember
CO3 Remember the relationship with corporate vision of marketing strategy	Remember
CO4 Understand the identification of attractive markets and industry or business analysis	Understand
CO5 Remember the application to different business sectors and constraints in marketing strategy	Remember

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	S	M	L	-	-	-	M	-	L	L	-	-	M	L	M
CO2	S	M	L	S	-	-	-	-	-	-	-	-	L		
CO3	S	M	M	S	S	-	-	-	-	-	L	-	L	S	L
CO4	S	M	M	M	-	-	M	-	-	L	-	-			
CO5	S	M	M	-	-	S	-	-	L	-	-	M	L	S	M

S- Strong; M-Medium; L-Low

SYLLABUS

FINANCIAL MANAGEMENT: An Overview. Evolution of finance, The Basic Goal: Creating Shareholder Value, Agency Issues, Business Ethics and Social Responsibility, Time value of money concept.

STRATEGIC INVESTMENT DECISIONS: Capital Budgeting Decisions – Capital Budgeting: Process and Techniques - Payback period, Accounting rate of return, NPV, IRR, MIRR, Profitability index, Discounted payback period, Estimation of cash flows, NPV vs. IRR, Risk analysis in Capital Budgeting - Sensitivity analysis, Certainty Equivalent Approach, Calculation of RADR, Real options.

OVERVIEW OF MARKETING STRATEGY: Relationship with Corporate Vision, Mission and Objectives. Market-led strategic management.

STRATEGIC MARKETING ANALYSIS: Identification of attractive markets, Industry/business analysis and sustaining competitive advantage.

INTEGRATION OF MARKETING STRATEGIES: Application to different business sectors – FMCG, Industrial, & Services. Constraints in marketing strategy implementation. Periodical assessment.

TEXT BOOKS:

1. Bhalla V.K. (2009). Financial Management. New Delhi: Anmol Publications

2. Brealey, R. R., Myers. S., Allen, F., & Mohanty, P. (2009). Principles of corporate finance (8th ed.). New Delhi: Tata McGraw Hill.

3. Brigham, E F., & Davis, P. (2009). Intermediate financial management (10th ed.). USA: South Western

REFERENCES:

1. Brigham, E. F., & Houston, J. F. (2007). Fundamentals of financial Management (11th Ed.). USA:

Thomson

2. Chandra, P. (2008). Financial management (7th ed.). New Delhi: McGraw Hill.
3. Hickman, K. A., Hunter, H. O., & Byrd, J. W. (2008). Foundations of corporate finance (2nd ed.). USA South Western.
4. Horne, V. (2008). Fundamentals of financial Management (12th ed.). New Delhi: Pearson Education.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	Dr.S.P.Sangeetha	HOD-Civil	AVIT	sangeetha@avit.ac.in
2.	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	VALUATION & DOCUMENTATION WRITING	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the essential structure of a report, purpose and properties of valuation and to consequences of report.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To learn about the various methods of Essential structure of a report.
2	To know about the different types of structure in valuation.
3	To understand the purpose of valuation
4	To learn the procedure of report writing as per court of law
5	To understand about the pattern of the examination

COURSE OUTCOMES

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

CO1. Remember the various methods of Essential structure of a report.	Remember
CO2. Understand the different types of structure in valuation.	Understand
CO3. Understand the purpose of valuation	Understand
CO4. Remember the procedure of report writing as per court of law	Remember
CO5. Understand the pattern of the examination	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO3
CO1	S	M	L	L	-	L	L	M	-	L	-	-	L	--	L
CO2	S	M	L	S	-	L	-	-	-	-	-	-	L	--	--
CO3	S	S	L	S	-	-	-	-	M	-	-	-	M	M	-
CO4	S	L	S	M	-	M	-	-	L	-	L	-	--	---	--
CO5	S	L	S	-	-	-	-	M	-	-	-	L	--	M	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Essential structure of a report

STRUCTURE OF A REPORT : The general structure of a report

PURPOSE OF VALUATION: Details required according to the purpose of valuation - Details required according to the type of properties

REPORT WRITING: Consequences of report – Writing a report – Negotiations, Negligence and leading expert evidence in court of law.

GENERAL PRACTICES: Practice and Examination

TEXT BOOKS:

1) Joseph C. Mancuso, Mastering Technical Writing.

2) Matt Young, The Technical Writer's handbook.

3) P.T.Hardikkar, Report writing, Academic Book Center (2006), Ahmedabad.

REFERENCES:

1) Arlen C. Mills, MAI, Communicating the Appraisal, /The individual condominium or PUD Unit Appraisal Report.

2) S. Sreenivas Rao, Hand book for writers and editors, academic Book Centre, 10 Walkeshwar, Ambawadi, Ahmedabad 380 015.

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Name of the College	Mail ID
1.	Dr.S.P.Sangeetha	Professor	AVIT	sangeetha@avit.ac.in
2.	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	QUALITY CONTROL AND ASSURANCE IN REAL ESTATE	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to understand about the quality, strategic planning, and competitive advantage in real estate, principles of total quality management, customer relationship management techniques, quality control and quality assurance and benefits of control charts and applications

PREREQUISITE – NIL

COURSE OBJECTIVES

1	To study about the concept of quality, planning and quality and market share
2	To learn about the elements and benefits of total quality management
3	To understand about the customer satisfaction measurement techniques and customer relationship management techniques.
4	To learn about the quality control and quality assurance
5	To know about the benefits of control charts and applications

COURSE OUTCOMES

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

CO1. Understand the concept of quality, planning and quality and market share	Understand
CO2. Remember the elements and benefits of total quality management	Remember
CO3. Understand the customer satisfaction measurement techniques and customer relationship management techniques.	Understand
CO4. Remember the quality control and quality assurance	Remember
CO5. Understand the benefits of control charts and applications	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

QUALITY, STRATEGIC PLANNING, AND COMPETITIVE ADVANTAGE: Brief History -Definitions of Quality. Quality in Manufacturing and Service Systems. Quality and Price - Quality and Market Share - Quality and Cost - Quality & Competitive Advantage.

PRINCIPLES OF TOTAL QUALITY MANAGEMENT: Introduction - Elements of Total Quality Management - Malcolm Baldrige National Quality Award Criteria. Benefits of Total Quality Management. The Deming Management Philosophy – The Juran Philosophy – The Crosby Philosophy.

CUSTOMER FOCUS: The Customer-Driven Quality Cycle - Quality Function Deployment –Customer Satisfaction Measurement Techniques – Customer Relationship Management Techniques.

QUALITY CONTROL AND QUALITY ASSURANCE Concept of Quality Control – Concept of Process Variation – Acceptance Sampling – Sampling Inspection Vs. 100% Inspection – Attributes and variable sampling plans – OC Curves – Producer and Consumer Risk – AQL, RQL, TQL, AOQL and AOL. (10%)

STATISTICAL PROCESS CONTROL : Control Charts – X-R, P, np and C Charts – Benefits of Control Charts and Applications

TEXT BOOKS:

1. Quality Control - Dale H Besterfield – Pearson Education
2. Total Quality Management – S. Sundarrajan
3. Quality Control & Total Quality Management – Jain

REFERENCES:

1. The essence of Total Quality Management – Hansen & Ghare
2. Managing for Total Quality – Logothetic
3. Quality Problem Solving – Smith
4. ISO 9000 – Kairon
5. Manuals of various standards

COURSE DESIGNERS

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2.	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	senthilkumar@vmkvec.edu.in

	ESTIMATING, COSTING AND PROFESSIONAL PRACTICE	Category	L	T	P	Credit
		EC-SE	0	0	4	2

PREAMBLE

To introduce the students to modern irrigation methods and enabling the students to work professionally in the irrigation technology and agricultural sector and other related industry.

PREREQUISITE

NIL

LIST OF EXPERIMENT

1	Analysis of rate for concrete Material
2	Quantity calculation for Concrete
3	Analysis of rate for Steel Material
4	Preparation of Bar Bending Schedule

	RENEWABLE ENERGY SYSTEMS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Energy formula and unit, various forms of energy, renewable energy, non renewable energy, Energy consumption of a building, Energy consumption of any industrial site, Energy efficiency calculation.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the different type of energy.
2	To learn about the principle, reconstruction and the uses of solar thermal energy.
3	To understand the basics and advancement in Ocean and Geothermal Energy.
4	To learn about Sustainable energy for all-planning aspect-action.
5	To understand the concepts of Renewable Energy Policy.

COURSE OUTCOMES

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

CO1. List and generally explain the main sources of energy and their primary applications in the world.	Apply
CO2. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.	Analyze
CO3. Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.	Analyze
CO4. Convert units of energyto quantify energy demands and make comparisons among energy uses, resources, and technologies.	Apply
CO5. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.	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	S	L
CO2	S	M	L	M	L	-	-	L	-	-	-	-	-	L	-
CO3	S	L	M	M	-	M	L	-	M	L	-	M	L	-	M
CO4	S	M	M	M	-	-	-	-	-	L	-	-	-	-	-
CO5	S	L	M	-	L	L	M	-	-	-	-	-	M	S	L

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Types of energy- solar energy- nuclear energy- wind energy- thermal energy- geo thermal energy- fossil fuels-hydroelectric energy- Energy reserves of India- Energy intensity- Energy efficiency- Renewable energy sources- green house effect

SOLAR THERMAL ENERGY: Solar thermal water heating- solar distillation-solar pumping systems-solar thermal power plant- solar collectors- thermal storage-solar pond- solar pumping systems-solar cooker-solar air condition and refrigerator-energy efficient buildings- assessment of solar radiation- solar photovoltaic system

OCEAN, HYDRO AND GEOTHERMAL ENERGY: Wave and tidal energy, ocean thermal energy conversion - principle, types, power plants- small, mini and micro hydro power plants. Exploration of geothermal energy, geothermal power plants. Introduction to direct energy conversion systems – fuel cells and magneto hydrodynamic power generations

SUSTAINABLE ENERGY : Sustainable energy for all-planning aspect-action area- implementation road map-mobilizing action- Sustainable energy futures, global scenarios, promising technologies, development pathways, clean coal and carbon technologies, electric vehicles, energy fluctuation and energy storage, distributed generation and smart grids.

RENEWABLE ENERGY POLICY: Renewable energy policies, including feed-in tariffs, portfolio standards, policy targets, tax incentives, and biofuels mandates. International policies for climate change and energy security. Economic analysis and comparisons, Life cycle analysis, financial analysis, cost of conserved energy, and externalities. Cost assessment of supply technologies versus energy-efficiency.

TEXT BOOKS:

7. Rai .G .D, "Non-Conventional Energy Sources", Khanna Publishers, 4th edition, New Delhi, 2009.

8. John E Freund's Mathematical Statistics: (7th Ed.), Miller & Miller, Prentice-Hall

9. Probability and Statistics for Engineers –Miller, Freund-Hall, Prentice India Ltd. 2009

4. Roland Wengenmayr, Thomas Buhrke," Renewable energy: Sustainable energy concepts for the future", Wiley-VCH, 1st edition, 2008.

REFERENCES:

5. "Fundamentals of Renewable Energy Systems". D. Mukherjee, S. Chakrabarti

6. Godfrey Boyle, "Renewable energy", Oxford University Press, 2nd edition, 2010

7. Hans-Josef Fell, "Global cooling strategies for climate protection", CRC Press, 2012.

4. Ottmar Edenhofen, "Renewable energy sources and climate change mitigation", Cambridge University Press, 2011.

COURSE DESIGNERS

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2	Mr.Harish	Assistant Professor	CIVIL/ VMKVEC	harshk317@gmail.com

	THERMAL INSULATION INSTALLATION	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

One must understand the concept of thermal insulation, need for thermal insulation, materials, safety hazards for a thermal insulation, OSHA standards, Building regulations, MEP works

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Purpose and need of Insulation.
2	To learn about the various types of thermal insulation materials.
3	To understand the basic need for Insulation and Refractoriness.
4	To learn about properties of Thermal Insulation Materials.
5	To understand the concepts of Insulation Installation For Residential Housing.

COURSE OUTCOMES

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

CO1. Identify the correct tools for installation of specific thermal insulation processes	Apply
CO2. Identify the correct materials required for installation of specific thermal insulation and address any defects with materials	Apply
CO3. Identify potential installation faults and carry out corrective actions where applicable	Apply
CO4. Ensure installation area is cleaned in accordance with contractual, health and safety and organizational requirements	Apply
CO5. Demonstrate good practice in relation to the health and safety of the individual, other workers and visitors	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	--	L
CO2	S	M	L	M	-	M	-	-	L	L	-	-	M	--	L
CO3	S	L	M	M	-	L	L	-	-	-	M	-	--	L	--
CO4	M	M	L	L	-	-	-	-	-	L	-	-	--	--	--
CO5	M	M	M	L	-	-	-	-	-	-	-	-	L	L	--

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Thermal insulation, Purpose of Insulation, Need for insulation, Benefits of insulation, Feasibility in insulation, Procedure for proving insulation, heat energy transfer, heat radiation, types and Applications.

THERMAL INSULATION MATERIALS: Types, mineral wool- Rock or slag, fiber glass, polyurethane foam, polystyrene, cellulose, cellular plastics, plastic fibers, natural fibers, insulating concrete, reflective surface, insulation board.

INSULATION AND REFRACTORIES: Insulation and Refractories: Insulation-types and application, Economic thickness of insulation, Heat savings and application criteria, Refractory-types, selection and application of refractories, Heat loss.

PROPERTIES OF INSULATION MATERIALS : Mechanism of heat transfer, thermal conductivity, surface emissivity, insulation thickness, density, specific heat capacity, thermal bridging, Insulations used as buildings, factors affecting insulation performance, compaction effects, moisture, air infiltration, other properties, fire performance, corrosion, moisture absorption, summary.

INSULATION INSTALLATION FOR RESIDENTIAL HOUSING: Installation tips, thermal bridging, vapour barriers, roof ventilation, gaps, bulk insulation, reflective insulation, roof and ceiling insulation, external wall insulation, flooring insulation, Advantages and disadvantages.

TEXT BOOKS:

1. "Thermal insulation, materials and systems for energy conservation in the '80s" by Govan, Greson, Mc Allister.
2. "Insulation materials, testing and applications", Mc Elroy/ Kimpflen.
3. "An assessment of Thermal insulation Materials and system for building Applications", prepared by Brookhaven National Laboratory.

REFERENCES:

1. "Thermal Insulation Materials and systems" by Powell/ Matthews editors
2. "Thermal insulation handbook for the Oil, gas, and petrochemical Industries", Alireza Bahadori.
3. Sustainable Energy Authority Victoria (SEAV). 2006. Energy smart housing manual, Ch. 7, Insulation

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	SUSTAINABLE URBAN SYSTEMS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

GIS (geographic information systems) which enables students to process real urban datasets, script and perform spatial analyses, interpret results, and produce visualization. To draw the sketch of urban area in software like CAD. Student must learn to get the plan of urban area from town and country planning authorities.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Sustainability urban systems.
2	To learn about the principle global Sustainable in urban system.
3	To understand the basics ecological and environmental Sustainability.
4	To gain the knowledge about public transport and urban development
5	To understand the concepts of sustainable urban water management.

COURSE OUTCOMES

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

CO1. Identify and support the good practices in green and efficient urban development and planning.	Apply
CO2. Review policies and foster technologies used to promote energy efficiency and reduced GHG emissions from buildings and transportation.	Apply
CO3. Review policies and foster technologies necessary to ensure healthy water and sanitation services.	Apply
CO4. Examine policies and foster technologies necessary for the effective collection, disposable, and possible re-use of waste and in promoting circular economy	Apply
CO5. Examine, track, and analyze sustainability metrics and indicators for urban centers	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	-	S	M	-	L	S	L	--
CO2	S	M	L	L	-	-	-	M	-	-	-	-	-	--	S
CO3	M	L	M	S	-	S	-	-	-	-	-	-	M	M	--
CO4	S	M	L	L	-	-	S	-	-	-	M	L	--	--	L
CO5	S	L	S	-	-	-	-	M	-	L	-	-	--	L	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION TO SUSTAINABLE URBAN SYSTEM: Sustainability definition, need for sustainability for urban system, land use and urban design issues, sustainability of structures, Design procedure for urban system.

GLOBAL SUSTAINABILITY : Urban sustainability, natural systems in crisis, climate change causes and effects, Urbanisation, sustainable urban development, complex urban systems, Urban planning strategy.

ECOLOGICAL AND ENVIRONMENTAL SUSTAINABILITY: Urban ecology and restoration, soil, water and air; energy and materials use, sustainable communities, Urban Planning issues.

PUBLIC TRANSPORT & URBAN DEVELOPMENT: Sustainable construction techniques, Planning roadways, railways in urban area, Planning national highways which connect various cities, various types of transportation in urban city.

SUSTAINABLE URBAN DRAINAGE SYSTEMS: Introduction to sustainable urban water management, technical approaches to reducing water use, Control systems for surface runoff, filter strips and swales, permeable surfaces, paving, ponds and wet lands.

TEXT BOOKS:

1. Sustainable Urban Metabolism" by Paulo Ferrao, John E. Fernandez
2. "The Urban Climatic Map: A methodology for sustainable Urban Planning" by Edward Ng, Chao Ren.
3. "Local Sustainable Urban Development in a global world" by Lauren C. Heberie, Susn M. Opp.

REFERENCES:

1. "Pathways to Urban Sustainability: Research and Development on urban systems" by National Research council Policy and Global Affairs Science and technology for Sustainability Program Committee on the challenge of developing Sustainable Urban Systems.

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	ENERGY AUDITING IN SPECIAL STRUCTURES	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Before starting the course one must be able to define the energy audit and its types. Sources of energy, forms of energy and understand the clear concept of special structures.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the detail energy audit system.
2	To learn about the Energy resources & electricity consumption.
3	To study about the various other sources for production of electricity.
4	To gain the knowledge about various types of energy audit.
5	To learn about the Estimation of energy economy of the building.

COURSE OUTCOMES

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

CO1. Identify and describe the energy conservation opportunities in industrial and commercial systems.	Apply
Co2. Apply energy auditing techniques	Apply
Co3. Describe the energy rate structures.	Apply
Co4. Examine the economic evaluation of energy conservation solutions.	Apply
CO5. Use computers to monitor and control energy use.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Energy Audit, standard energy audit, detail energy audit, stepwise procedures for energy audit, common energy conservation measures, electrical systems, HVAC systems, Compressed air systems, Energy management controls, Indoor Water Management, New technologies, Case studies.

ENERGY SOURCES AND UTILITY RATE STRUCTURES: Energy resources, electricity consumption, service level, Bill based on 4 RTP rates, home energy audit, Energy efficiency.

ENERGY SAVING TECHNIQUES: Household- use of CFL, solar panels for usage of electricity. Industrial- usage of various other sources for production of electricity such as coal, hydro energy and solar panels huge size. Comparison of energy saving techniques to conventional method of electricity production.

ENERGY AUDIT: Define energy audit, macro audit, micro audit, developing an audit plan, defining audit resources, energy analysis methodology, systematic approach, energy management opportunities, Electricity from purchase to end-use, units of energy.

SPECIAL STRUCTURES: Estimation of energy economy of the building, control and regulation methods. Special structures – more energy consumption than conventional buildings- comparative study. Case study of few energy audit in special structures.

TEXT BOOKS:

1. "Energy Audit of building Systems: An Engineering Approach", Second Edition by Monoef Krarti
2. "Energy management handbook" by Wayne C. Turner.
3. "Green energy Audit of buildings: A guide for a sustainable energy audit of Buildings", by Giuliano Dall O.

REFERENCES:

1. Energy savings toolbox- An energy audit manual and tool.
2. Studies on the structure of the industrial economy : Report on energy audit of paper industry
3. "An energy audit of Kindergartens to improve their energy efficiency", by Nikolay et.al, St. Petersburg, Russia.

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	LIFE CYCLE ASSESSMENT FOR COMPLEX SYSTEMS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Life cycle modeling of products, industrial processes, and infrastructure/building systems; material and energy balances for large interdependent systems; environmental accounting; and life cycle costing. These methods, based on ISO 14000 standards, are used to examine emerging technologies, such as bio based products, building materials, building integrated photovoltaics, and alternative design strategies, such as remanufacturing, dematerialization, LEED, and Design for Environment: Student teams complete a life cycle assessment of a product or system chosen from industry.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Life cycle assessment & goals.
2	To learn about the History, methodology and benefit of LCA.
3	To study about the various process of data collection in LCI.
4	To gain the knowledge about Green sustainable materials & biocompatible materials.
5	To learn about the LCA on Residential building, Industrial buildings and bridges.

COURSE OUTCOMES

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

CO1. Articulate the value of a Life Cycle Analysis (LCA)	Apply
CO2. Outline the steps to conduct an attributional LCA.	Apply
CO3. Describe common environmental impacts associated with a life cycle inventory of processes.	Apply
CO4. Approach complex problems with a systems thinking approach.	Analyze
CO5. Conduct a life cycle assessment.	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	-	-	L	-	L	S	--
CO2	S	L	L	M	-	-	-	-	-	-	-	-	S	--	M
CO3	S	L	M	L	-	M	-	-	-	L	-	-	--	L	--
CO4	L	S	M	L	-	-	M	M	-	-	L	-	--	L	M
CO5	S	M	L	-	-	-	-	-	-	L	-	L	L	L	--

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Life cycle assessment- goals- purpose- life cycle impact assessment- life cycle inventory- life cycle energy analysis-LCA and environmental systems- risk assessment methods- environmental risk assessment.

DATA COLLECTION AND METHODOLOGY: Environmental data collection, History of LCA, LCA methodology, LCA benefits and drawbacks.

LCI DATABASES: Unit process, data and LCI databases, inventory data and LCIA, LCA interpretation, key points of good LCA and examples, Chemical release in environment.

GREEN SUSTAINABLE MATERIALS: Green sustainable materials, biocompatible materials for future construction- straw, grass Crete, rammed earth, hemp Crete, bamboo, recycled plastic, wood, mycelium, ferrock, ashcrete, timbercrete, and design for sustainability.

CASE STUDIES: Case studies – LCA on Residential building, Industrial buildings and bridges.

TEXT BOOKS:

1. Life cycle of Structural Systems: Design, Assessment, Maintenance and Management, edited by Hitoshi Furuta, Dan M. Frangopol, Mitsuyoshi Akiyama.

2. Eco-efficient Construction and Building Materials: Life Cycle Assessment, by Fernando Pachecco-Torgal, Luisa F. Cabeza, Joao Labrincha, Aldo Giuntini de Magalhaes

REFERENCES:

1. Life-Cycle Civil Engineering: Proceedings of the International Symposium, by Fabio Biondini, Dan Frangopol. Integrated life cycle assessment of concrete structures: State-of-the-art Report, by Federation International du beton

2. NPTEL Notes by Dr. Brajesh Kr. Dubey, Associate Professor in IIT Kharagpur.

COURSE DESIGNERS

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	INFRASTRUCTURE PROJECT DEVELOPMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To study the elements of construction planning and scheduling and to apply appropriate tools and techniques like networks and coding systems. To study the elements of quality control and safety of construction projects. To study the monitoring of projects through cost control.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Concepts environment relationship with focus on issues of population
2	To learn about the Application of ecological principles in sustainability.
3	To study about the Land capability and suitability analysis in location and planning of urban.
4	To gain the knowledge about Urban interference in hydrological cycle.
5	To study about the Concepts of effects of air pollution and solid wasted is posalin cavities.

COURSE OUTCOMES

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

CO1. Understand infrastructure organizations	Apply
CO2. Prepare infrastructure master plan	Analyze
CO3. Schedule infrastructure project activities	Analyze
CO4. Prepare project development plan	Apply
CO5. Prepare tender documents for infrastructure project contract	Analyze

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INFRASTRUCTURE: Definitions of infrastructure, Governing Features, Historical overview of Infrastructure development in India, Infrastructure Organizations & Systems.

INFRASTRUCTURE PLANNING: Typical infrastructure planning steps, Planning and appraisal of major infrastructure projects, Screening of project ideas, Life cycle analysis, Multi-criteria analysis for comparison of infrastructure alternatives, Procurement strategies, Scheduling and management of planning activities, Infrastructure Project Budgeting and Funding, Regulatory Framework, Sources of Funding.

PROJECT MANAGEMENT IN CONSTRUCTION: Introduction to project management processes - Initiating, Planning, Executing, Controlling, and Closing processes; Project Integration Management - Project plan development, Project plan execution, and Overall change control; Project Scope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scope change control.

CONTRACTS AND MANAGEMENT OF CONTRACTS: Engineering contracts and its formulation, Definition and essentials of a contract, Indian Contract Act 1872, types of contracts and clauses for contracts, Preparation of tender documents, Issues related to tendering process, Awarding contract.

AIR QUALITY & SOLID WASTE MANAGEMENT: Sources, types and effects of air pollution and solid wasted is posalinc activities, urban industrial processes and land use and transportation implications in air and solid waste pollution; norms, standards, laws, organizations and policies in urban air quality control and solid waste management; example stabilized organic fraction best practices.

TEXT BOOKS:

1. A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
2. J. Parkin and D. Sharma, Infrastructure planning, Thomas Telford, London, 1999.
3. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.

REFERENCES:

1. J. Kelly, S. Male and D. Graham, Value management of construction projects, Blackwell Publishing, Oxford, 2003.
2. Vasant Desai, "Project Management", Himalaya Publishing , 1st Edition, 2010
3. James C. Van Horne, John M. Wachowicz, "Fundamentals of Financial Management",
4. PHI, 2nd Edition, 2000 Ronald W Hudson, "Infrastructure Management: integrating design, Construction, maintenance, rehabilitation and renovation", MGH, 1st Edition, 1997.

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	GREEN BUILDING AND ENERGY EFFICIENT BUILDING	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Before starting with this course one must get a clear knowledge on the basics of green building, learning the plan details of HVAC for a building, energy efficient modeling.

PREREQUISITE

Nil.

COURSE OBJECTIVES

1	To study about the Development & Plan Implementation.
2	To learn about the fundamentals of electric power systems and building electric wiring.
3	To study about the Bioclimatic design and concepts.
4	To gain the knowledge about Water conservation & water management systems.
5	To learn about the Key components of remodelling project.

COURSE OUTCOMES

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

CO1. Describe what green building	Apply
CO2. Understand the benefits and advantages of green building practices	Apply
CO3. Identify and describe green systems and features in residential and commercial buildings	Analyze
CO4. Define what makes up a healthy building	Apply
CO5. Describe green and sustainable materials and practices	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

GREEN BUILDING BASICS AND PRACTICES: Site Design / Development & Plan Implementation, Resource Efficiency, Energy Efficiency, Water Efficiency, Indoor Environmental Quality and Homeowner Education, Operation, Maintenance & Practices. Assessment of building design and construction, emission of CO2, SO2, and NO2 of building materials, elements, and construction process.

ENERGY MANAGEMENT SYSTEM OF BUILDINGS: The objective of the course is to provide students the necessary tools to control, monitor and optimize the building's facilities, mechanical and electrical equipment for comfort, safety, and efficiency. It starts with the fundamentals of electric power systems and building electric wiring and then works through building automation systems (BAS) principles. The course allows students to acquaint applying BAS to commercial HVAC equipment, lighting systems, fire systems and security/observation systems.

LOW ENERGY ARCHITECTURE, PASSIVE BUILDING DESIGN: Solar geometry, climate/regional limitations, natural lighting, passive design and sustainability initiatives, insulating and energy storing material. Bioclimatic design and concepts. Case studies will be used extensively as a vehicle to discuss the success/failure of ideas and their physical applications.

WATER MANAGEMENT, BUILDING METHODS & MATERIALS : Water conservation, water management systems, water efficient landscaping, green roofing, rainwater harvesting, sanitary fixtures and plumbing systems, wastewater treatment and reuse, and process water strategies. AAC (Aerated Auto clave Concrete), ICF (Insulated Concrete Forms), new Advanced Framing & Insulation Techniques, SIPs (Structural Insulated Panels), Straw Bale and Pumice-crete Rammed Earth, Timber Frame, Straw Clay, and Earth ship buildings.

ENERGY EFFICIENT REMODELING : Key components of remodeling projects-windows, walls, roofs, heating and ventilation, insulation, tighten up the building envelope, Advances in building technology and materials, Incorporate active and passive solar into the home or commercial building, Mistakes to avoid, various improvements cost

TEXT BOOKS:

1. Kibert, C. J. "Sustainable Construction: Green Building Design and Delivery," Second Edition, New York: John Wiley & Sons, Inc., 2008.
2. Thermal analysis and design of passive solar buildings by A. K. Athienitis and Mat Santamouris.
3. Passive building design by N.K. Bansal, G. Hauser, and G. Minke

REFERENCES:

1. McDonough, W. and Braungart, M. "Cradle to Cradle: Remaking the Way We Make Things," New York: Farrar, Straus and Giroux, 2002

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	SUSTAINABLE BUILDING MATERIAL LABORATORY	Category	L	T	P	Credit
		EC-SE	0	0	4	2

PREAMBLE

To introduce the students to modern irrigation methods and enabling the students to work professionally in the irrigation technology and agricultural sector and other related industry.

PREREQUISITE

NIL

LIST OF EXPERIMENT

1	Testing of Cross-laminated timber
2	Testing of Memory Steel
3	Testing of chipboard
4	Testing of Mushroom insulation
5	Testing of Zero-carbon cement

	ENVIRONMENTAL IMPACT ASSESSMENT OF IRRIGATION PROJECTS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

To introduce the students to environmental impact assessment and enabling the students to conduct and implement EIA studies in the agricultural sector and other related industry for the betterment of society

PREREQUISITE

Irrigation Engineering

COURSE OBJECTIVEGS

1	Understand the EIA studies and help in carrying out the EIA studies at various hydro and irrigation projects
2	Obtain essential skills to understand, critically read and evaluate, review and begin to conduct impact assessments and to balance and integrate environmental, social and economic needs
3	Apply Knowledge and skills in relation to the framework and procedures of environmental impact assessment
4	Use basic knowledge and skills to practice a number of selected methods used in Environmental impact Assessments
5	Understand the basic critical information to guide decisions about whether some hydro and irrigation projects and policies should be rejected

COURSE OUTCOMES

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

CO1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment in water resources development	Apply
CO2. The student will appreciate the importance of environment in water resources development and understand current methods of environmental assessment.	Apply
Co3. Students will become aware of future challenges facing water resources management	Analyze
Co4. Calculate the components of environmental impacts	Apply
Co5. Analyze the environmental issues	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	-	M	M	-	M	-	-	-	-	-	-	-
CO2	M	M	L		-	-	S	S	-	-	-	-	L	M	S
CO3	S	L	L	--	M	M	-	-	-	-	-	-	-	-	L
CO4	S	M	M		-	-	-	-	-	-	-	-	L	M	-
CO5	S	M	M	-	-	-	-	-	-	-	-	-	L	L	M

S- Strong; M-Medium; L-Low

SYLLABUS

ENVIRONMENTAL ISSUES: Water resources development and environmental issues – Environmental regulations and requirements - The EIA (Environmental Impact Assessment) notification

EIA FUNDAMENTALS: Environmental Impact Assessment (EIA) – EIA in Project Cycle – Legal and Regulatory aspects in India according to Ministry of Environment and Forests – Types and limitations of EIA – Participation of Public and Non-Governmental Organizations in environmental decision making

ENVIRONMENTAL IMPACTS: Hydrological and water quality impacts – Ecological and biological impacts – Social and cultural
impacts – Soil and landscape changes – Agro economic issues – Human health impacts – Ecosystem changes.

METHODS OF EIA : EIA team formation– Development of scope, mandate and study design – Base line survey – Check lists – Ad hoc procedures – Network and matrix methods – Semi-quantitative methods – ICID checklist – Economic approaches – Environmental Impact Statement (EIS) preparation.

ENVIRONMENTAL MANAGEMENT PLAN: In-stream ecological waterrequirements - Public participation inenvironmental decision making – Sustainable water resources development – Ecorestoration – Hydrology and globalclimate change – Human ecology – Ecosystem services – Environmental monitoring programs.

TEXT BOOKS:

4. L.W. Canter, "Environmental Impact Assessment", McGraw-Hill Book Company, 1995
5. Liu and Liptak, "Environmental Engineer's Handbook", CRCnet Base, 2008
6. Anjaneyulu and Valli Manickam, "Environmental Impact Assessment Methodologies", BS Publications, 1998.

REFERENCES:

1. Barthwal, R.R., Environmental Impact Assessment. New Age International Publishers, NewDelhi. 2002.
2. .Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell ScienceLondon. 1999.
3. Lawrence, D.P., Environmental Impact Assessment– Practical solutions to recurrent problems, Wiley-InterScience, New Jersey. 2003.
4. Arnel, N., Hydrology and global environmental change. Prentice Hall, Harlow. 2002.
5. Chari. B., Richa Sharma and S.A. Abbasi, Comprehensive Environmental Impact Assessment of Water Resources Projects : With Special Reference to Sathanur Reservoir Project (Tamil Nadu)/K. Discovery Pub., New Delhi, 2005.

COURSE DESIGNERS

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	INSTRUMENTAL MONITORING OF ENVIRONMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This Course helps in understanding the basics of instrumental measurements of environment and gives knowledge about chromatography, Electro and radio analytical methods.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Understand the basics of instrumental measurement and its preliminary corrections while doing the experiments
2	Gain knowledge on various spectroscopic instruments
3	Gain knowledge on chromatographs and working principles of various types of chromatographs.
4	Gain knowledge on basic and working principle of Electro and radio analytical methods.
5	Understand the principle behind continuous monitoring and the various instruments used for continuous monitoring.

COURSE OUTCOMES

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

CO1. Perform the experiments individually for various environmental parameters	Understand
CO2. Work on the various spectrographic instruments used for environmental quality monitoring.	Analyze
CO3. Work with various chromatographs in environmental quality monitoring areas.	Analyze
CO4. Use and access various electro and radio instruments in various environmental quality monitoring area.	Apply
CO5. Understand the principles behind continuous monitoring, for analyzing the various gaseous emissions and water.	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	M	S	M	-	-	L	-	L	-	M	S	L	M
CO2	S	M	L	S	-	-	-	-	-	-	M	-	--	--	M
CO3	M	L	L	S	-	M	M	-	L	-	-	-	L	--	--
CO4	M	M	M	S	-	-	-	-	-	M	L	L		S	--
CO5	S	M	M	S	-	-	L	-	-	-	-		L	--	L

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Instrumental Methods, Selection of method, Precision and Accuracy, Errors in measuring signals, Noise/signal ratio, base line drift, Indicator tubes.

SPECTROSCOPIC METHODS: Electromagnetic radiation, matter radiation interactions, Colorimetry and spectrophotometry, fluorimetry, nephelometry and turbidimetry, flame photometry Atomic Absorption Spectrometry (AAS), Atomic Emission Spectrometry (AES) - Inductively coupled plasma (ICP) and Direct Current Plasma (DCP) spectrometry. ICP - MS (Mass spectrometry).

CHROMATOGRAPHIC METHODS: Classical methods, Column, Paper and thin layer chromatography (TLC), Gas Chromatrography (GC), GC-MS, High performance liquid chromatography (HPLC) and Ion chromatrography (IC).

ELECTRO AND RADIO ANALYTICAL METHODS: Conductometry, potentiometry, coulometry, amperometry polarography, Neutron Activation Analysis (NAA), X-ray Fluorescence (XRF) and X-ray Diffraction (XRD) methods**.**

CONTINUOUS MONITORING INSTRUMENTS: Non-dispersive infra-red (NDIR) analyzer for CO, chemiluminescent analyzer for NOx, Fluorescent analyzer for SO2, Auto analyzer for water quality using flow injection analysis; permeation devices.

TEXT BOOKS:

1. Ewing "Instrumental Methods of Chemical Analysis", 5th Edition., McGraw-Hill, New York, 1995

REFERENCES:

1. Willard, H., Merritt, L., Dean, D.A. and Settle. F.A. "Instrumental methods of analysis, 7th Edition, Worlds Worth, New York, 2004

COURSE DESIGNERS

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2	Mr.M.Senthilkumar	Assistant Professor	Civil / VMKVEC	Senthilkumar@vmkvec.edu.in

	INDOOR AIR QUALITY	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This Course helps in understanding the indoor air quality, its pollution level and how to control it.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Understand the knowledge on indoor activities and its pollution levels
2	Know about air pollution in indoor environments with respect to various buildings.
3	Gain knowledge on control of air pollutants
4	Understand the concepts and tools used in air pollution control.
5	Understand the knowledge on various air pollutants and its sources along with its control technologies.

COURSE OUTCOMES

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

CO1 Assess the levels of indoor air pollution.	Understand
Co2. Design the air circulation and ventilation of various buildings prior to ambient air quality standards.	Analyze
Co3. Use the air pollution control measures of arresting air pollutants in various buildings.	Apply
Co4. Use the concepts and tools in designing the ambient air pollutant control measures.	Apply
CO5. Implement pollution control technologies while designing the buildings.	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
CO 1	S	M	M	L	-	M	-	M	L	-	S	-	M	--	S
CO 2	S	M	L	S	M	-	-	-	-	L	-	-	L	M	--
CO 3	S	M	M	S	-	-	L	-	-	-	M	-	--	--	--
CO 4	M	L	M	L	L	L	-	-	-	-	-	-	--	L	--
CO 5	S	L	L	S	-	L	-	M	-	M	-	L	L	--	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Indoor activities of inhabitants - residence time. Levels of many pollutants in indoor and outdoor air. Design and operation of buildings for improvements of public health. IAQ policy issues; sustainability; indoor air quality as a basic human right

INDOOR AIR POLLUTANTS : Air pollutants in indoor environments, private residences, offices, schools, sand public buildings, factors that govern pollutant indoors concentrations, including ventilation. Characteristics, Consequences

CONTROL OF POLLUTANTS: Control of several pollutant classes, such as radon, toxic organic gases, combustion byproducts, and microorganisms such as molds and infectious bacteria. Case study by an exploration of public policy related to indoor air.

CONCEPTS AND TOOLS : Concepts and tools; exposure, material-balance models, statistical models Ventilation

INDOOR AIR POLLUTION FROM OUTDOOR SOURCES: Indoor air pollution from outdoor sources; particulate matter and ozone; Combustion byproducts; Radon and its decay products. Volatile organic components: odors and sickbuilding syndrome, Humidity Bio-aerosols: infectious disease transmission. Special indoor environments; A/C units in indoor, museums-labs; museums-labs, Measurement methods, Control technologies, Control strategies.

TEXT BOOKS:

1. Thad Godish, Indoor air and Environmental Quality, CRC Press, 2000

REFERENCES:

1. Nazaroff W.W and L Alvarez-Cohen, Environmental Engineering Science Wiley sons, New York, 2001. 2. Moroni Marco, Seifert Bernd and Lindell Thomas, Indoor Air Quality: A Comprehensive Reference Book, Elsevier Science, Vol. 3, 1995.

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	ENVIRONMENTAL POLICIES AND LEGISLATIONS	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This Course helps in gaining knowledge about various environmental policies and legislations and various articles related toenvironmental law and powers and responsibilities of pollution control board.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Understand the various Sections and subsections of civil and criminal law.
2	Study the importance of fundamental rights and directive principles of our constitution
3	Study the various articles related to environmental law and powers and responsibilities of pollution control board.
4	Know about the awareness of various pollution and control laws related to water and air.
5	To gain knowledge on EIA, Ecolabelling, hazardous and biomedical waste handling.

COURSE OUTCOMES

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

CO1. Describe the importance of civil and criminal law related to environmental legislation	Understand
CO2. Gain knowledge on fundamental rights and directive principles of our constitution.	Remember/Understand
CO3. Understand the various environmental issues and handle the real time problems inindustries.	Understand/Apply
CO4. Gain knowledge in pollution control laws and implement it in working sectors.	Understand/Apply
CO5. Understand and manage biomedical, hazardous waste, Ecolabelling, and EIA.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Basics of jurisprudence - Environmental law relation with other disciplines - Criminal law - CommonLaw - Relevant sections of the Code of Civil Procedure, Criminal Procedure Code - Indian Penal Code

INDIAN CONSTITUTION AND ENVIRONMENT : Introduction - Fundamental Rights - Directive Principles of State Policy - Article 48 (A) and 51- A(g) Judicial enforceability - Constitution and Resources management and pollution control -Indian Forest Policy (1990) - Indian Environmental Policy (1992).

ADMINISTRATIVE REGIME & LEGAL REGIME: Administrative regulations - constitution of Pollution Control Boards Powers, functions, Accounts, Audit etc. - Formal Justice Delivery mechanism Higher and Lower of judiciary - Constitutional remedies writ jurisdiction Article 32, 226 136 special reference to Mandamus and Certiorari for pollution abatement - Equitable remedies for pollution control.

POLLUTION CONTROL LAWS : Administrative regulation under recent legislations in wear pollution control. Water(prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (prevention and control of pollution) Rules 1975 Water (prevention & Control or Pollution) Cess Act. 1977 as amended by Amendment Act 1987 and relevant notifications.

ENVIRONMENTAL (PROTECTION) ACT 1986: Relevant notifications in connection with Hazardous Wastes (management and handling) Biomedical wastes (management and handling), Noise pollution, Eco-labeling, and E.I.A.**TEXT BOOKS:**

1. Environmental, A., Divan and Noble M. Environmental Law and Policy in India (cases, Materials and Statutes) 1991 Tripathi Bombay.

REFERENCES:

1. Constitution of India Eastern Book Company Lucknow 12th Edition. 1997.

2. Constitutional Law of India - J.N. Pandey 1997 (31st Edition) Central Law Agency, Allahabad.
3. Administrative Law U.P.D. Kesari 1998. Universal Book Trade, Delhi.
4. Environmental Law H.N. Tiwari, Allahabad Law Agency 1997.
5. Environmental Policy. Forest Policy, Bare Acts - Government Gazette Notification.

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	SUSTAINABLE DEVELOPMENT AND ENVIRONMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This Course helps in understanding about sustainable development and environment.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Be acquainted with the concept of sustainable development based on global environmental issues.
2	Be familiar with social, economical and environmental dimensions of sustainable development.
3	Gain knowledge on achieving sustainability using performance indicators.
4	Learn the steps of action plan for implementation of sustainable development.
5	Be familiar with the contribution of developed countries on sustainable development.

COURSE OUTCOMES

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

CO1. Develop knowledge on sustainable development concepts	Understand
CO2. Describe social, economical and environmental issues of sustainable development.	Understand/apply
CO3. Be aware of the performance indicators to asses' sustainable development.	Remember/Understand
CO4. Identify the steps in action plan for implementation of sustainable development.	Analyze
CO5. Relate to the integrated approach for resource protection and management.	Understand/apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

CONCEPT OF SUSTAINABLE DEVELOPMENT: Environment and Development - Population, Poverty and Pollution - Global and Local environmental issues - Resource Degradation - Greenhouse gases - Desertification - Industrialization - Social insecurity, Globalization and environment. History arid emergence of the concept of sustainable development - Objectives of Sustainable Development

COMPONENTS AND DIMENSIONS OF SUSTAINABLE DEVELOPMENT : Components of sustainability - Complexity of growth and equity - Social, economic and environmental dimensions of sustainable development - Environment - Biodiversity - Natural Resources - Ecosystem integrity - Clean air and water - Carrying capacity - Equity, Quality of Life, Prevention, Precaution, Preservation and Public participation-structural and functional linking of developmental dimensions

FRAMEWORK FOR ACHIEVING SUSTAINABILITY: Operational guidelines - Interconnected prerequisites for sustainable development - Empowerment of Women, Children, Youth, Indigenous People, Non-Governmental Organizations, Local Authorities, Business and Industry - Science and Technology for sustainable development - Performance indicators of sustainability and Assessment mechanism - Constraints and barriers for sustainable development.

SUSTAINABLE DEVELOPMENT OF SOCIO-ECONOMIC SYSTEMS : Demographic dynamics of sustainability - Policies for socio-economic development - Strategies for implementing eco-development programs - Sustainable development through trade - Economic growth - Action plan for implementing sustainable development - Urbanization and Sustainable Cities - Sustainable Energy and Agriculture - Sustainable Livelihoods.

SUSTAINABLE DEVELOPMENT AND INTERNATIONAL RESPONSE: Role of developed countries in the development of developing countries - International summits - Stockholm to Johannesburg - Rio Principles - Agenda 21 - Conventions - Agreements - Tokyo Declaration - Doubling statement - Transboundary issues - Integrated approach for resource protection and management.

TEXT BOOKS:

1. Jeffry Sayer and Campbell, B., The Science of Sustainable Development: Local Livelihoods and the Global Environment (Biological Conservation, Restoration & Sustainability), Cambridge University Press, London, 2003.

REFERENCES:

1. Kirkby, J., O'Keefe, P. and Timberlake, Sustainable Development, Earthscan Publication; London, 1993.

2. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publications, London, 1998. 3. Bowers, J., Sustainability and Environmental Economics - An Alternative Text, Longman London, 1997.

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	REMOTE SENSING AND GIS FOR ENVIRONMENTAL APPLICATION	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This Course helps in gaining knowledge about remote sensing and GIS for environment application.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Be acquainted with the concepts of Remote sensing, EMR interaction with Environmental issues.
2	Be familiar with remote sensing platform systems, its satellites and sensors.
3	Gain knowledge on data processing using image processing software.
4	Gain knowledge on GIS and GIS software.
5	Be familiar with monitoring environment using remote sensing and GIS.

COURSE OUTCOMES

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

CO1. Develop knowledge on concept of remote sensing.	Understand
CO2. Be aware of remote sensing platforms and sensors.	Understand
CO3. Identify the steps in Image processing software.	Apply
CO4. Relate the problems in GIS software.	Apply
CO5. Describe the environmental application using remote sensing and GIS.	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	-	-	S	-	S	S	M	-	L	L	L
CO2	M	L	M	L	M	-	-	M	-	-	-	-	L	M	L
CO3	S	M	M	L	M	-	M	-	-	-	-	M	M	--	-
CO4	S	S	M	L	-	-	-	-	M	-	-	-	S	M	L
C05	S	-	M	-	M	L				L	L		-	--	M

S- Strong; M-Medium; L-Low

SYLLABUS

PRINCIPLES OF ELECTRO MAGNETIC RADIATION: Concepts of Remote Sensing - Energy sources and radiation principles, Energy interactions in the atmosphere - Spectral reflectance of earth surface features. **REMOTE SENSING PLATFORMS:** Aerial Photographs, Photographic Systems - Visible, Infra Red and Microwave sensing - Active and passive sensors - Satellites and their sensors, Indian Space Program - Satellite data products

DATA PROCESSING: Photogrammetry - Satellite data analysis - Visual Interpretation, Interpretation equipments - Digital Image Processing - Image rectification, enhancement, classification, data merging and biophysical modeling - Image Processing software.

GEOGRAPHIC INFORMATION SYSTEM : Introduction to GIS concepts - Data base structure - Data analysis - GIS software

REMOTE SENSING AND GIS APPLICATIONS: Management and monitoring of environment, conservation of resources, coastal zone management - Limitations.

TEXT BOOKS:

1. Lillesand, T.M. and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2004.

REFERENCES:

1. Burrough, P.A. and McDonnell, R.A., Principles of Geographic Information Systems, Oxford University Press, New York, 2001.

2. Lintz, J. and Simonet, Remote Sensing of Environment, Addison Wesley Publishing Company, New Jersey, 1998.

COURSE DESIGNERS

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	WASTE WATER MANAGEMENT	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

This Course helps in understanding about various methods of wastewater treatment and management.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	Be familiar with the concept of aerobic and anaerobic treatment of waste water.
2	Be acquainted with the origin of various units of Aerobic treatment of waste water.
3	Be acquainted with the design and concepts of various units of Anaerobic treatment of waste water.
4	Gain knowledge on sludge treatment and disposal.
5	Understand the operations, maintenance and management of sewage treatment plants.

COURSE OUTCOMES

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

CO1. Describe the concept of aerobic and anaerobic treatment of waste water.	Understand
CO2.Develop knowledge on the design of various unit of Aerobic treatment of waste water.	Understand/Apply
CO3. Develop knowledge on the design of various unit of Anaerobic treatment of waste water.	Understand/Analyze
CO4. Identify the ways of treatment of sludge and its disposal.	Analyze
CO5. Be aware of the operation, maintenance and management of sewage treatment plants.	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	-	-	S	-	S	S	M	-	M	-	--
CO2	M	L	M	L	M	-	-	M	-	-	-	-	L	M	L
CO3	L	L	M	M	M	-	M	-	-	-	-	M	L	--	-
CO4	S	S	L	L	-	-	-	-	M	-	-	-	S	L	L
C05	L	-	M	-	M	L				L	L		-	--	M

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION: Objectives of biological treatment - significance - aerobic and anaerobic treatment - kinetics of biological growth - Factors affecting growth attached and suspended growth - Determination of Kinetics coefficients for organics removal - Biodegradability assessment - selection of process.

AEROBIC TREATMENT OF WASTEWATER: Design of sewage treatment plant units - screen chamber, Grit chamber with proportional flow weir, sedimentation tank - Trickling filters, Rotating Biological contactor, activated sludge process & variations, aerated lagoons, waste stabilization ponds - nutrient removal systems - natural treatment systems - Disinfected disposal options - reclamation and reuse - Flow charts, layout, hydraulic profile - Recent advances.

ANAEROBIC TREATMENT OF WASTEWATER: Attached and suspended growth, Design of units - UASB, up flow filters, Fluidized beds - Septic tank and disposal - Nutrient removal systems - Layout and Hydraulic profile - Recent advances.

SLUDGE TREATMENT AND DISPOSAL: Design of Sludge management facilities, sludge thickening, sludge digestion, Biogas generation, sludge dewatering (mechanical and gravity) - upgrading existing plants - ultimate residue disposal - Recent Advances.

OPERATIONS, MAINTENANCE, MANAGEMENT AND CASE STUDIES: Operational problems - Trouble shooting, Planning, Organizing and Controlling of plant operations - capacity building, Case studies on sewage treatment plants - sludge management facilities**.**

TEXT BOOKS:

1. Metcalf & Eddy, Inc. "Wastewater Engineering, Treatment and Reuse, Third Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.

REFERENCES:

1. Arceivala, S.J., Wastewater treatment for pollution control, TMH, New Delhi, 1998.
2. Manual on "Sewerage and Sewage Treatment" CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1999.
3. Qasim, S.R, Wastewater Treatment Plant, Planning, Design & Operation Technomic Publications, New York, 1994.

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	ENVIRONMENTAL ANALYSIS LABORATORY	Category	L	T	P	Credit
		EC-SE	0	0	4	2

PREAMBLE

To introduce the students to modern irrigation methods and enabling the students to work professionally in the irrigation technology and agricultural sector and other related industry.

PREREQUISITE

NIL

LIST OF EXPERIMENT

1	Experimental Investigation on Total Carbon
2	Experimental Investigation on Organic/Inorganic Carbon
3	Experimental Investigation on Total Nitrogen
4	Experimental Investigation on Particle Size
5	Experimental Investigation on Soil Digestion

	3D PRINTING WITH SKETCHUP	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

SketchUp is a 3D software that is suitable for everyone. It is one of the most-widely used 3D-modeling software, used both in schools and at workplaces. It is surface modeling software with which you are able to manipulate faces and edges. One of the reasons for its success is that it has simple, intuitive modeling tools, with an easy-to- use user interface. This 3D design software can be used both by people wishing to use 3D printing, by interior designers, by design modelers, for architecture design or by engineers for product design.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To make the tools of Sketchup software familiar to the students
2	To make the learners to design the required object in to appropriate 2D object and convert it into 3D model
3	To develop knowledge to the learners on the layers and terrains
4	To make them familiarize on importing terrains and print different objects
5	To fabricate desired object in 3D printer.

COURSE OUTCOMES

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

CO1 model a desired object using sketchup software	Apply
CO2 choose appropriate resolution for the concerned type of Object	Apply
CO3 to print an object in 3D using 3D printer	Apply
CO4 import terrain and print in different Color	Apply
CO5 design complex models and print it in 3D printer	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	**L**	**L**	**L**	M	**L**	**S**	**S**	**L**	**L**	**M**	**M**	**M**	**L**	**L**	**L**
CO2	**M**	**M**	**M**	**L**	**M**	**S**	**S**	**-**	**L**	**S**	**L**	**S**	**S**	**M**	**M**
CO3	**M**	**L**	**M**	**L**	**M**	**M**	**-**	**M**	**M**	**-**	**S**	**L**	**M**	**S**	**S**
CO4	**M**	**M**	**M**	**L**	**M**	**S**	**L**	**M**	**M**	**L**	**S**	**L**	**M**	**L**	**L**
CO5	**L**	**L**	**L**	**M**	**L**	**M**	**S**	**M**	**M**	**M**	**M**	**M**	**S**	**M**	**M**

S- Strong; M-Medium; L-Low

SYLLABUS

Unit 1 Design a printable 3D file using Sketchup software

Know the Material Used for Successful 3D Printing - Prepare for Modeling - Orient the Faces of Your Model Correctly - Create Closed Volumes (Solids) - Optimize Modeling with Plugins - Color Your 3D Model

Unit 2 Understanding Model Resolution

Creating a profile - Avoiding missing faces by scaling up your model - Creating wall thickness - Understanding

noncircular circles - Making the magic happen with the Follow Me tool - desktop extrusion printers - Combining solids with the Outer Shell tool

Unit 3 : Using Existing Models

Leveraging SketchUp components to save time - Saving a model as a Component - Online 3D model repositories – Thingiverse - 3D Warehouse – GrabCAD - Case study – modifying a GoPro wrench

Unit 4 Importing Terrain and Printing in Color

Working with the Google Earth terrain - Printing models with color - Textures versus solid colors Working with solid colors in SketchUp - Working with textures in SketchUp - Exporting the model for color printing

Unit 5 Modeling Architecture for 3D Printing

Using SketchUp for 3D printing versus rendering Case study – 3D printing a model designed for rendering Examining the original model - Planning the model - Using groups and layers to organize the model - Creating a standard wall thickness - Editing wall panels to add details - Adding the window grills - Adding interior walls - Modeling the roof - Orienting the parts for printing - Printing the model and bonus commentary - Preparing the model for full color printing - Orienting the parts for printing - Printing from i.materialise - Printing from Shapeways - The full-color printed cabin

BOOK:

1. Marcus Ritland, '3D Printing with SketchUp', Packt Publication, 2014.

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	MODERNISTIC APPROACHES IN CONSTRUCTION	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

Study and comprehend the Modernized construction approaches practicing in the field of civil engineering.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To study and understand the usage of different sustainable materials in construction
2	To study the concept and usage of Nano technology in the field of civil engineering
3	To study the inevitable role of biotechnology in the field of construction
4	To rendering the different automation process involved in modern day of construction
5	To acquire the role of prefab construction

COURSE OUTCOMES

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

CO1. Investigate and comprehend the use of various sustainable building materials.	Understand
CO2. Analyze the concept of Nanotechnology and its application in the field of civil engineering.	Understand
CO3. To validate the basic knowledge of biotechnology in the construction Industry	Analyze
CO4. To clearly elucidate about the various automation processes that are used in today's construction	Apply
CO5. To clearly explicate the equipment's and methods used in modular construction	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT - I SUSTAINABLE BUILDING MATERIALS

Special alloys of steel and other metals- glass- polymer- fabric- Construction chemicals- Specialized

equipment's-Market survey -collection of information about the materials

UNIT - II NANO CONCRETE

Concept of Nanotechnology- Nano Cement materials- Nanoscale Characterization -Silica Aerogels- Effect of Nano-SiO- Nano Clay- Graphene-Oxide- Electrochemical Injection- Cement Reinforcement by Nanotubes.

UNIT - III CONSTRUCTION BIOTECHNOLOGY

Basics of Biotechnology for Civil Engineering - Biotechnological Admixtures- Biotechnological Plastics- Bio cements- Bio coating of Surfaces- Bio grouts- Bio corrosion- Bio deterioration - Future Developments

UNIT - IV CONSTRUCTION AUTOMATION

Concept- Building Information Model- 3D Printing- Roles of artificial intelligence in construction engineering and management

UNIT - V MODULAR CONSTRUCTION

Modular construction- Types- prefabrication–Principles–Materials–Modular coordination– Standardization–Systems–Production–Transportation–Erection –Construction and erection of roof and floor slabs–Wall panels –Columns–Shear walls

BOOKS:

1. CBRI, Building materials and components, India, 1990
2. Nanotechnology in Construction, Konstantin Sobolev & Surendra P. Shah, Springer International Publishing, Switzerland 2015
3. Construction Biotechnology, Volodymyr & Ivanov Viktor Stabnikov, Green Energy and Technology (GREEN), 2017
4. Construction Automation. In: Castro-Lacouture D. (2009) , Springer Handbook of Automation, 2009

REFERENCES:

1. Henrick Nissen, "Industrial Building and Modular Design",Cement Concrete Association,
2. Roy Chudley& Roger Greeno, "Advanced Construction Techniques", Pearson Prentice Hall

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	FUNDAMENTALS OF 3D PRINTING	Category	L	T	P	Credit
		EC (PE)	3	0	0	3

PREAMBLE

The students will be able to gain knowledge about the importance of 3D printing fundamentals & process.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To the know history and technology about 3D printing
2	To become aware of storage devices.
3	To study about 3D printing process.
4	To know about 3D applications.
5	To do case study about 3D technologies.

COURSE OUTCOMES

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

CO1. Should be exposed to knowledge of basics of 3D printing.	Understand
CO2. Should be able to learn storage devices	Understand
CO3. Should be able to learn about 3D printing devices.	Analyze
CO4. The concept of other various printing applications.	Apply
CO5. Should be able to know some case studies.	Understand

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S-Strong; M-Medium; L-Low

SYLLABUS

UNIT – I Introduction

History of 3D printing - advantages of 3D printing - various 3D printing technologies and materials - geometry terms – types of 3D printing.

UNIT – II Storage Devices

Digital image input, image editing using software. File format and image compression. Printer drivers and printing software. Comparing digital printing technologies with conventional. Storage devices. Limitations, Pros & cons of digital printing.

UNIT – III 3D Printing Processes

Challenges with 3D Printing - 3D Printing Benefits & Value - 3D Printing Materials – Stereolithography – DLP - Extrusion / FDM / FFF – Inkjet – SDL – EBM -

UNIT – IV 3D Printing Applications

Medical and Dental – Aerospace – Automotive – Jewellery - Art / Design / Sculpture – Architecture - Fashion – Food – Consumers.

UNIT – V Case Study

Design Process Overview - Prototyping – case study.

BOOKS:

1. Marianne Rosner Klimchuk and Sandra A. Krasovec, "Packaging Design", John Wiley and Sons, Inc, 2006.
2. Geoff A. Giles, "Design and Technology of Packaging Decoration for the consumer market, SmithKline, Beecham, 2000
3. Alastair Campbell, The Graphics Designer Handbook, MacDonald & Co, 1983.

REFERENCES:

1. "Hand Book of Printing Technology" EIRI Board of Consultants and Engineers, Engineers India Research Institute, New Delhi

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	NANO MATERIALS FOR 3D PRINTING	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

The students will be able to gain knowledge about the importance of nano materials fundamentals & process.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To study and understand the basic concepts of nano technology.
2	To study the role of advanced nano materials and 3D printing.
3	The students know about different fabrication techniques of nano systems and nano materials
4	To expose the students knowledge of 3D printing technology.
5	To acquire the knowledge of problem analysis and interpretation of data

COURSE OUTCOMES

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

CO1. To be well versed in 3D printing workflow technology	Understand and Apply
CO2. To clearly understand the basic types of 3D printing, materials used and their application	Apply
CO3. To be well versed in different fabrication methods for nano Materials	Apply
CO4. To demonstrate the 3D printing technology for all kind of projects.	Apply
CO5. Select appropriate method for designing and modeling Applications	Understand and Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S-Strong; M-Medium; L-Low

SYLLABUS

UNIT – I INTRODUCTION

Introduction to nano systems -fabrication methods; properties of nano materials- Synthesis of Nanomaterials & Nanostructures: Nanoparticles, Nanorods, Nanowires, MOFs, Quantum Dots

UNIT – II NANO MATERIALS

Processes – Extrusion, Wire, Granular, Lamination, Photo-polymerisation; Materials – Paper, Plastics, Metals, Ceramics, Glass, Wood, Fibre, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection – Processes, applications, limitations

UNIT – III INKJET TECHNOLOGY

Printer – Working Principle, Positioning System, Print-head, Print bed, Frames, Motion control; Print-head Considerations -Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication –Continous jet, Mulitjet; Powder based fabrication – Colour-jet.

UNIT – IV ADVANCED NANO MATERIALS

Fundamentals; Techniques; Characterizations -Synthesis of Nanoparticles; Carbon dots- Nanocomposites- Layer by Layer Assembly- Electrospining- Nanofibers, carbon nanotubes, nanocellulose, nano-composites, bioinspired materials.

UNIT- V INDUSTRIAL APPLICATIONS

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Opensource; Future trends..

BOOKS:

1. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.
2. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.
3. Introduction to Nanoscience and Nanotechnology, G.L. Hornyak, H.F. Tibbals, J.Dutta, J.J. Moore, CRC Press.
4. Nanotechnology: synthesis to applications / edited by Sunipa Roy, Chandan Kumar Ghosh, and Chandan Kumar Sarkar

REFERENCES:

1. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co.2007
2. Joan Horvath, Mastering 3D Printing, APress, 2014
3. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010.

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	BIM And 3D Printing of Concrete	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE:

This course focuses on the skills and information needed to effectively use an existing Building Information Model (BIM) in plan execution for a building construction project. This is a project-based course where students gain knowledge on the implementation of BIM concepts throughout the lifecycle of a building, from planning and design, to construction and operations.

PREREQUISITE: NIL

COURSE OBJECTIVES:

The holistic process of creating and managing information for a built asset.

BIM shows visually understand how a building will be constructed.

Use the principles of Design Thinking and document their design process.

Produce a product using 3D Printing or Additive Manufacturing (AM).

To apply these techniques into various applications.

COURSE OUTCOMES:

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

CO1: Understand the concept of BIM design	Understand
CO2: Apply the BIM techniques to the field	Apply
CO3: To gain knowledge and skills related to 3D printing technologies.	Understand
CO4: To understand the various software tools, process and techniques for digital Manufacturing	Understand
CO5: To apply these techniques into 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	M	-	S	S	S	-	M	L	L	L	-	M	-	M	L
CO2	M	-	S	M	S	-	M	L	M	L	-	M	-	M	-
CO3	S	-	S	S	S	-	M	L	-	L	-	L	M	M	-
CO4	S	-	S	M	S	-	L	L	L	M	-	M	-	M	-
CO5	S	-	M	L	S	-	L	L	M	L	-	M	L	L	M

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION

BIM in design - Creating Levels and Grids-Wall modeling-Object Modification-Doors, Windows-Floors and Roofs-Curtain, Ramps,Stairs- Dimensions and constraints -Annotation and Documentation.

BUILDING SIMULATION
Schedules -Perform model-BIM to the Field- Construction Scheduling and 4D Simulation - based cost estimating.

3 D PRINTING
Introduction, Process, Classifications, Advantages, Additive v/s Conventional Manufacturing processes, Applications.
MATERIAL SCIENCE
Components of a Concrete 3 D Printing System-Cement Production Process- Chemical Properties of Cement-Characteristics of 3D Print Materials-On site Mixing System
APPLICATIONS
Technology Perspectives and Insights -Technical and non-technical challenges - Legislative Challenges and Trends

TEXT BOOKS:

1. Jannsen, Constructional Drawings & Architectural models, Kari Kramer Verlag Stuttgart, 1973.
2. Werner, M. (2011). Model Making. New York: Princeton Architectural Press.

REFERENCES:

1. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.

2. CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.

COURSE DESIGNERS:

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	ADVANCED 3D PRINTING APPLICATIONS IN CONSTRUCTION	Category	L	T	P	Credit
		EC-SE	3	0	0	3

PREAMBLE

The students will be able to gain knowledge about the importance of advanced 3D printing application in construction.

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To gain knowledge and skills related to 3D printing technologies.
2	To learn the selection of material, equipment and development of a product for Industry 4.0 environment.
3	To understand the various software tools, process and techniques for digital manufacturing
4	To apply these techniques in construction
5	To apply these techniques into various applications

COURSE OUTCOMES

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

CO1. To Develop CAD models for 3D printing.	Understand and Apply
CO2. To learn 3D Printing usage in all application domains	Apply
CO3.. To learn about technologies used for construction	Apply
CO4. Understand about all the printable challenges	Apply
CO5. Produce a product using 3D Printing or Additive Manufacturing (AM).	Understand and Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO1	**S**	L	**S**	**L**	**S**	L	L	**L**	**L**	**L**	**L**	**M**	**S**	**S**	**L**	**S**
CO2	**M**	L	**M**	**L**	**M**	L	L	**L**	**M**	**L**	**L**	**S**	**M**	**M**	**L**	**S**
CO3	**S**	L	**S**	**L**	**S**	L	L	**L**	**L**	**L**	**L**	**M**	**S**	**S**	**L**	**S**
CO4	**M**	L	**M**	**M**	**S**	L	L	**L**	**M**	**L**	**L**	**M**	**S**	**M**	**M**	**S**
CO5	**S**	L	**S**	**M**	**S**	L	L	**L**	**L**	**L**	**L**	**S**	**S**	**S**	**L**	**M**

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT - I 3D Printing

Introduction, Process Equipment- Design and process parameters -Governing Bonding Mechanism -Common faults and troubleshooting - Classifications, Advantages, Additive v/s Conventional Manufacturing processes, Applications.

UNIT II Additive Manufacturing Techniques

Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Autom Construction, Food Processing, Machine Tools.

UNIT III 3d Printing Technologies

Benefits-different technologies-Robotic arm extruders-Sand 3D printing-Metal technology

UNIT IV 3D Printing Construction

3D Printable Materials and Challenges- Cement-Based Materials for 3D Printing-Contour crafting-concrete printing

UNIT V 3d Printing Applications

Printing of 3D Houses- Printing of 3D Bridge and Canal-Metal Frames For Solid Structures-Building Disaster Relief Shelters

BOOKS:

1.Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.

2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, R Manufacturing", Hanser Publisher, 2011.

3. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.

4. CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", Wor Scientific, 2017

.**REFERENCES:**

1.J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Materia Science, 2013.

2..L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kul Academic Press, 2001.

3.Zhiqiang Fan And Frank Liou, "Numerical Modelling of the Additive Manufacturing (AM) Process Titanium Alloy", InTech, 2012.

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		Category	L	T	P	Credit
	ADDITIVE MANUFACUTURING TECHNIQUES	EC-SE	3	0	0	3

PREAMBLE

This course address the fundamentals of additive manufacturing, concept, types, scope and area of application

PREREQUISITE

NIL

COURSE OBJECTIVES

1	To introduce the development of Additive Manufacturing (AM), various business opportunities and applications
2	To know the principle, methods, possibilities and limitations as well as environmental Effects of Additive Manufacturing technologies.
3	To be familiar with the characteristics of the different materials those are used in Additive Manufacturing technologies
4	To familiarize various software tools, processes and techniques to create physical objects that satisfy product development / prototyping requirements, using AM.
5	To be acquainted with vat polymerization and material extrusion processes.

COURSE OUTCOMES

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

CO1. Distinguish between and apply a variety of additive manufacturing processes	Apply
CO2. Select and utilize the appropriate CAD formats when fabricating a 3D printed part	Apply
CO3. Recognize the principles of operation, capabilities, and limitations of liquid and solid-based additive manufacturing systems, including fused deposition modelling and stereolithographic.	Understand
CO4. Acquaint yourself with the principles of operation, capabilities, and limitations of powder-based additive manufacturing systems, such as 3D printing and laser sintering..	Understand
CO5. Identify critical process parameters for bio manufacturing and select the most appropriate additive technique for bio manufacturing	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PS O2	PS O3
CO1	**M**	L	S	L	**M**	S	**M**	L	S	L	S	**L**	**L**	L	S
CO2	**M**	S	L	S	**M**	L	**M**	S	L	S	L	**L**	**L**	S	L
CO3	**M**	S	L	S	**M**	L	**M**	S	L	S	L	**L**	**L**	S	L
CO4	**M**	L	S	L	**M**	S	**M**	L	S	L	S	**L**	**L**	L	S
CO5	**M**	S	L	S	**M**	L	**M**	S	L	S	L	**L**	**L**	S	L

S- Strong; M-Medium; L-Low

SYLLABUS

UNIT - I INTRODUCTION 9

Overview – Need - Development of Additive Manufacturing Technology -Principle – AM Process Chain-

Classification –Rapid Prototyping- Rapid Tooling – Rapid Manufacturing – Applications- Benefits

UNIT-II CAD & REVERSE ENGINEERING

Basic Concept – Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology: CAD model preparation – Part Orientation and support generation – Model Slicing –Tool path Generation – Software's for Additive Manufacturing Technology: MIMICS, MAGICS

UNIT - III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS

Classification – Liquid based system – Stereolithography Apparatus (SLA)- Principle, process, advantages and applications – Solid based system –Fused Deposition Modeling – Principle, process, advantages and applications, Laminated Object Manufacturing

UNIT - IV OWDER BASED ADDITIVE MANUFACTURING SYSTEMS

Selective Laser Sintering – Principles of SLS process – Process, advantages and applications, Three Dimensional Printing – Principle, process, advantages and applications- Laser Engineered Net Shaping (LENS), Electron Beam Melting.

UNIT – V MEDICAL AND BIO-ADDITIVE MANUFACTURING

Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Case studies

BOOKS:

5. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third Edition, World Scientific Publishers, 2010.
6. Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003.

REFERENCES:

5. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications : A tool box for prototype development", CRC Press, 2007.
6. Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
7. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC press, 2000.

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2	Mr.C.Kathirvel	Associate Professor & Head	Civil / VMKVEC	kathirvel@vmkvec.edu.in

	MEASUREMENT SCIENCE IN 3D PRINTING	Category	L	T	P	Credit
		EC-SE	0	0	4	2

PREAMBLE

The purpose of this course is to understand Measurement in 3D printing to develop ideas that can be turned into objects and help in design thinking.

PREREQUISITE- NIL

COURSE OBJECTIVES

1	To understand and analyse different measurement systems, Standards of Measurement and Measurement Errors.
2	Measurements for the determination of composition, structure, and properties of a variety of materials.
3	Implement and analyse appropriate measurement methods for variables.

COURSE OUTCOMES

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

CO1. Study the Basic concepts of Measurement Science in Additive Manufacturing	Understand
CO2. Understand the Geometrics in 3D Printing.	Understand
CO3. To Design and Develop 3D Measuring and Simulation.	Apply
CO4. Understand the Process and Monitoring of Modeling.	Understand
CO5. To Perform different measurement and check the components for functionality.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	S	-	-	L	L	-	L	-	L	-	-	L	-	L	M
CO2	S	-	-	L	L	-	L	-	L	L	-	L	-	L	L
CO3	S	L	L	M	L	L	L	-	M	-	M	M	-	S	M
CO4	M	M	M	M	-	L	M	-	M	L	S	M	M	S	L
CO5	M	L	S	M	-	M	M	-	M	L	S	M	M	S	L

S- Strong; M-Medium; L-Low

SYLLABUS

INTRODUCTION – Measurement Science in Additive Manufacturing – Material uncertainties – Process uncertainties – Part accuracy and uncertainties – Physics-based and property-based models for simulation and analysis.

GEOMETRICS – 3D Mesh Geometries – Sensors - Measurement Device – Algorithms – Measure and Predict Properties - Measurement test pieces - Calibration standards - Data reporting and collection - Process parameters.

DESIGN AND DEVELOPMENT - Manufacturing Standards – Modeling And Simulation – Potentials in Measurement Sciences – Monitoring During Fabrication – Defect Detection – PBF System - data translation facilitate to export design.

PROCESS CONTROL AND MODELING - Process Parameters - Control Objectives - Monitoring Sensors - In-Process Control and Monitoring Setup - Simufact Additive - ESI-Additive Manufacturing - Netfabb Simulation - Current Commercial Process Control Solutions.

PROTOTYPING, FUNCTIONALITY AND MEASUREMENT INSTRUMENT – Product Development – Estimate Materials Requirement - 3D drawing for the product - simple assembly/ sub assemble model - functionality of the product - desired output - appropriate measuring instruments - observing standard inspection process.

TEXT BOOKS:

Chee Kai Chua, Chee How Wong and Wai Yee Yeong "Standards, Quality Control, and Measurement Sciences in 3D Printing and Additive Manufacturing" ISBN978-0-12-813489-4. 2017 Elsevier Ltd.
Hiroshi Toriya "3D Manufacturing Innovation Revolutionary Change in Japanese Manufacturing with Digital Data ISBN 978-1-84800-038-4 Springer.

REFERENCE:

S. Moylan, J. Slotwinski, A. Cooke, K. Jurrens, M.A. Donmez, Proposal for a standardized test artifact for additive manufacturing machines and processes, in: Solid Freeform Fabrication Symposium, Austin, TX, USA, 2012.
Energetics Inc and NIST, Measurement science roadmap for metal-based additive manufacturing, NIST, 2013.

COURSE DESIGNER

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