VINAYAKA MISSION'S RESEARCH FOUNDATION

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

FACULTY OF ENGINEERING AND TECHNOLOGY

REGULATIONS 2021

Programme:

BE / B.Tech. - CIVIL ENGINEERING (PART TIME)

3 ½ Years

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM

(Semester I to VII)

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 of complex engineering problems
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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./B.Tech. – Choice Based Credit System

2021 - 2022 onwards

Regulation: R2021

Name of the Board: Civil Engineering

Name of the Program: B.E./B.Tech. – Civil Engineering (Part-Time)

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM PART-TIME 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 (Maths, Physics & Chemistry)		9-12
3	**B. Professional**	Core courses		61
4	**C. Elective Courses**	Professional Electives		12-15
		Open Electives	Innovation Entrepreneurship, Skill Development	3-6
			Emerging Areas like 3D Printing, Artificial Intelligence, Internet of Things etc.	3-6
5	**D. Courses for presentation of technical skills related to the specialization**	Project work		8
6	**E.**MandatoryCourses**	Mandatory Courses [Gender Equity and Law, Indian Constitution, Essence of Indian Traditional Knowledge, 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 be completed)
Minimum Credits to be earned				105
**** Credits earned under this category will not be considered for CGPA calculation**				

A. Foundation Courses									
Humanities and Social Sciences including Management Courses –Credits (9-12)									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1.		UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY	ENG	FC-HS	3	0	0	3	NIL
2.		TOTAL QUALITY MANAGEMENT	MANAG	FC-HS	3	0	0	3	NIL
3.		ENGINEERING MANAGEMENT AND ETHICS	MANAG	FC-HS	3	0	0	3	NIL
4.		OPERATIONS MANAGEMENT	MANAG	FC-HS	3	0	0	3	NIL

Basic Science Courses –Credits (9-12)									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**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.		SMART MATERIALS	PHY	FC-BS	3	0	0	3	PHYSICAL SCIENCES
6.		GREEN BUILDING MATERIALS	CHEM	FC-BS	3	0	0	3	NIL
7.		ENVIRONMENTAL SCIENCES	CHEM	FC-BS	3	0	0	3	NIL

B. Professional

Core Courses – Credits (61)

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		ENGINEERING MECHANICS	MECH	CC	2	1	0	3	NIL
19		WASTE WATER ENGINEERING	CIVIL	CC	3	0	0	3	NIL

20		COMPUTER AIDED DESIGN AND DRAWING LAB	CIVIL	CC	0	0	4	2	NIL

C.Elective Courses									
Professional Elective courses Credits (12-15)									
S.No	**CODE**	**COURSE**	**OFFERING DEPT.**	**CATEGORY**	**L**	**T**	**P**	**C**	**PREREQUISITE**
1		REPAIR AND REHABILITATION OF STRUCTURES	CIVIL	EC-PS	3	0	0	3	CONSTRUCTION MATERIALS AND TECHNIQUES (THEORY AND PRACTICALS)
2		TRAFFIC ENGINEERING AND MANAGEMENT	CIVIL	EC-PS	3	0	0	3	TRANSPORTATION ENGINEERING
3		HYDROLOGY	CIVIL	EC-PS	3	0	0	3	NIL
4		DISASTER MANAGEMENT	CIVIL	EC-PS	3	0	0	3	NIL
5		HOUSING PLANNING AND MANAGEMENT	CIVIL	EC-PS	3	0	0	3	NIL
6		GROUND IMPROVEMENT TECHNIQUES	CIVIL	EC-PS	3	0	0	3	GEOTECHNICAL ENGINEERING (THEORY AND PRACTICALS)
7		AIR POLLUTION MANAGEMENT	CIVIL	EC-PS	3	0	0	3	ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)
8		TALL BUILDINGS	CIVIL	EC-PS	3	0	0	3	DESIGN OF STEEL STRUCTURES
9		STRUCTURAL DYNAMICS	CIVIL	EC-PS	3	0	0	3	STRUCTURAL ANALYSIS
10		WIND ENGINEERING	CIVIL	EC-PS	3	0	0	3	NIL
11		INDUSTRIAL STRUCTURES	CIVIL	EC-PS	3	0	0	3	DESIGN OF STEEL STRUCTURE
12		FINITE ELEMENT TECHNIQUES	CIVIL	EC-PS	2	1	0	3	STRUCTURAL ANALYSIS
13		GROUND WATER ENGINEERING	CIVIL	EC-PS	3	0	0	3	ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)
14		CONTRACT LAWS AND REGULATIONS	CIVIL	EC-PS	3	0	0	3	NIL
15		SOLID WASTE MANAGEMENT	CIVIL	EC-PS	3	0	0	3	NIL
16		CONSTRUCTION PLANNING AND SCHEDULING	CIVIL	EC-PS	3	0	0	3	NIL
17		CONCRETE TECHNOLOGY	CIVIL	EC-PS	3	0	0	3	CONSTRUCTION MATERIALS AND TECHNIQUES (THEORY AND PRACTICALS)
18		PRESTRESSED CONCRETE	CIVIL	EC-PS	3	0	0	3	DESIGN OF REINFORCED CONCRETE ELEMENTS

19		ENGINEERING GEOLOGY	CIVIL	EC-PS	3	0	0	3	NIL
20		IRRIGATION ENGINEERING	CIVIL	EC-PS	3	0	0	3	ENVIRONMENTAL ENGINEERING AND DESIGN (THEORY AND PRACTICALS)

Open subjects –Electives from Innovation, Entrepreneurship, Skill Development etc. Credits (3-6)									
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 (3-6)									
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 - Credits (8)

S.No	CODE	COURSE	OFFERING DEPT.	CATEGORY	L	T	P	C	PREREQUISITE
1		PROJECTWORK	CIVIL	PI-P	0	0	16	8	NIL

MANDATORY COURSES (NO 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

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 andnature/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. -Understandingthe Body as an instrument of 'I' (I being the doer, seer and enjoyer)- Understanding the characteristics andactivities 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
2	Dr. V. Sheela Mary	Associate Professor	Management Studies	sheelamary@avit.ac.in

	OPERATIONS NANAGEMENT	Category	L	T	P	Credit
		FC-HS	3	0	0	3

Preamble

The contemporary uncertain business environment is forcing the organizations to adopt the latest tools, techniques and strategies for managing their resources in the most effective and efficient fashion. The topics of the course deals with the management of resources and activities that lead to production of goods of right quality, in right quantity, at right time and place in the most cost- impressive manner. The course focuses on the basic concepts, issues, and techniques adopted worldwide for efficient and effective operations. The topics include operations strategy, product design and development, forecasting, facility planning and layout, aggregate production planning, capacity planning, project management, production control, materials management, inventory and quality management, JIT and Kanban System.

Prerequisite

Not Required

Course Objectives

1. To understand the Fundamentals of Operations.
2. To Understand the importance of Job Design and their relationship towards Efficiency.
3. To understand the importance of Production, Planning and Control.
4. To evaluate the material requirement with the techniques.
5. To impart the Operation management Techniques to get rid of the Competitive advantage.

Course Outcomes

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

CO1. Understand the importance of Operations Managenet	Understand
CO2. Evaluating the various organisation and staffing functions.	Evaluate
CO3. Understand the Impoprtance Of Production Planning and Control.	Understand
CO4. Evaluate the Various Operation Management Techniques.	Evaluate
CO5. Analyse and Evaluating the various Inventory Management Techniques to take Competitive advantage	Analyse

Mapping with Programme Outcomes and Programme Specific Outcomes

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

S- Strong; M-Medium; L-Low

Syllabus

UNIT- I INTRODUCTION TO OPERATIONS MANAGEMENT
9 Hours

Operations Management- Nature & Scope – Evolution of Operatons Management – Types of Production System, Operations Stratergy – Product Life Cycle- Value Engineering concepts - Make or Buy Decision- Recent Trends in Operations Management- Plant Capacity - Plant Location & Factors.

UNIT- II JOB DESIGN & MATERIAL HANDLING
9 Hours

Layout- Princilpes of Layout- factory-Basic types of layout product layout, group technology layout, fixed position layout, Retail service layout.Principles of material handling-Material handling equipment.Job-design: Effective job design- Combining engineering and behavioral approaches, Work measurement- method analysis- Ergonomics-Case studies.
UNIT- III PRODUCTION, PLANNING & CONTROL **9 Hours**
Basic types of production- Interminent, Batch, continuous-Routing, Scheduling, Activating and Monitoring-Production Planning and Control, Process Planning, Aggregate Production Planning, Capacity Planning: Introduction, Capacity Planning
UNIT IV OPERATION TECHNIQUES **9 Hours**
Project Scheduling, Network Diagrams, Critical Path Method (CPM), Critical Path Method: Problems, Critical Path Method. Program Evaluation and Review Technique (PERT), PERT Problems, PERT Problems, Time Cost Trade Off Production Control, Sequencing, Sequencing Problems-I, Sequencing Problems- II, Master Production Scheduling- Concept of Quality, Total Quality Management (TQM), Total Productive Maintenance (TPM), Statistical Quality Control (SQC), Six Sigma.
UNIT- V INVENTROY MANAGEMENT **9 Hours**
Materials Management, Inventory Control, Economic Order Quantity (EOQ) Models, Economic Order Quantity (EOQ): Problems, Production Quantity- Just in Time (JIT), Kanban System, Materials Requirement Planning (MRP)-I, Materials Requirement Planning (MRP)-II, Enterprise Resource Planning (ERP).
TOTAL HOURS : 45 HOURS
TEXT BOOKS
1.Operation Management: K. N. Dervitsiotis, McGraw-Hill International Company.
2.Operations Management: R.S. Russell, and B.W. Taylor, Pearson Education
3.Industrial Engineering and Production Management: M. Telsang, S. Chand & Company Ltd.
REFERENCES
1. The Encyclopedia of Operations Management: A Field Manual and Glossary of Operations Management ARTHUR V HILL 1st Edition
2. Handbook of Industrial Engineering: Technology and Operations Management, Gavriel Salvendy 3rd Edition.
3. Quality and Operations Management: Revised Edition.
4. Operations Management: Theory and Practice by Mahadevan
5. Production and Operations Management by PANNEERSELVAM. R.

COURSE DESIGNERS:

S.No	Name of the Faculty	Designation	Department	mail id
1	Dr. B. Rajnarayanan	Associate Professor & Head	Management Studies	rajnarayanan@vmkvec.edu.in
2	Mr. T. Thangaraja	Associate Professor	Management Studies	thangaraja@avit.ac.in

	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:

S.No	Name of the Faculty	Designation	Department	mail id
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

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

	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

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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
2.	Dr. A.K.Bhuvaneswari	Associate Professor	Mathematics	bhuvaneswari@avit.ac.in

	NUMERICAL METHODS	Category	L	T	P	Credit
		FC-BS	2	1	0	3

PREAMBLE

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

PREREQUISITE

1. 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

	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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2.	Dr. R. N. Viswanath	Professor	Physics	rnvishwanath@avit.ac.in
3.	Dr. B. Dhanalakshmi	Associate Professor	Physics	dhanalakshmi.phys@avit.ac.in

	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.

S.No	Name of the Faculty	Designation	Department	Mail Id
1	A. Gilbert Sunderraj	Assistant Professor	Chemistry	gilbertsunderraj@vmkvec.edu.in
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

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

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

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.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

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.R.Abirami	Assistant Professor I	Civil/AVIT	Abirami.civil@avit.ac.in

	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

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.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

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	Mr.K.Naveenkumar	Assistant Professor	Civil/AVIT	naveen.civil@vait.ac.in

	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
2	Mr.K.Naveenkumar	Assistant Professor	Civil/AVIT	naveen.civil@vait.ac.in

	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**
1	Mr.C.Kathirvel	Asso. Professor & Head	Civil / VMKVEC	kathirvel@vmkvec.edu.in
2	Mrs.J.Srija	Assistant Professor	Civil/AVIT	Srija.civil@avit.ac.in

	ENGINEERING MECHANICS	Category	L	T	P	Credit
		CC	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				
S.No	**Faculty Name**	**Designation**	**Department/Name of the College**	**Email id**
1	J.Sathees Babu	Associate Professor	Mech / VMKVEC	satheesbabu@vmkvec.edu.in
2	Dr. S.Arunkumar	Associate Professor	Mech / VMKVEC	arunkumar@vmkvec.edu.in

	WASTE WATER ENGINEERING	Category	L	T	P	Credit
		CC	3	0	0	3

PREAMBLE

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..

PREREQUISITE

Environmental Engineering and Design (Theory And Practicals)

COURSE OBJECTIVES

1	To Understand basic concepts in Transmission of water system
2	To Understand the process and Treatment of waste water.
3	To Understand the methods of Sewage Disposal
4	To understand the advances in sewage treatment

COURSE OUTCOMES

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

CO1. An ability to estimate sewage generation and design sewer system including sewage pumping stations	Understand
CO2. The required understanding on the characteristics and composition of sewage, self purification of streams	Understand
CO3. An ability to perform basic design of the unit operations and processes that are used in sewage treatment	Apply
CO4. Understand the standard methods for disposal of sewage.	Apply
CO5. Gain knowledge on sludge treatment and disposal.	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	S	S	S	S	S	-	-	M	-	S	S	S	S
CO2	M	M	S	S	M	S	S	-	-	S	-	S	M	M	S
CO3	S	S	S	S	S	M	M	-	M	-	-	-	S	S	S
CO4	M	S	M	M	M	S	S	L	-	-	-	-	M	S	M
CO5	S	S	S	S	S	S	S	-	-	-	M	S	S	S	S

S- Strong; M-Medium; L-Low

SYLLABUS

SEWERAGE SYSTEM: COLLECTION & TRANSMISSION

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials - Sources of wastewater – Estimation of storm runoff – Wastewater characteristics andsignificance – Effluent disposal standards – Design of sewers – Computer applications – Laying, jointing and testing of sewers - Sewer appurtenances – Pump selection – Drainage in buildings - House Sewer connection.

SEWAGE TREATMENT – PRIMARY TREATMENT

Objectives – Unit Operations & Processes - Selection of treatment processes — Onsite sanitation — Septic tank- Grey water harvesting - Materials for sewers – Layout of wastewater Treatment Plant - Characteristics and composition of sewage – Principles, functions and design of screen, grit chambers and primary sedimentation tanks – Construction,Operation and Maintenance aspects.

SEWAGE TREATMENT – SECONDARY TREATMENT

Objectives – Selection of Treatment Methods – Principles, Functions - Secondary Treatment – Activated Sludge Process and Trickling filter Sequencing Batch Reactor(SBR) — Membrane Bioreactor – Stabilisation Ponds and Septic tanks - Recent Advances in Sewage Treatment – Construction, Operation andMaintenance aspects.

SEWAGE DISPOSAL

Methods – Dilution – Self purification of surface water bodies – Oxygen sag curve - deoxygenation and reaeration - Streeter–Phelps model – Land disposal – Sewage farming –Deep well injection – Soil dispersion system.

SLUDGE TREATMENT AND DISPOSAL

Objectives - Sludge characterization – Thickening – Sludge digestion - Standard rate and High rate digester design – Biogas recovery – Design of Drying beds – Conditioning and Dewatering- Sludge drying beds- ultimate residue disposal — recent advances.

TEXT BOOKS:

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.

REFERENCES:

1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development,Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R.Qasim, Edward M. Motley and Guang Zhu - Wastewater Treatment Plants: Planning, Design and Operation 2nd Edition, CRC Press, 2015.
4. Metcalf & Eddy, George Tchobanoglous and Franklin L. Burton, Wastewater Engineering:
5. Treatment and Resource Recovery (2013), 5th Edition, The McGraw- Hill Companies, Inc.

MAPPING COURSE WITH NPTEL

Water and Waste water treatment

COURSE DESIGNERS

S.No	Name of the Faculty	Designation	Department	Mai l 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

	COMPUTER AIDED DESIGN AND DRAWING LAB	Category	L	T	P	Credit
		CC	**0**	**0**	**4**	**2**

PREAMBLE

This course helps to know the design of R.C.C cantilever and counterfort retaining walls, Design of solidslab, Design of various types of steel structures

PREREQUISITE- Design Of Reinforced Concrete Elements

COURSE OBJECTIVES

1	The student acquires hands on experience in design and preparation of structural drawings for concrete structures normally encountered in Civil Engineering practice.
2	The student acquires hands on experience in design and preparation of structural drawings for steel structures normally encountered in Civil Engineering practice.

COURSE OUTCOMES

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

CO1. Develop drafting skills in drawing R.C.C. cantilever and counter fort typeretaining walls with reinforcement details.	Apply
CO2. Develop drafting skills in Design of solid slab and R.C. Tee beam bridges	Apply
CO3. Design of rectangular, pressed and hemispherical bottomed steel tank –staging –rivetedjoints detailed drawing	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	COS
CO1	S	L	L	L	M	L	L	L	L	L	L	L	-	-	CO1
CO2	S	L	S	L	L	L	L	L	L	L	L	L	-	-	CO2
CO3	S	S	S	L	L	L	L	S	L	L	L	L	-	-	CO3

S- Strong; M-Medium; L-Low

LIST OF EXPERIMENTS :

1. Design and drawing of R.C.C. cantilever and counter fort type retaining walls with reinforcement details
2. Design of solid slab and R.C. Tee beam bridges for IRC loading and reinforcement detail
3. Design of rectangular, pressed and hemispherical bottomed steel tank –staging –riveted joints detailed drawing
4. Design of circular, rectangular and intze type water tank reinforcement details
5. Design of plate girder – twin girder deck type railway bridge – through type and deck type highway bridges – Truss girder bridges – detailed drawing – riveted connection

REFERENCES:

1.Computer Aided Design And Drawing Lab Manual by VMKV Engineeing College 2.Structural

design & drawing (concrete & steel) – Krishnaraju, CBS Publishers.2005

3. Krishnaraju,N. "Structural Design & Drawing, Universities Press, 2009.

COURSE DESIGNERS

S.No.	Name of the Faculty	Designation	Department	Mail ID
1	M.Senthilkumar	Asst. Professor	CIVIL	senthilkumar@vmkvec.edu.in
2	S.Prakash	Asst. Professor	CIVIL	tsprakashcivil@gmail.com

	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:

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1	Mr.D.Parthiban	Assistant Professor	CIVIL/AVIT	Parthiban.civil@avit.ac.in
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	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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	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

	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
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	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
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	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

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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

S.No.	Name of the Faculty	Designation	Department	Mail ID
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

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

	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
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	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 knowledgeabout 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

	WASTE WATER ENGINEERING	Category	L	T	P	Credit
		EC-PS	3	0	0	3

PREAMBLE

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..

PREREQUISITE

Environmental Engineering and Design (Theory And Practicals)

COURSE OBJECTIVES

1	To Understand basic concepts in Transmission of water system
2	To Understand the process and Treatment of waste water.
3	To Understand the methods of Sewage Disposal
4	To understand the advances in sewage treatment

COURSE OUTCOMES

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

CO1. An ability to estimate sewage generation and design sewer system including sewage pumping stations	Understand
CO2. The required understanding on the characteristics and composition of sewage, self purification of streams	Understand
CO3. An ability to perform basic design of the unit operations and processes that are used in sewage treatment	Apply
CO4. Understand the standard methods for disposal of sewage.	Apply
CO5. Gain knowledge on sludge treatment and disposal.	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	S	S	S	S	S	-	-	M	-	S	S	S	S
CO2	M	M	S	S	M	S	S	-	-	S	-	S	M	M	S
CO3	S	S	S	S	S	M	M	-	M	-	-	-	S	S	S
CO4	M	S	M	M	M	S	S	L	-	-	-	-	M	S	M
CO5	S	S	S	S	S	S	S	-	-	-	M	S	S	S	S

S- Strong; M-Medium; L-Low

SYLLABUS

SEWERAGE SYSTEM: COLLECTION & TRANSMISSION

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation – Sewer materials - Sources of wastewater – Estimation of storm runoff – Wastewater characteristics andsignificance – Effluent disposal standards – Design of sewers – Computer applications – Laying, jointing and testing of sewers - Sewer appurtenances – Pump selection – Drainage in buildings - House Sewer connection.

SEWAGE TREATMENT – PRIMARY TREATMENT

Objectives – Unit Operations & Processes - Selection of treatment processes — Onsite sanitation — Septic tank- Grey water harvesting - Materials for sewers – Layout of wastewater Treatment Plant - Characteristics and composition of sewage – Principles, functions and design of screen, grit chambers and primary sedimentation tanks – Construction,Operation and Maintenance aspects.

SEWAGE TREATMENT – SECONDARY TREATMENT

Objectives – Selection of Treatment Methods – Principles, Functions - Secondary Treatment – Activated Sludge Process and Trickling filter Sequencing Batch Reactor(SBR) — Membrane Bioreactor – Stabilisation Ponds and Septic tanks - Recent Advances in Sewage Treatment – Construction, Operation andMaintenance aspects.

SEWAGE DISPOSAL

Methods – Dilution – Self purification of surface water bodies – Oxygen sag curve - deoxygenation and reaeration - Streeter–Phelps model – Land disposal – Sewage farming –Deep well injection – Soil dispersion system.

SLUDGE TREATMENT AND DISPOSAL

Objectives - Sludge characterization – Thickening – Sludge digestion - Standard rate and High rate digester design – Biogas recovery – Design of Drying beds – Conditioning and Dewatering- Sludge drying beds- ultimate residue disposal — recent advances.

TEXT BOOKS:

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

REFERENCES:

6. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development,Government of India, New Delhi, 2013.
7. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
8. Syed R.Qasim, Edward M. Motley and Guang Zhu - Wastewater Treatment Plants: Planning, Design and Operation 2nd Edition, CRC Press, 2015.
9. Metcalf & Eddy, George Tchobanoglous and Franklin L. Burton, Wastewater Engineering:
10. Treatment and Resource Recovery (2013), 5th Edition, The McGraw- Hill Companies, Inc.

MAPPING COURSE WITH NPTEL

Water and Waste water treatment

COURSE DESIGNERS

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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
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	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

	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

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

	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
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	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
2	Dr. V. Sheela Mary	Associate Professor	Management Studies	sheelamary@avit.ac.in

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

PREAMBLE

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

PREREQUISITE – NIL

COURSE OBJECTIVES

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

COURSE OUTCOMES

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

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

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

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

S- Strong; M-Medium; L-Low

SYLLABUS:

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

Social entrepreneurs – mindset, characteristics and competencies – developing a social 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:

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

	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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1	Dr. G. Murugesan	Professor	Management Studies	murugesan@vmkvec.edu.in
2	Mr. T. Thangaraja	Assistant Professor	Management Studies	thangaraja@avit.ac.in

	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

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

	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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	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.

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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
		OE-EA	3	0	0	3

PREAMBLE

To understand the need for Cyber Security in real time and to study techniques involved in it.

PREREQUISITE : NIL

COURSE OBJECTIVES

1.	To understand the fundamentals of Cyber Security and issues
2.	To study various cyber crimes and legal remedies
3.	To apply various privacy and security
4.	To study E-Commerce and digital payments
5.	To study the basic security aspects related to Computer and Mobiles

COURSE OUTCOMES

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

CO1: able to understand the concept of Cyber security and issues and challenges associated with it.	Understand
CO2: able to understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures	Apply
CO3: able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.	Apply
CO4: able to understand the basic concepts related to E-Commerce and digital payments.	Apply
CO5: able to understand the basic security aspects related to Computer and Mobiles.	Apply

MAPPING WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO 2	PSO3
CO 1	M	M	M	M	-	-	-	-	-	-	-	-	M	M	M
CO 2	M	M	M	M	M	-	-	-	-	-	-	-	M	M	M
CO 3	M	M	S	M	M	-	-	-	-	-	-	-	M	M	M
CO 4	S	M	M	M		-	-	-	-	-	-	-	M	M	S
CO 5	S	M	M	M	S	-	-	-	-	-	-	-	M	M	S

S- Strong; M-Medium; L-Low

SYLLABUS:

INTRODUCTION TO CYBER SECURITY **9 hours**
Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.
CYBER CRIME AND CYBER LAW **9 hours**
Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.
SOCIAL MEDIA OVERVIEW AND SECURITY **9 hours**
Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.
E - C O M M E R C E AND DIGITAL PAYMENTS **9 hours**
Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payament Settlement Act,2007.
DIGITAL DEVICES S E C U R I T Y , TOOLS AND TECHNOLOGIES FOR CYBER SECURITY **9 hours**
End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.
REFERENCES
1. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011) 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001) 4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd. 5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers. 6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd. 7. Fundamentals of Network Security by E. Maiwald, McGraw Hill

COURSE DESIGNERS

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	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, Industrial Sensing & Actuation. IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II, Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II.

IIoT COMMUNICATION

Communication-Part I, Industrial IoT- Layers: IIoT Communication, IIoT Networking-Part I, Part II, Part III. Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Industrial IoT

IIoT BIG DATA & SDN APPLICATIONS

Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II, 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.