SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.

CIVIL ENGINEERING

ACADEMIC REGULATIONS 2020
(R-2020)

CURRICULUM

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

MI: Quality Education

To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation

To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship

To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: Ethical Values

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

DEPARTMENT VISION AND MISSION

Vision

We envision a world where the civil engineering department will be a home to an intellectual community with good quality education embedded with practical knowledge by inculcating research, strong social commitment and ethical values from its students, staffs and alumni.

Mission

M1: Quality Education

To fulfill the requirements of construction industry, Civil Engineering profession and rural community through dissemination of technical services.

M2: Practical Knowledge

To impart quality and real-time education to the students with the knowledge & skills needed for Civil Engineering practice

M3: Work Efficiency

To encourage research, development and consultancy through sustained interaction with industry & research organization.

M4: Societal issues

To develop graduates to compete at the global level to deal with modern issues.

M5: Moral & Ethical

To insist ethical values and professionalism among the students.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8: Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
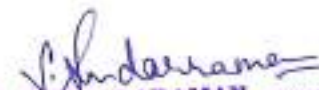
PO10: Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Fundamental Knowledge

To gain a thorough fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities for a civil engineering career.

PEO2: Knowledge and Skills

To establish the knowledge and skills necessary for identifying and assessing design alternatives and the related social, economic, environmental, and public safety impacts.

PEO 3: Societal Implications

To develop the ability to deal effectively with ethical and professional issues, taking into account the broader societal implications of civil engineering

PEO 4: Competent Professionals

To create competent professionals who are trained in the design and development of Civil Engineering systems to engulf research and development activities

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Practical Knowledge

Inculcating practical knowledge in planning, analysis, design and construction management without much exploiting natural resources.

PSO 2: Critical Thinking

Imparting effective communicational skills, leadership attributes towards the team work and developing critical thinking abilities to find solutions for civil engineering problems of multi-disciplinary nature.

PSO 3: Challenging Employment

Ability to take up any challenging employment, entrepreneurship, research and development for sustainable civil society as a civil engineering graduate.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Science (HS)	07
2	Basic Sciences(BS)	19
3	Engineering Sciences (ES)	22
4	Professional Core (PC)	77
5	Professional Electives (PE)	18
6	Open Electives (OE)	09
7	Project Work and Internship (PW)	12
8	Employability Enhancement Courses (EEC*)	-
9	Mandatory courses (MC*)	-
	Total	164

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	AICTE Suggested Course Category	I	II	III	IV	V	VI	VII	VIII	Total Credits
1	Humanities and Social Science (HS)	-	-	1	1	3	-	1	1	07
2	Basic Sciences(BS)	6	3	3	4	3	-	-	-	19
3	Engineering Sciences (ES)	7	7	4	4	-	-	-	-	22
4	Professional Core (PC)	5	11	14	7	13	15	9	3	77
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	3	-	3	3	-	9
7	Project Work (PW)	-	-	-	-	-	-	2	8	10
8	Internship (PW)	-	-	-	-	-	-	2	-	02
9	Employability Enhancement Courses (EEC*)	-	-	-	-	-	-	-	-	-
10	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	-
	Total	18	21	22	22	22	21	20	18	164

EEC and MC are not included for CGPA calculation

Dr.S. SUNDARARAMAN, B.Tech., Ph.D.
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

SEMESTER – I

Sl. No.	Course Code	Course Title	Category	Periods L	T	P	Credits	Max. Marks CAM	ESM	Total
Theory										
1	U20BST101	Engineering Mathematics - I Calculus and Linear Algebra	BS	2	2	0	3 .	25	75	100
2	U20BST108	Physics for Civil Engineering	BS	3	0	0	3	25	75	100
3	U20EST101	Programming in C	ES	3	0	0	3	25	75	100
4	U20EST119	Engineering Mechanics	ES	2	2	0	3	25	75	100
5	U20CET101	Building materials	PC	3	0	0	3	25	75	100
Practical										
6	U20ESP102	Programming in C Laboratory	ES	0	0	2	1	50	50	100
7	U20CEP101	Civil Engineering Building Planning and Drafting	PC	0	0	2	1	50	50	100
8	U20CEP102	Civil Engineering Practice Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
9	U20CEC1XX	Certification Course – I**	EEC	0	0	4	-	100	-	100
Mandatory Course										
10	U20CEM101	Induction Program	MC	3 Weeks			-	-	-	-
							18	375	525	900

** Certification courses are to be selected from the list given in Annexure III

SEMESTER – II

Sl. No.	Course Code	Course Title	Category	Periods L	T	P	Credits	Max. Marks CAM	ESM	Total
Theory										
1	U20BST215	Engineering Mathematics - II Multiple Integrals and Transforms	BS	2	2	0	3	25	75	100
2	U20EST217	Basic Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
3	U20EST242	Green Buildings	ES	3	0	0	3	25	75	100
4	U20CET202	Mechanics of Solids - I	PC	2	2	0	3	25	75	100
5	U20CET203	Fluid Mechanics and Machinery	PC	2	2	0	3	25	75	100
6	U20CET204	Building Construction	PC	3	0	0	3	25	75	100
Practical										
7	U20ESP218	Basic Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	50	50	100
8	U20CEP203	Fluid Mechanics and Machines Laboratory	PC	0	0	2	1	50	50	100
9	U20CEP204	Strength of Materials Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CEC2XX	Certification Course – II**	EEC	0	0	4	-	100	-	100
11	U20CES201	Skill Development Course 1*	EEC	0	0	2	-	100	-	100

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Mandatory Course

12	U20CEM202	Environmental Science	MC	2	0	0	-	100	-	100
							21	600	600	1200

** Certification courses are to be selected from the list given in Annexure III
* Skill Development Courses (1,2 and 3) are to be selected from the list given in Annexure IV
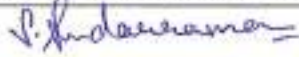
SI. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
SEMESTER – III										
Theory										
1	U20BST324	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U20EST356	Data Structures	ES	3	0	0	3	25	75	100
3	U20CET305	Mechanics of Solids - II	PC	2	2	0	3	25	75	100
4	U20CET306	Surveying	PC	3	0	0	3	25	75	100
5	U20CET307	Geotechnical Engineering - I	PC	2	2	0	3	25	75	100
6	U20CET308	Concrete Technology	PC	3	0	0	3	25	75	100
Practical										
7	U20HSP301	General Proficiency – I	HS	0	0	2	1	50	50	100
8	U20ESP357	Data Structures Laboratory	ES	0	0	2	1	50	50	100
9	U20CEP305	Surveying Laboratory	PC	0	0	2	1	50	50	100
10	U20CEP306	Concrete Engineering Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CEC3XX	Certification Course – III**	EEC	0	0	4	-	100	-	100
12	U20CES302	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U20CEM303	Physical Education	MC	0	0	2	-	100	-	100
							22	650	650	1300

** Certification courses are to be selected from the list given in Annexure III
* Skill Development Courses (1,2 and 3) are to be selected from the list given in Annexure IV

SI. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
SEMESTER – IV										
Theory										
1	U20BST434	Numerical Methods	BS	2	2	0	3	25	75	100
2	U20EST467	Programming in Java	ES	3	0	0	3	25	75	100
3	U20CET409	Design of RC Elements	PC	2	2	0	3	25	75	100
4	U20CET410	Geotechnical Engineering- II	PC	2	2	0	3	25	75	100
5	U20CEE4XX	Professional Elective - I$	PE	3	0	0	3	25	75	100
6	U20XXO4XX	Open Elective – I$	OE	3	0	0	3	25	75	100
Practical										
7	U20HSP402	General Proficiency - II	HS	0	0	2	1	50	50	100
8	U20BSP435	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
9	U20ESP468	Programming In Java Laboratory	ES	0	0	2	1	50	50	100
10	U20CEP407	Geotechnical Engineering Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CEC4XX	Certification Course – IV**	EEC	0	0	4	-	100	-	100
12	U20EES403	Skill Development Course 3*	EEC	0	0	2	-	100	-	100

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

	Mandatory Course									
13	U20CEM404	NSS	MC	0	0	2	-	100	-	100
							22	650	650	1300

Professional Electives are to be selected from the list given in Annexure I
$ Open electives are to be selected from the list given in Annexure II
** Certification courses are to be selected from the list given in Annexure III
* Skill Development Courses (1,2 and 3) are to be selected from the list given in Annexure IV

SEMESTER – V										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20BST551	Operations Research	BS	2	2	0	3	25	75	100
2	U20CET511	Structural Analysis – I	PC	2	2	0	3	25	75	100
3	U20CET512	Environmental Engineering-I	PC	3	0	0	3	25	75	100
4	U20CET513	Instrumentation And Sensor Technologies for Civil Engineering Applications	PC	3	0	0	3	25	75	100
5	U20CEE5XX	Professional Elective - II#	PE	3	0	0	3	25	75	100
6	U20XXO5XX	Open Elective-II$	HS	3	0	0	3	25	75	100
Practical										
7	U20CEP508	Modeling and Analysis Laboratory	PC	0	0	2	1	50	50	100
8	U20CEP509	Sensors Applications in Civil Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U20CEP510	REVIT Architecture	PC	0	0	2	1	50	50	100
10	U20CEP511	Estimation Costing and Valuation Engineering	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U20CEC5XX	Certification Course – V**	EEC	0	0	4	-	100	-	100
12	U20CES504	Skill Development Course 4: Foreign Language/ IELTS - I	EEC	0	0	2	-	100	-	100
13	U20CES505	Skill Development Course 5: Presentation Skill using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U20CEM505	Indian Constitution	MC	2	0	0	-	100	-	100
							22	750	650	1400

Professional Electives are to be selected from the list given in Annexure I
$ Open electives are to be selected from the list given in Annexure II
** Certification courses are to be selected from the list given in Annexure III

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20CET614	Design of Steel Structures	PC	2	2	0	3	25	75	100
2	U20CET615	Structural Analysis – II	PC	2	2	0	3	25	75	100
3	U20CET616	Environmental Engineering – II	PC	3	0	0	3	25	75	100

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
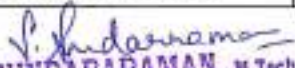Madagadipet, Puducherry India

B.Tech. Civil Engineering

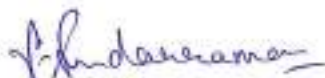| Sl. No	Course Code	Course Title	Category	L	T	P	Credits	CAM	ESM	Total
4	U20CET617	Transportation Engineering	PC	3	0	0	3	25	75	100
5	U20CEE6XX	Professional Elective - III#	PE	3	0	0	3	25	75	100
6	U20XXO6XX	Open Elective – III$	OE	3	0	0	3	25	75	100
Practical										
7	U20CEP612	Transportation Engineering Laboratory	PC	0	0	2	1	50	50	100
8	U20CEP613	Environmental Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U20CEP614	Design and Drawing Laboratory (RCC and Steel)	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20CEC6XX	Certification Course – VI**	EEC	0	0	4	-	100	-	100
11	U20CES606	Skill Development Course 6: Foreign Language / IELTS - II	EEC	0	0	2	-	100	-	100
12	U20CES607	Skill Development Course 7: Technical Seminar	EEC	0	0	2	-	100	-	100
13	U20CES608	Skill Development Course 8: NPTEL / MOOC - I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U20CEM606	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	800	600	1400

Professional Electives are to be selected from the list given in Annexure I
$ Open electives are to be selected from the list given in Annexure II
** Certification courses are to be selected from the list given in Annexure III

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	**Periods**			Credits	**Max. Marks**		
				L	T	P		CAM	ESM	Total
Theory										
1	U20CET718	Construction Management	PC	3	0	0	3	25	75	100
2	U20CET719	Hydrology and Water Resource Engineering	PC	3	0	0	3	25	75	100
3	U20CEE7XX	Professional Elective – IV#	PE	3	0	0	3	25	75	100
4	U20XXO7XX	Open Elective – IV$	OE	3	0	0	3	25	75	100
Practical										
5	U20HSP703	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U20CEP715	Irrigation and Environmental Engineering Drawing	PC	0	0	2	1	50	50	100
7	U20CEP716	Simulation Software Laboratory (Ansys)	PC	0	0	2	1	50	50	100
8	U20CEP717	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U20CEW701	Project Phase – I	PW	0	0	4	2	50	50	100
10	U20CEW702	Internship / Inplant Training	PW	-	-	-	2	100	-	100

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Mandatory Course										
11	U20CEM707	Professional Ethics	MC	2	0	0	-	100	-	100
							20	600	500	1100

Professional Electives are to be selected from the list given in Annexure I
$ Open electives are to be selected from the list given in Annexure II

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20CET820	Architecture and Town Planning	PC	3	0	0	3	25	75	100
2	U20CEE8XX	Professional Elective – V#	PE	3	0	0	3	25	75	100
3	U20CEE8XX	Professional Elective – VI#	PE	3	0	0	3	25	75	100
Practical										
4	U20HSP804	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U20CEW803	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
6	U20EES809	Skill Development Course 9: NPTEL / MOOC-II	EEC	0	0	0	-	100	-	100
							18	365	335	700

Professional Electives are to be selected from the list given in Annexure I
$ Open electives are to be selected from the list given in Annexure II

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
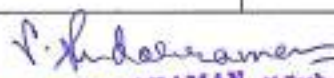Sri Manakula Vinayagar Engg. College
Medagadipet, Puducherry, India

B.Tech. Civil Engineering

Annexure – I

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)

Sl. No.	Course Code	Course Title
1	U20CEE401	Engineering Geology
2	U20CEE402	Geographic Information System
3	U20CEE403	Building Services
4	U20CEE404	Renewable Energy Sources
5	U20CEE405	Alternative Building Materials and Technologies

Professional Elective – II (Offered in Semester V)

Sl. No.	Course Code	Course Title
1	U20CEE506	Ground Improvement Techniques
2	U20CEE507	Fundamentals of Nano Science
3	U20CEE508	Smart City
4	U20CEE509	Air and Noise Pollution
5	U20CEE510	Advanced Design of RCC Structures

Professional Elective – III (Offered in Semester VI)

Sl. No.	Course Code	Course Title
1	U20CEE611	Rock Engineering
2	U20CEE612	Intellectual Property Rights
3	U20CEE613	Shoring scaffolding and Form Work
4	U20CEE614	Municipal Solid Waste Management
5	U20CEE615	Design of Industrial Structures

Professional Elective – IV (Offered in Semester VII)

Sl. No.	Course Code	Course Title
1	U20CEE716	Site Investigation Methods and Practices
2	U20CEE717	Urban Planning and Development
3	U20CEE718	Bridge Engineering
4	U20CEE719	Pollution Control and Monitoring
5	U20CEE720	Advanced Structural Analysis

Professional Elective – V (Offered in Semester VIII)

Sl. No.	Course Code	Course Title
1	U20CEE821	Structural Dynamics and Earthquake Engineering
2	U20CEE822	Housing - Planning and Management

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

3	U20CEE823	Tall Structures
4	U20CEE824	Industrial Waste Disposal and Treatment
5	U20CEE825	Prefabricated Structures

Professional Elective – VI (Offered in Semester VIII)

Sl. No.	Course Code	Course Title
1	U20CEE826	Coastal and Offshore Structures
2	U20CEE827	Pavement Engineering
3	U20CEE828	Repair and Rehabilitation of Structures
4	U20CEE829	Environmental Impact Assessment
5	U20CEE830	Pre- Stressed Concrete Structures

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Annexure – II

OPEN ELECTIVE COURSES

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester IV)				
1	U20EEO401	Solar Photovoltaic Fundamental and applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE
2	U20EEO402	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT
3	U20ECO401	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U20ECO402	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT
5	U20CSO401	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U20CSO402	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U20ITO401	Database System: Design & Development	IT	EEE, ECE, ICE, CCE, BME
8	U20ITO402	R programming	IT	EEE, ECE, ICE, CCE, BME, MECH, Mechatronics
9	U20ICO401	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT
10	U20ICO402	Industrial Safety Management	ICE	CSE, IT, MECH, CCE, AI&DS
11	U20MEO401	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME, FT
12	U20MEO402	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
13	U20MEO403	Industrial Engineering for Textile	MECH	FT
14	U20CEO401	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics, FT
15	U20CEO402	Building Science and Engineering	CIVIL	EEE, MECH, BME
16	U20BMO401	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
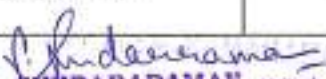Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

17	U20BMO402	Telemedicine	BME	EEE, ECE, CSE, IT, ICE, CCE, AI&DS
18	U20CCO401	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20CCO402	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
20	U20ADO401	Knowledge Representation and Reasoning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20ADO402	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics

Open Elective – II / Open Elective – III

1	U20HSO501/ U20HSO601	Product Development and Design	MBA	**Common to B. Tech** (Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics, AI&DS**)
2	U20HSO502/ U20HSO602	Intellectual Property and Rights	MBA	
3	U20HSO503/ U20HSO603	Marketing Management and Research	MBA	
4	U20HSO504/ U20HSO604	Project Management for Engineers	MBA	
5	U20HSO505/ U20HSO605	Finance for Engineers	MBA	

Open Elective – II / Open Elective – III

(Offered in Semester V for **CSE, IT, MECH, Mechatronics, AI&DS**)

(Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME, CCE, FT**)

1	U20EEO503/ U20EEO603	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS, FT
2	U20EEO504/ U20EEO604	Industrial Drives and Control	EEE	ECE, ICE, MECH, Mechatronics, AI&DS
3	U20ECO503/ U20ECO603	Electronic Product Design and Packaging	ECE	EEE, CSE, IT, ICE, MECH, CCE, BME, Mechatronics
4	U20ECO504/ U20ECO604	Automotive Electronics	ECE	EEE, ECE, ICE, MECH
5	U20CSO503/ U20CSO603	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, CCE, BME, AI&DS
6	U20CSO504/ U20CSO604	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, FT

7	U20ITO503/ U20ITO603	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U20ITO504/ U20ITO604	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics, AI&DS
9	U20ICO503/ U20ICO603	Fuzzy logic and neural networks	ICE	CSE, IT, CIVIL, BME, AI&DS
10	U20ICO504/ U20ICO604	Measurement and Instrumentation	ICE	ECE, Mechatronics
11	U20MEO504/ U20MEO604	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO505/ U20MEO605	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
13	U20CEO503/ U20CEO603	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
14	U20CEO504/ U20CEO604	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
15	U20BMO503/ U20BMO603	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics
16	U20BMO504/ U20BMO604	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, CIVIL , Mechatronics
17	U20CCO503/ U20CCO603	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
18	U20CCO504/ U20CCO604	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
19	U20ADO503/ U20ADO603	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE
20	U20ADO504/ U20ADO604	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20MCO501/ U20MCO601	Industrial Automation for Textile	Mechatronics	FT

Open Elective – IV (Offered in Semester VII)

1	U20EEO705	Hybrid and Electrical Vehicle	EEE	ECE, Mechatronics , MECH
2	U20EEO706	Electrical Energy Conservation and auditing	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics, CCE, AI&DS
3	U20ECO705	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, FT

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

4	U20ECO706	Sensors for Industrial Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
5	U20CSO705	Artificial Intelligence	CSE	EEE, ICE, CIVIL, CCE, MECH, FT
6	U20CSO706	Cloud Technology and its Applications	CSE	EEE, ICE, MECH, CIVIL, CCE, BME, Mechatronics
7	U20ITO705	Automation Techniques & Tools- DevOps	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, CCE, BME, Mechatronics, AI&DS
8	U20ITO706	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS
9	U20ICO705	Industrial Automation	ICE	EEE, ECE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics
10	U20ICO706	Ultrasonic Instrumentation	ICE	EEE, ECE, MECH, Mechatronics
11	U20MEO706	Principles of Hydraulic and Pneumatic System	MECH	EEE, ECE, ICE, CIVIL
12	U20MEO707	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
13	U20CEO705	Energy Efficient Buildings	CIVIL	EEE, ECE, MECH
14	U20CEO706	Global Warming and Climate Change	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME, CCE, AI&DS, FT
15	U20MCO702	Building Automation	Mechatronics	MECH, CIVIL
16	U20MCO703	Automation in Manufacturing Systems	Mechatronics	MECH, CIVIL
17	U20BMO705	Internet of Things for Healthcare	BME	EEE, ECE, ICE, CCE
18	U20BMO706	Telehealth Technology	BME	EEE, ECE, ICE, CCE
19	U20CCO705	Data Science using python	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U20CCO706	Mobile Applications Development using Android	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
21	U20ADO705	Data Science Application of NLP	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics.
22	U20ADO706	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME

Dr.S. SUNDARARAMAN M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

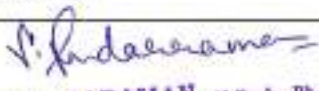| 23	U20HSO706	Industrial Safety and Human Resource Management	MBA	FT
24	U20HSO707	Operation Research in Textile Industry	MBA	FT
25	U20HSO708	Global marketing and Sourcing Strategies	MBA	FT
26	U20HSO709	Fashion Advertising and sales promotions	MBA	FT
27	U20HSO710	Luxury Brand management	MBA	FT
28	U20HSO711	Fashion Retail Store Operations	MBA	FT

Annexure – III

EMPLOYABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

Sl. No.	Course Code	Course Title
1	U20CECX01	3ds Max
2	U20CECX02	Advance Structural Analysis of Building using ETABS
3	U20CECX03	Advanced Java Programming
4	U20CECX04	Advanced Python Programming
5	U20CECX05	Analog System Lab Kit
6	U20CECX06	Android Medical App Development
7	U20CECX07	Android Programming
8	U20CECX08	ANSYS -Multiphysics
9	U20CECX09	Artificial Intelligence
10	U20CECX10	Artificial Intelligence and Edge Computing
11	U20CECX11	Artificial Intelligence in Medicines
12	U20CECX12	AutoCAD for Architecture
13	U20CECX13	AutoCAD for Civil
14	U20CECX14	AutoCAD for Electrical
15	U20CECX15	AutoCAD for Mechanical
16	U20CECX16	Azure DevOps
17	U20CECX17	Basic Course on ePLAN
18	U20CECX18	Basic Electro Pneumatics
19	U20CECX19	Basic Hydraulics

Dr.S. SUNDARARAMAN, M.Tech., Ph.D., B.Tech. Civil Engineering
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

20	U20CECX20	Bio Signal and Image Processing Development System
21	U20CECX21	Blockchain
22	U20CECX22	Bridge Analysis
23	U20CECX23	Building Analysis and Construction Management
24	U20CECX24	Building Design and Analysis Using AECO Sim Building Designer
25	U20CECX25	CATIA
26	U20CECX26	CCNA (Routing and Switching)
27	U20CECX27	CCNA (Wireless)
28	U20CECX28	Cloud Computing
29	U20CECX29	Computer Programming for Medical Equipments
30	U20CECX30	Corel Draw
31	U20CECX31	Creo (Modeling and Simulation)
32	U20CECX32	Cyber Security
33	U20CECX33	Data Science and Data Analytics
34	U20CECX34	Data Science using Python
35	U20CECX35	Data Science using R
36	U20CECX36	Deep Learning
37	U20CECX37	Design and Documentation using ePLAN Electric P8
38	U20CECX38	Design of Biomedical Devices and Systems
39	U20CECX39	Digital Marketing
40	U20CECX40	Digital Signal Processing Development System
41	U20CECX41	DigSILENT Power Factory
42	U20CECX42	Electro Hydraulic Automation with PLC
43	U20CECX43	Embedded System using Arduino
44	U20CECX44	Embedded System using C
45	U20CECX45	Embedded System with IoT
46	U20CECX46	ePLAN Data Portal
47	U20CECX47	ePLAN Electric P8
48	U20CECX48	ePLAN Fluid
49	U20CECX49	ePLAN PPE
50	U20CECX50	Fusion 360
51	U20CECX51	Fuzzy Logic and Neural Networks
52	U20CECX52	Google Analytics

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

53	U20CECX53	Hydraulic Automation
54	U20CECX54	Industrial Automation
55	U20CECX55	Industry 4.0
56	U20CECX56	Internet of Things
57	U20CECX57	Introduction to C Programming
58	U20CECX58	Introduction to C++ Programming
59	U20CECX59	IoT using Python
60	U20CECX60	Java Programming
61	U20CECX61	Machine Learning
62	U20CECX62	Machine Learning and Deep Learning
63	U20CECX63	Machine Learning for Medical Diagnosis
64	U20CECX64	Mechatronics
65	U20CECX65	Medical Robotics
66	U20CECX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U20CECX67	Mobile Edge Computing
68	U20CECX68	Modeling and Visualization using Micro station
69	U20CECX69	MX Road
70	U20CECX70	Photoshop
71	U20CECX71	PLC
72	U20CECX72	Pneumatics Automation
73	U20CECX73	Project Management
74	U20CECX74	Python Programming
75	U20CECX75	Revit Architecture
76	U20CECX76	Revit Inventor
77	U20CECX77	Revit MEP
78	U20CECX78	Robotics
79	U20CECX79	Search Engine Optimization
80	U20CECX80	Software Testing
81	U20CECX81	Solar and Smart Energy System with IoT
82	U20CECX82	Solid Works
83	U20CECX83	Solid Works with Electrical Schematics
84	U20CECX84	Speech Processing
85	U20CECX85	STAAD PRO V8i

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

86	U20CECX86	Structural Design and Analysis using Bentley
87	U20CECX87	Total Station
88	U20CECX88	Video and Image Processing Development System
89	U20CECX89	VLSI Design
90	U20CECX90	Web Programming - I
91	U20CECX91	Web Programming - II

Annexure – IV

EMPLOYABILITY ENHANCEMENT COURSES – (B). SKILL DEVELOPMENT COURSES

SI. No	Course Code	Course Title
1	U20CES201	Skill Development Course 1 *
		1) MS Office – Word, Excel, Power Point
		2) Measurements and Conversion
		3) Traditional construction in modern age
2	U20CES302	Skill Development Course 2 *
		1) Basic Vasthu
		2) Plane Table surveying
		3) Auto level surveying
3	U20CES403	Skill Development Course 3 *
		1) Safety in building construction
		2) Air Quality Monitoring
		3) Experience with On-Site Construction Observation and Management
4	U20CES504	Skill Development Course 4 : Foreign Language/ IELTS - I
5	U20CES505	Skill Development Course 5 : Presentation Skills using ICT
6	U20CES606	Skill Development Course 6 : Foreign Language/ IELTS - II
7	U20CES607	Skill Development Course 7 : Technical Seminar
8	U20CES608	Skill Development Course 8 : NPTEL / MOOC – I
9	U20CES809	Skill Development Course 9 : NPTEL / MOOC - II

* Any one course to be selected from the list

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

SEMESTER – I

	ENGINEERING MATHEMATICS – I	L	T	P	C	Hrs
U20BST101	**CALCULUS AND LINEAR ALGEBRA**	2	2	0	3	60

(Common to all branches except CSBS)

Course Objectives

- To familiarize the concept of matrices.
- To introduce mathematical tools to solve first order differential equations.
- To learn linear differential equations of higher order with constant coefficients.
- To understand the concept of partial differentiation.
- To introduce the concepts of curl, divergence and integration of vectors in vector calculus.

Course Outcomes

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

CO1 – Understand the concept of Eigen values and Eigen vectors, Diagonalization of a matrix. **(K2)**

CO2 – Solve differential equations. **(K3)**

CO3 – Solve higher order differential equations.**(K3)**

CO4 – Solve different types of partial differential equation. **(K3)**

CO5 – Understand the use of vector calculus. **(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT– I MATRICES   (12Hrs)

Rank of a Matrix – Consistency of system of equations. Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors. Cayley – Hamilton Theorem – Diagonalization of matrices.

UNIT – II DIFFERENTIAL EQUATIONS   (12 Hrs)

Exact equations, First order linear equations, Bernoulli's equation, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT – III DIFFERENTIAL EQUATIONS (HIGHER ORDER)   (12 Hrs)

Linear differential equations of higher order with constant coefficients, the operator D,
Euler's linear equation of higher order with variable coefficients, Solution by variation of parameter method.

UNIT – IV PARTIAL DIFFERENTIAL EQUATIONS   (12 Hrs)

Partial derivatives, Total derivatives, Differentiation of implicit functions, Maxima and Minima of two variables.Partial differential equations of higher order with constant coefficients.

UNIT – V VECTOR CALCULUS   (12 Hrs)
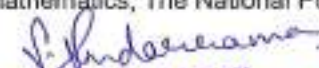
Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Gauss Divergence Theorem and Stokes Theorem.

Text Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, 10th Edition, 2019.
2. B.V.Ramana, "Higher Engineering Mathematics", Tata McGraw – Hill, New Delhi, 6th Edition 2018.
3. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, 9th Edition, 2018.

Reference Books

1. C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rd Edition, 2019.
2. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019.
3. M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,   B.Tech. Civil Engineering
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

4. S.Narayanan and Manicavachagom T.K. Pillay, "Differential Equations and Its Applications", Paperback, Viswanathan.S Printers& Publishers PvtLtd , 2009.
5. Dr. G Balaji, "Engineering Mathematics – I", G. Balaji publishers, 2017.

Web References

1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra –slides- systems of quation-handout.pdf
2. http://www.math.cum.edu/~wn0g/2ch6a.pdf
3. https://nptel.ac.in/courses/122/104/122104017/
4. https://nptel.ac.in/courses/111/106/111106051/
5. https://nptel.ac.in/courses/111/108/111108081/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	1	1	-	-	-	-	1	1	-	-
CO2	3	2	1	1	-	1	1	-	-	-	-	1	1	-	-
CO3	3	2	1	1	-	1	1	-	-	-	-	1	1	-	-
CO4	3	2	1	1	-	1	1	-	-	-	-	1	1	-	-
CO5	2	1	-	-	-	-	1	-	-	-	-	1	1	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20BST108	PHYSICS FOR CIVIL ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce the concepts of thermal measurements and performance in buildings.
- To learn the sound energy and its measurements.
- To introduce the concepts of radiation laws and artificial lighting in buildings
- To introduce the new engineering materials and its properties.
- To study the concepts of natural hazards

Course Outcomes

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

CO1 - Understand the concepts of thermal measurements and performance in buildings(**K2**)

CO2 – Learn the sound energy and its measurements(**K2**)

CO3 – Gain knowledge on the concepts of radiation laws and artificial lighting in buildings. (**K3**)

CO4 - Learn various new engineering materials and its properties(**K1**)

CO5 - Understand the the concepts of natural hazards and its safety measures(**K3**)

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I THERMAL PERFORMANCE OF BUILDINGS   (9 Hrs)

Heat transfer through fenestrations, thermal insulation and its benefits. Heat gain and heat loss estimation – factors affecting the thermal performance of buildings. Thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices Central heating. Principles of natural ventilation – ventilation measurements, design for natural ventilation. Window types and packaged air conditioners – chilled water plant – fan coil systems – water piping – cooling load. Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C.Systems.

UNIT II ACOUSTICS   (9 Hrs)

Classification of sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method. Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Methods of sound absorptions – absorbing materials – noise and its measurements, sound insulation and its measurements, impact of noise in multi-storeyed buildings.

UNIT III LIGHTING DESIGNS   (9 Hrs)

Radiation quantitites – spectral quantities – relationship between luminescence and radiant quantities – hemispherical reflectance and transmittance – photometry: cosines law, inverse square law. Vision – photobic, mesophic, scotopic visions. Colour – luminous efficiency function – Visual field glare, colour – day light calculations – day light design of windows, measurement of day-light and use of models and artificial skies, principles of artificial lighting, supplementary artificial lighting.

UNIT IV NEW ENGINEERING MATERIALS   (9 Hrs)

Composites – definition and classification – Fibre reinforced plastics (FRP) and fiber reinforced metals (FRM). Metallic glasses – Shape memory alloys – Ceramics – Classification – Crystalline – Non Crystalline. Bonded ceramics, Manufacturing methods – Slip casting – Isostatic pressing – Gas pressure bonding. Properties – thermal, mechanical, electrical and chemical ceramic fibres – ferroelectric and ferromagnetic ceramics – High Aluminium ceramics.

UNIT V HAZARDS   (9 Hrs)

Seismology and Seismic waves – Earth quake ground motion – Basic concepts and estimation techniques – site effects. Probabilistic and deterministic Seismic hazard analysis. Cyclone and flood hazards – Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and fire fighting equipment. Prevention and safety measures.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Text Books

1. Alexander, D. "Natural disaster", Springer (1993).
2. Budinski, K.G. and Budinski, M.K. "Engineering Materials Properties and Selection", Prentice Hall, 2009.
3. Severns, W.H. and Fellows, J.R. "Air conditioning and Refrigeration", John Wiley and Sons, London, 1988.
4. Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013

Reference Books

1. Gaur R.K. and Gupta S.L., Engineering Physics. Dhanpat Rai publishers, 2012.
2. Reiter, L. "Earthquake hazard analysis – Issues and insights", Columbia University Press, 1991
3. Shearer, P.M. "Introduction to Seismology", Cambridge University Press, 1999.

Web References

1. https://nptel.ac.in/courses/122/103/122103011/
2. https://nptel.ac.in/courses/122/107/122107035/
3. https://www.sciencedirect.com/science/article/abs/pii/S0959652618332530

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	-	-	-	-	-	-	-	2	2	1
CO2	3	3	2	3	3	-	-	-	-	-	-	-	3	3	1
CO3	3	3	3	3	2	-	-	-	-	-	-	-	2	2	1
CO4	3	3	1	3	3	-	-	-	-	-	-	-	2	2	1
CO5	3	3	1	2	2	-	-	-	-	-	-	-	3	3	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

	PROGRAMMING IN C	L	T	P	C	Hrs
U20EST101	(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL,BME,MECHTRONICS, CCE)	3	0	0	3	45

Course Objectives

- To understand the Fundamentals of Computers and introduction to C language.
- To study about the programs using Control structures.
- To understand programs using looping and arrays.
- To understand the concepts of Functions and Pointers.
- To study about Structure, Union and File Management Operations in C.

Course Outcomes

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

CO1 - Comprehend the basic constructs of C programming. **(K2)**

CO2 - Illustrate the concepts of sequential, selection and repetition control structures in C program. **(K2)**

CO3 - Implement simple programs using looping structure and arrays. **(K3)**

CO4 - Demonstrate programs using Functions and Pointers. **(K3)**

CO5 - Build programs using Structure, Union and understand the concept of File management Operations. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION TO C (9 Hrs)

C programming: Overview of C - Visual Studio code-Constants- Compiling a C Program -Variables and Data Types- Technical Difference between Keywords and Identifiers- - Types of C Qualifiers and format specifies - Operators and Expressions-Operators Precedence-Type conversion-Input-Output Statements.

UNIT II DECISION MAKING (9 Hrs)

Decision making and branching- Relational operators – Logical operators- if – if else-if else if –nested if. Switch-case.

UNIT III LOOPING AND ARRAYS (9 Hrs)

Looping: while - do while – for – break – continue - nested loop Arrays: One Dimensional Arrays-Two-Dimensional Arrays-Multi-Dimensional Array-Dynamic arrays-Character Arrays and String-Sorting - Searching.

UNIT IV FUNCTIONS, POINTERS (9 Hrs)
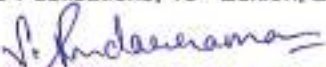
Functions: Introduction - Definition – Declaration – Categories of Functions - Nesting of Functions, Recursive functions - Passing Arrays to Functions - Strings – String library function. Pointers: Introduction - Declaring Pointer Variables - Initialization of Pointer Variables - Accessing the address of a variable - Accessing a variable thorough Pointer - Chain of Pointers - Pointer Expressions - Pointers and arrays – Pointers and functions – Call by Reference - Pointers and character strings - Array of Pointers - Pointers and Structures.

UNIT V STRUCTURES AND UNIONS, FILE MANAGEMENT (9 Hrs)

User defined data types: Introduction – Structure: definition - declaration - Arrays of Structures – Nested structures – Passing structures to functions — Union - Enumeration and Typedef. Introduction to File Handling in C, Input and Output operations on a file – Error Handling - Random access to files – command line arguments. Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, 8th Edition, 2019.
2. Herbert Schildt," C: The Complete Reference", McGraw Hill, Fourth Edition, 2014.
3. Yashvant Kanetkar, "Let us C", BPB Publications, 16th Edition, 2017.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2012.
2. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition, 2012.
3. Dr. P. Rizwan Ahmed, 'Office Automation", Margham Publications, 2016.
4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
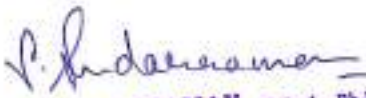5. Pradip Dev, Manas Ghoush, "Programming in C", Second Edition, Oxford University Press, 2011.

Web References

1. https://www.programiz.com/c-programming
2. https://www.geeksforgeeks.org/c-language-set-1-introduction/
4. https://www.tutorialspoint.com/cprogramming
5. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c
6. https://nptel.ac.in/courses/106/104/106104128/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	3	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20EST119	**ENGINEERING MECHANICS** (Common to Civil, ECE, EEE, MECH, Mechatronics)	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To understand the basic of forces and moments, static equilibrium of particles in two and three dimensions.
- To study about the equilibrium of rigid bodies and components of a moment.
- To understand the concept of properties of surfaces and solids.
- To impart knowledge on relationship between the motion of bodies
- To understand the various structural analysis and load on system of rigid bodies.

Course Outcomes

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

CO1 - Recognize the basics of equilibrium of particles in 2D and 3D. **(K2)**

CO2 - Review the requirements of equilibrium of rigid bodies in 2D and 3D **(K2)**

CO3 - Compute the center of mass and moment of inertia of surfaces and solids**(K3)**

CO4 - Predict displacement, velocity and acceleration of dynamic particles**(K3)**

CO5 - Solve for friction force and rigid body dynamics**(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I BASICS AND STATICS OF PARTICLES (12 Hrs)

Introduction - Units and Dimensions - Vectorial representation of forces and moments –Coplanar Forces - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces -Resolution and Composition of forces -Equilibrium of a particle - Principle of transmissibility -Single equivalent force - Free body diagram

UNIT II EQUILIBRIUM OF RIGID BODIES (12 Hrs)

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 dimensions –Forces in space -Equilibrium of a particle in space - Equivalent systems of forces - Equilibrium of Rigid bodies in three dimensions –Examples.

UNIT III PROPERTIES OF SURFACES AND SOLIDS (12 Hrs)

Determination of centroid of areas, volumes and mass - Pappus and Guldinus theorems - moment of inertia of plane and areas- Parallel axis theorem and perpendicular axis theorem, radius of gyration of area- product of inertia- mass moment of inertia.

UNIT IV DYNAMICS OF PARTICLES AND FRICTION (12 Hrs)
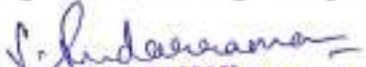
Displacements, Velocity and acceleration, their relationship - Relative motion -Curvilinear motion - Newton's law -Work Energy Equation of particles -Impulse and Momentum -Impact of elastic bodies.

Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction -wedge friction- Rolling resistance

UNIT V STRUCTURAL ANALYSIS OF TRUSSES AND RIGID BODY DYNAMICS (12 Hrs)

Trusses: - Definition of a truss - Simple Trusses - Analysis of Trusses - Method of joints- Method of sections. - Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

Text Books

1. F.P.Beer, and Johnston Jr. E.R. "Vector Mechanics for Engineers", McGraw-Hill Education India Pvt Ltd., 11th Edition, 2016.
2. J.L. Meriam & L.G. Karidge, Engineering Volume I and Engineering Mechanics: Dynamics, 8th edition,

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg

B.Tech. Civil Engineering

Wiley student edition, 2016.

3. R.C, Hibbeller, "Engineering Mechanics", Prentice hall, 14th edition, 2016.

Reference Books

1. Arthur P. Boresi and Richard J. Schmidt, "Engineering Mechanics: Statics and Dynamics", Thomson Asia Private Limited, Singapore, 2010.
2. D.P.Sharma "Engineering Mechanics", Dorling Kindersley India Pvt. Ltd, New Delhi, 2010
3. S.Rajasekaran, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2012.
4. S.S.Bhavikatti and K.G. Rajashekarappa, Engineering Mechanics, New Age International(P) Ltd, New Delhi, 7th Edition, 2019.
5. Dr. I. SGujral "Engineering Mechanical" second edition, Lakshmi Publication (P).Ltd., 2011
6. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

Web References

1. http://nptel.iitm.ac.in/video.php?subjectId=112103108
2. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR / Engineering mechanics / Table of Contents.html
3. https://nptel.ac.in/courses/112/106/112106286/
4. https://www.coursera.org/learn/engineering-mechanics-statics
5. https://nptel.ac.in/courses/122/104/122104014/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	1	2	3	2
CO2	3	2	2	3	-	-	-	-	-	-	-	1	2	3	2
CO3	3	2	2	3	-	-	-	-	-	-	-	1	2	3	2
CO4	3	2	2	3	-	-	-	-	-	-	-	1	2	3	2
CO5	3	2	2	3	-	-	-	-	-	-	-	1	2	3	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CET101	BUILDING MATERIALS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce students on the fundamental knowledge of stones and bricks.
- To impart knowledge on cement and aggregate properties.
- To study on manufacturing of concrete with mix specifications and its application in construction site.
- To understand the manufacturing process and properties of steel.
- To study timber and various form of use and other construction materials.

Course Outcomes

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

CO1 - Learn and identify good selection of stones and bricks.(K2)

CO2 - Understand the various types of cements and aggregate properties used in construction. (K2)

CO3 - Know the production of concrete and also the method of placing and making of concrete elements. (K2)

CO4 - Learn the steel properties, forms and measures to prevent corrosion. (K2)

CO5 - Understand the application of timber and other materials. (K3)

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I STONES AND BRICKS (9Hrs)

Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks.

UNIT II CEMENT AND AGGREGATES (9Hrs)

Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

UNIT III CONCRETE (9Hrs)

Concrete – Ingredients – Manufacturing Process – Batching plants –mixing – transporting – placing – compaction of concrete –curing and finishing – Ready mix Concrete – Mix specification.

UNIT IV STEEL (9Hrs)

Manufacture of steel - properties and uses of different types of steel - Market forms of steel - mechanical and heat treatment of steel - Anticorrosive measures for steel.

UNIT V TIMBER AND OTHER MATERIALS (9Hrs)

Timber - Classification, properties - defects in timber - Processing, seasoning and preservation. Veneer – Plywood - Paints – Varnishes – Distempers

Text Books

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Duggal.S.K., "Building Materials", 4th Edition, New Age International, 2008
3. Building Materials, S. S. Bhavikatti, Vicas publications House private ltd, 2012
4. Building Materials, B. C. Punmia, Laxmi Publications private ltd, 2005

Reference Books

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., &NehaJamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
3. Sushil Kumar "Building Materials and construction", Standard Publishers, 20th edition, reprint, 2015.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
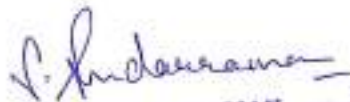Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

Academic Curriculum and Syllabi R-2020

Web References

1. https://nptel.ac.in/courses/105/102/105102088/
2. https://nptel.ac.in/courses/124/105/124105013/
3. https://nptel.ac.in/courses/105/106/105106053/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High
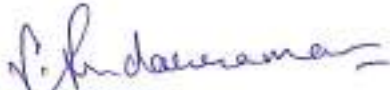
Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20ESP102	**PROGRAMMING IN C LABORATORY** (Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL,BME,MECHTRONICS, CCE)	**L** 0	**T** 0	**P** 2	**C** 1	**Hrs** 30

Course Objectives

- To practice the fundamental programming methodologies in the C programming language.
- To apply logical skills for problem solving using control structures and arrays.
- To design, implement, test and debug programs that use different data types, variables, strings, arrays, pointers and structures.
- To design modular programming and provide recursive solution to problems.
- To understand the miscellaneous aspects of C and comprehension of file operations.

Course Outcomes

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

CO1 - Implement logical formulations to solve simple problems leading to specific applications. **(K3)**
CO2 - Execute C programs for simple applications making use of basic constructs, arrays and strings. **(K3)**
CO3 - Experiment C programs involving functions, recursion, pointers, and structures. **(K3)**
CO4 - Demonstrate applications using sequential and random access file processing. **(K3)**
CO5 - Build solutions for online coding challenges. **(K3)**
KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

List of Exercises

1. Simple programming exercises to familiarize the basic C language constructs.
2. Develop programs using identifiers and operators.
3. Develop programs using decision-making and looping constructs.
4. Develop programs using functions as mathematical functions.
5. Develop programs with user defined functions – includes parameter passing.
6. Develop program for one dimensional and two dimensional arrays.
7. Develop program for sorting and searching elements.
8. Develop program to illustrate pointers.
9. Develop program with arrays and pointers.
10. Develop program for dynamic memory allocation.
11. Develop programs for file operations.

Reference Books

1. Zed A Shaw," Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley, 2016.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C", First edition, Pearson Education ,2011
3. Yashwanth Kanethkar, "Let us C", 13th Edition, BPB Publications, 2008.
4. Maureen Sprankle, Jim Hubbard," Problem Solving and Programming Concepts," 9th Edition, Pearson, 2011.
5. B.W.Kernighan and D.M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 2006.

Web References

1. https://alison.com/course/introduction-to-c-programming
2. https://www.geeksforgeeks.org/c-programming-language/
3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf
4. https://www.tenouk.com/clabworksheet/clabworksheet.html
5. https://fresh2refresh.com/c-programming/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEP101	CIVIL ENGINEERING BUILDING PLANNING AND DRAFTING	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To learn the concepts of planning and orientations of building using Autocad software
- To draft the building layout with load bearing walls, sloping roofs and framed structures
- To draft the industrial building with trussed roof
- To study the perspective views of buildings

Course Outcomes

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

CO1 - Familiarize with the fundamentals and standards of engineering graphics **(K2)**

CO2 - Understand the basic principle of drafting the plan, elevation and sectional views of the building by Autocad software. **(K2)**

CO3 - Draw building layout with load bearing walls, sloping roofs and framed structures**(K2)**

CO4 - Draw the industrial building with trussed roof**(K2)**

CO5 - Understand the different views of buildings**(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS

1. Study of capabilities of software for Drafting and Modelling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning.
5. Principles of planning, orientation and complete joinery details (Panelled and Glazed Doors and Windows)
6. Buildings with load bearing walls
7. Buildings with sloping roof
8. R.C.C. framed structures.
9. Industrial buildings – North light roof structures
10. Perspective views of Buildings

Text Books

1. NS Parthasarathy and Vela Murali, "Engineering Drawing", Oxford university press,2015.
2. ITL Education Solutions Limited, "Engineering Graphics", Pearson EducationPublication, 2011
3. Sikka V. B., "A Course in Civil Engineering Drawing", 11th Edition, S.K. Kataria and Sons, 2019.
4. Linkansagar, "Autocad 2019 Training Guide", BPB Publications, 2019
5. B.P. Verma "Civil Engineering Drawing and House Planning" , Khanna publishers, Delhi 2007

Reference Books

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Build Environment", Tata McGraw Hill Publishers Limited, 2019.
2. Dr. N. Kumaraswamy, A. KameswaraRao, Charotar Publishing- Building planning and Drawing,2017
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2018.

Web References

1. https://nptel.ac.in/courses/105/105/105105105/
2. https://nptel.ac.in/courses/124/107/124107001/
3. https://nptel.ac.in/courses/105/107/105107156/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	2	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEP102	CIVIL ENGINEERING PRACTICE LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To get knowledge about several Workshop Practices like carpentry, fitting and welding.
- Tom give practice for masonry techniques and procedures.
- To learn the concepts of connecting the pipes for residential building.
- To study the types building materials and their preliminary testing methods
- To gain the knowledge of IS Codes for testing the building materials

Course Outcomes

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

CO1 - Fabricate components with their own hands. **(K3)**

CO2 - Learn about tools and equipment, and measurements and drawings used by masons, and tasks like the spreading of mortar and brick laying techniques. **(K3)**

CO3 - Learn about various Exposure regarding pipe connection.**(K3)**

CO4 - get clear knowledge about Exposure to various testing for building materials. **(K2)**

CO5 - Familiarize with the IS codes for building materials. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

LIST OF EXPERIMENTS

CARPENTRY, WELDING AND FITTING WORKs

1. Types of woods/timber, different types of tools, machines and accessories for wood works
2. Types of welding, ARC welding, Gas welding, Gas Cutting, welding of dissimilar materials,
3. Selection of welding rod material, welding processes.
4. Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc.

MASONRY

5. Brick work, Different type of joints/bonds, Concept of line, plumb, right angle and water level.

PLUMBING

6. Different types of pipes, joints, taps, fixtures and accessories used in plumbing.
7. Components (pipes, bends, chambers etc.) used in sanitary/sewerage lines Scheme/plan for water supply and sanitary system for a simple residential building

BUILDING MATERIALS LABORATORY
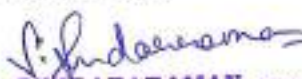
8. Exposure to various building materials like sand, cement, bricks, wood, steel, plastics, aluminum etc and their preliminary testing methods
9. Exposure to IS Codes for testing the above materials

Reference Books

1. John K C, "Mechanical Workshop Practice" 2nd Edition, PHI Learning Privet limited
2. Richard Kreh, "Building With Masonry: Brick, Block & Concrete Hardcover",Taunton Press
3. Silowash, Brian, "Piping Systems Manual"

Web References

1. http://www.vssut.ac.in/lecture_notes/lecture1424085991.pdf
2. https://nptel.ac.in/courses/112/107/112107090/
3. https://www.youtube.com/watch?v=-WDuzW-49K8

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	1	1	-	1	1	-	2	3	1	2
CO2	3	1	1	1	1	1	1	-	1	1	-	2	3	1	1
CO3	3	1	1	1	1	1	1	-	2	1	-	2	3	1	1
CO4	3	1	1	1	1	1	1	-	2	2	-	2	3	1	1
CO5	3	1	1	1	1	1	1	-	2	2	-	2	3	1	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

		L	T	P	C	Hrs
U20CEC1XX	CERTIFICATION COURSE - I	0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40 - 50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEM101   **INDUCTION PROGRAM**

Induction program for students to be offered right at the start of the first year

Duration of the Program	3 Weeks
Induction program	- Physical Activity - Creative Arts and Culture - Mentoring & Universal Human Values - Familiarization with College, Dept./Branch - Literary Activity - Proficiency Modules - Lectures & Workshops by Eminent People - Visits in Local Area - Extra-Curricular Activities in College

1. **Physical Activity**

   This would involve a daily routine of physical activity with games and sports. There would be games in the evening or at other suitable times according to the local climate. These would help develop teamwork besides health. Each student could pick one game and learn it for the duration of the induction program and hopefully, continue with it later.

2. **Creative Arts**

   Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

3. **Mentoring and Universal Human Values**

   Mentoring and connecting the students with faculty members is the most important part of student induction. Mentoring takes place in the context and setting of Universal Human Values. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer pressure and take decisions with courage, be aware of relationships and be sensitive to others, understand the role of money in life and experience the feeling of prosperity. Need for character building has been underlined by many thinkers, universal human values provide the base. Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but by getting the students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

4. Other Activity

Activities that are not there on a daily basis, but are conducted for 3 - 4 days (typically in the afternoons) and change thereafter.

4.1. Familiarization with College, Department/Branch

The incoming students should be told about the credit and grading system, and about the examinations. They should be informed about how study in college differs from study in school. They should also be taken on a tour of the college and shown important points such as library, canteen, and other facilities. They should be shown their department, and told what it means to get into the branch or department. Describe what role the technology related to their department plays in society, and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the Dept. would be very helpful in this regard. They should also be shown the laboratories, workshops and other facilities. The above should be done right in the first two days, and then over the afternoons thereafter, as appropriate.

4.2. Literary Activity

Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

4.3. Proficiency Modules

The induction program period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

4.4. Lectures & Workshops by Eminent People

Lectures by eminent people should be organized, say, once a week. It would give the students exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni could be invited as well. Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, Vivekan and Kendras, S-VYASA, etc. may be organized. Workshops which rejuvenate or bring relief to students would also be welcome, such as, Art of Living workshops (3 sessions, 9 hours).

4.5. Visits in Local Area

A couple of visits to the local landmarks including historical monuments should be organized. This would familiarize the students with the area together with bonding with each other, like in a picnic. Visits should also be organized to a hospital, orphanage or a village. These would expose them to people in suffering or to different lifestyles. This might also sensitize them to engineering needs in these areas.

4.6. Extra-Curricular Activities in College

The new students should be introduced to the extra-curricular activities at the college/university. They should be shown the facilities and informed about activities related to different clubs etc. This is when selected senior students involved in or leading these activities can give presentations, under faculty supervision.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

SEMESTER – II

	ENGINEERING MATHEMATICS–II	L	T	P	C	Hrs
U20BST215	MULTIPLE INTEGRALS AND TRANSFORMS	2	2	0	3	60
	(Common to all branches except CSBS)					

Course Objectives

- To develop logical thinking and analytic skills in evaluating multiple integrals.
- To equip themselves familiar with Laplace transform and solve the differential equations using Laplace transform techniques.
- To enable the students to expand functions into Fourier series using change of intervals.
- To gain good knowledge in application of Fourier transform.
- To inculcate the computational knowledge in Z-transforms.

Course Outcomes

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

CO1 – Understand the concept of double and triple integrals. **(K2)**
CO2 – Apply Laplace transform and inverse Laplace transform of simple functions. **(K3)**
CO3 – Convert a periodic function into series form. **(K3)**
CO4 – Compute Fourier transforms of various functions. **(K3)**
CO5 – Solve difference equations using Z – transforms. **(K3)**
KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I MULTIPLE INTEGRALS   (12 Hrs)

Multiple Integrals, change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar).

UNIT II LAPLACE TRANSFORMS AND INVERSE LAPLACE TRANSFORMS   (12 Hrs)

Definition, Transforms of elementary functions, properties. Transform of derivatives and integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and final value theorems, Methods for determining inverse Laplace Transforms, Convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT III FOURIER SERIES   (12 Hrs)

Dirichlet's conditions – General Fourier series – Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

UNIT IV FOURIER TRANSFORMS   (12 Hrs)

Fourier Integral theorem Fourier transform and its inverse, properties. Fourier sine and cosine transforms, their properties, Convolution and Parseval's identity.

UNIT V Z - TRANSFORMS   (12 Hrs)

Difference equations, basic definition, z-transform - definition, Standard z-transforms, Damping rule, Shifting rule, Initial value and final value theorems and problems, Inverse z-transform. Applications of z-transforms to solve difference equations.

Text Books

1. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", 1st Edition, Tata McGraw Hill, New Delhi, 2016.
2. Sivaramakrishna Das P. and Vijayakumar C., "Engineering Mathematics", Pearsons, New Delhi, 2017.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi 2018
4. M.D.Petale, "A text book on Z- Transforms (Engineering Mathematics)", New Edition, Barnes and Noble, 2020.
5. Dr.G.Balaji, "Transforms and Partial Differential Equations", 11th Edition, Balaji Publication,2017.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

Reference Books

1. Dass .H.K, "Advanced Engineering Mathematics", S. Chand and co, New Delhi, 2019.
2. Bali N.P. and Dr. Manish Goyal, "Engineering Mathematics", 9th Edition, Lakshmi Publications Pvt. Ltd., New Delhi, 2015.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons, New Delhi, 2019.
4. Gupta .C.B, Shree Ram Singh, M. Kumar, "Engineering Mathematics for semester I and II", Tata McGraw Hill, New Delhi, 2015.
5. RamanaB.V.,"Higher Engineering Mathematics", Tata McGraw Hill, New Delhi 2018.

Web References

1. https://nptel.ac.in/courses/111105121/
2. https://nptel.ac.in/courses/111105035/
3. https://nptel.ac.in/courses/111107119/
4. https://swayam.gov.in/nd1_noc20_ma17/preview
5. https://nptel.ac.in/courses/111/103/111103021/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
CO3	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
CO4	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
CO5	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20EST217	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to MECH,CIVIL,FT, AI&DS)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce fundamental concepts, various laws and principles associated with electrical circuits and its analysis.
- To provide knowledge about the various factors in AC circuits and resonance condition.
- To introduce the concept of electrical safety, power system and working of transformers and motors.
- To understand the characteristics and applications of semiconductor devices
- To provide the basic knowledge in analog electronics
- To understand the purpose of communication and acquire knowledge on different communication systems

Course Outcomes

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

CO1 - Analyze the basic concepts, various laws and theorems used in DC circuits.(K3)

CO2 - Analyze and solve the AC circuits and develop resonance circuits for transmitter and receiver.(K4)

CO3 - Gain the knowledge of power system, importance of electrical safety measures and application of transformers and motors in real time.(K2)

CO 4 - Understand the operator of semiconductor diode and its applications. (K2)

CO 5 - Explain the characteristics and operation of BJT and FET. (K2)

CO 6 - Relate and Explain Different Communication Systems. (K2)

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

PART A - ELECTRICAL ENGINEERING

UNIT I D.C CIRCUITS AND NETWORK THEOREMS   (8 Hrs)
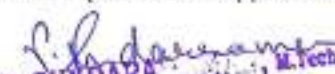
Concept of Potential difference, voltage, current, work, Power, Energy, Electric networks, voltage source and current sources, linear passive and active elements, current-voltage relation, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Simplifications of networks using series-parallel, Star/Delta transformation. Network Theorem – Superposition, Thevenin's, Norton's and Maximum Power Transfer.

UNIT II AC CIRCUITS   (8 Hrs)

AC waveform- definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, phasor representation in Polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, Resonance in series and parallel circuits, bandwidth and quality factors,3 phase Balanced AC Circuits (Y-Δ and Y-Y)-power Measurement –two Wattmeter method

UNIT III ELECTRICAL SAFETY AND ELECTRICAL MACHINES   (7Hrs)

Layout of electrical power system and its functions, Safety devices and systems, Types of domestic wiring, Wiring Accessories, Necessity of earthing, insulators, cables, fuse and circuit breakers - Sensors and its types.

Law of Electromagnetic induction, Auto transformer, Single phase transformer- load test – Open Circuit and Short Circuit test, Fleming's Right and Left hand rule – construction, principle, load test and performance characteristics of rotating machines – DC Motor and DC Generator - single phase/three phase induction motor, Alternator and synchronous motor (Qualitative approach only)

Dr.S. SUNDARA ...., M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

PART B - ELECTRONICS ENGINEERING

UNIT IV SEMICONDUCTOR DIODES AND APPLICATIONS   (7 Hrs)

Introduction semiconductor materials-Doping-Intrinsic and Extrinsic Semiconductor –PN junction diode, structure, characteristics-diffusion and depletion capacitance-Rectifier, Half wave and Full wave rectifier-zener diode characteristics-zener diode as regulator –Light Emitting Diode(LED)-Solar Panel.

UNIT V TRANSISTORS   (7 Hrs)

Bipolar Junction Transistor-construction-operation-Common Base, Common Emitter, Common collector Configuration-characteristics - Biasing- numerical application- Junction Field Effect Transistor(JFET), Metal oxide semiconductor Field Effect Transistor, EMOSFET-DMOSFET operation characteristics-Numerical applications.

UNIT VI COMMUNICATION SYSTEMS   (8 Hrs)

Need for Modulation – Block diagram of analog communication System - AM, FM, PM Definitions and Waveforms – Comparison of digital   and analog communication system- Block diagram of digital communication system – Electromagnetic Spectrum. Wired and wireless Channel – Block diagram of communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. Sudhakar.A and Shyam Mohan.S.P, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th edition, 2010.
2. D.P.Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill, New Delhi, 5th Edition, 2017.
3. Theraja B. L and Theraja A. K., "A Textbook of Electrical Technology", Vol. II, S Chand & Co. Ltd., New Delhi, 2009
4. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Private Limited, Ninth Edition, 2008
5. Wayne   Tomasi, "Electronic   Communication Systems- Fundamentals Theory Advanced", Fourth Edition, Pearson Education, 2001

Reference Books

1. V. Del Toro, "Electrical Engineering Fundamentals", Pearson Education India, New Delhi, 2nd Edition, 2015.
2. A.E.Fitzgerald, Charles Kingsley, Stephen. D. Umans, "Electric Machinery", Tata Mcgraw Hill, New Delhi, 7th Edition, 2013.
3. William H Hayt, J. E. Kemmerly and Steven M Durbin, "Engineering Circuit Analysis", McGraw Hill, 8th Edition, 2012.
4. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, Fourth Edition, 2008
5. George Kennedy, Bernard Davis and S. R. M Prasanna, "Electronic Communication Systems", 6th Edition, McGraw Hill Education, 2017

Web References

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://www.electrical4u.com/
3. https://nptel.ac.in/courses/108/102/108102146/
4. http://www.electronics-tutorials.ws
5. https://nptel.ac.in/courses/117/1 02/117102059/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	1	2	-	-	-	-	-	-	-	2	1	-
CO2	2	3	2	1	2	-	-	-	-	-	-	-	2	1	-
CO3	2	3	2	1	2	-	-	-	-	-	-	-	2	1	-
CO4	3	1	2	1	-	-	-	-	-	-	-	-	2	1	-
CO5	3	2	2	1	-	-	-	-	-	-	-	-	2	1	-
CO6	2	-	2	-	2	-	-	-	-	-	-	-	2	1	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20EST242	GREEN BUILDINGS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To study the concepts of Green buildings
- To learn Renewable energy for buildings.
- To study the Implement Automation techniques in buildings.
- To study appropriate materials for Green buildings
- To learn on the green composites for buildings

Course Outcomes

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

CO1 - Know the concepts of Green buildings.(K2)

CO2 - Adopt Renewable energy for buildings.(K2)

CO3 - Implement Automation techniques in buildings. (K2)

CO4 - Choose appropriate materials for Green buildings(K2)

CO5 – Understand effective management of water, wastewater and solid waste(K3)

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I CONCEPT OF GREEN BUILDINGS (9 Hrs)

Green building initiatives, its origin, characteristics of a green building, green buildings in India, certification of green buildings. Criteria for rating – sustainability. Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; green cement, biodegradable materials, smart materials, engineering evaluation of these materials. Case study

UNIT II SOURCES OF ENERGY (9 Hrs)

Renewable and non-renewable sources of energy ; coal, petroleum, nuclear, wind, solar, hydro, geothermal sources; potential of these sources, hazards, pollution; global scenario with reference to demand and supply in India. Energy arises. Carbon Emission: Forecasting, control of carbon emission, air quality and its monitoring carbon foot print; environmental issues, minimizing carbon emission.

UNIT III INTELLIGENT BUILDINGS (9 Hrs)

Intelligent buildings-Building automation-Smart buildings- Building services in high rise buildings-Green buildings-Energy efficient buildings for various zones-Case studies of residence, office buildings and other buildings in each zones. Case Study.

UNIT IV MATERIALS FOR GREEN SYSTEMS (9 Hrs)

Green materials, including biomaterials, biopolymers, bioplastics, and Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Paints, Roofs, Walls, and Cooling. Multifunctional Gas Sensors, Biomimetic Sensors, Optical Interference Sensors Thermo-, light-, and stimulus-responsive smart materials.

UNIT V GREEN COMPOSITES FOR BUILDINGS (9 Hrs)

Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment

Text Books

1. Kibert, CJ. "Sustainable Construction: Green Building Design and Delivery", John Wiley and Sons, 2016
2. Edward G Pita, "An Energy Approach- Air-conditioning Principles and Systems", Pearson Education, 2018.
3. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao, "Alternative Building Materials and Technologies", New Age International, 2018.

Reference Books

1. Osman Attmann "Green Architecture Advanced Technologies and Materials". McGraw Hill, 2018.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg.

B.Tech. Civil Engineering

2. Jerry Yudelson "Green building Through Integrated Design" McGraw Hill, 2018.
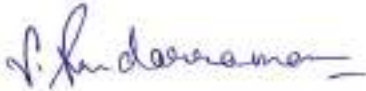3. Lever More G J, "Building Energy Management Systems", E and FN Spon, London, 2013.

Web References

1. https://nptel.ac.in/courses/105102195/
2. https://www.archdaily.com/tag/case-study-houses
3. https://www.archdaily.com/category/office-buildings

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET202	MECHANICS OF SOLIDS – I	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To understand the stress - strain concepts and behavior of materials.
- To get knowledge on Shear force and bending moment.
- To understand the concepts of flexural stresses in different sections
- To understand the concepts of shear stresses in different sections
- To understand the concepts of torsion in shafts and columns.

Course Outcomes

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

CO1 - Discuss the concept of stresses and strains developed in simple geometries **(K2)**

CO2 - Find out the shear force and bending moment for various types of beams with various types of loads. **(K4)**

CO3 - Calculate the bending stresses for both symmetrical and unsymmetrical sections. **(K4)**

CO4 - Calculate the shear stresses for both symmetrical and unsymmetrical sections. **(K4)**

CO5 - Analyse the torsion of shafts and buckling behavior of columns. **(K4)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I SIMPLE STRESS AND STRAIN (12 Hrs)

Introduction, Concept of Stress and Strain, Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain, Elastic constants, relationship among elastic constants. Bars of varying section – composite bars – Temperature stresses.

UNIT II SHEAR FORCE AND BENDING MOMENT (12 Hrs)

Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load – Point of contra flexure.

UNIT III FLEXURAL STRESSES (12 Hrs)

Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), Symmetrical 'I' and 'T' sections.

UNIT IV SHEAR STRESSES (12 Hrs)

Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, Symmetrical 'I' and 'T' sections.

UNIT V TORSION AND COLUMNS (12 Hrs)

Torsion of circular shafts: Pure torsion, torsion equation of circular shafts, torsional rigidity and polar modulus, Power transmitted by shaft for solid and hollow circular shafts. Elastic stability of columns: Short and long columns, Euler's theory on long columns, Effective length, slenderness ratio, radius of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula.

Text Books

1. Dr. R K Bansal, "A Textbook of Strength of Materials", 6th Edition, Laxmi Publisher, 2018.
2. S Ramamrutham and R Narayanan, "Strength of Materials", 18th Edition, DhanpatRai Publishing Company, 2014.
3. R.K.Rajput, "Strength of materials", 7th edition, S. Chand publishers, 2018.
4. R. S. Khurmi, "Strength of Materials", S. Chand and Company Ltd, New Delhi, 26th Edition, 2019.
5. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Strength of Materials", Laxmi Publications, 2013.

Dr.S. SUNDARARAMAN, M.Tech, Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet

B.Tech. Civil Engineering

Reference Books

1. Junnarkar, S.B. and Shah, H.J., "Mechanics of structures, Vol.I, II", 24rd Edition, Charotar Publishing House, India, 2015.
2. Subramanian R. "Strength of materials", 3rd Edition, Oxford University Press, New Delhi, 2016.
3. Dr. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications, 2017.
4. Dr. S. JoseandDr. Sudhi Mary Kurian," Mechanics of Solids" Pentagon Educational Services, 2nd Edition, 2018.
5. Dr. R. P. Rathaliya," Mechanics of Solids"AtulPrakashan, 2018.

Web References
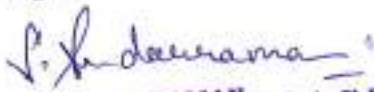
1. https://nptel.ac.in/courses/105/102/105102090/
2. https://nptel.ac.in/courses/105/104/105104160/
3. https://nptel.ac.in/courses/105/106/105106116/
4. https://nptel.ac.in/content/storage2/courses/105105104/pdf/m10l21.pdf
5. https://nptel.ac.in/content/storage2/courses/112105125/pdf/Module-2_Lesson-1.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET203	FLUID MECHANICS AND MACHINERY	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

- To study the properties of fluids and concept of control volume
- To study the flow through pipes of the conversation laws
- To understand the importance of dimensional analysis
- To understand the principles, working and application of pump.
- To understand the concept of impulse momentum principle on turbines to design and select turbines.

Course Outcomes

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

CO1 - Apply mathematical knowledge to predict the properties and characteristics of a fluid.(K3)

CO2 - Analyse and calculate major and minor losses associated with pipe flow in piping networks(K5)

CO3 - Mathematically predict the nature of physical quantities(K5)

CO4 - Critically analyse the performance of pumps(K5)

CO5 - Select the type of turbine required with reference to available head of water and discharge.(K5)

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS (12 Hrs)

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges. Flow characteristics – concept of control volume – application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS (12 Hrs)

Hydraulic and energy gradient – Laminar flow through circular conduits. Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT III DIMENSIONAL ANALYSIS (12 Hrs)

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV PUMPS (12 Hrs)
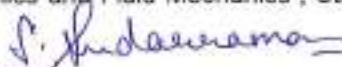
Impact of jets – Euler's equation – Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles – Centrifugal pumps– working principle- work done by the impeller – performance curves – Reciprocating pump- working principle – Rotary pumps –classification.

UNIT V TURBINES (12 Hrs)

Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles – work done by water on the runner – draft tube. Specific speed – unit quantities – performance curves for turbines– governing of turbines.

Text Books

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

2. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Twelfth Edition, Khanna Publishers, 2016
3. Dr. R.K. Bansal "Fluid Mechanics and Hydraulic Machines", 9th edition, Laxmi Publication, 2017
4. Fluid Mechanics seventh edition,2017 by Frank M White.
5. Fluid Mechanics: Fundamentals and Applications John. M. CimbalaYunus A. Cengel,2019

Reference Books

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor and Francis, Indian Reprint, 2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
4. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
5. John A.Roberson, "Hydraulic Engineering", John Wiley andSons,Incorporated, 2013.
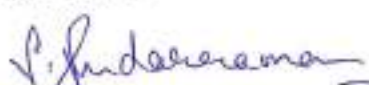
Web References

1. https://nptel.ac.in/courses/105/103/105103192/
2. https://www.youtube.com/watch?v=fa0zHI6nLUo&list=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEm
3. https://www.coursera.org/courses?query=fluid%20mechanics
4. https://www.classcentral.com/course/swayam-introduction-to-fluid-mechanics-7945
5. https://www.udemy.com/topic/fluid-mechanics

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	3	2	1	2	2	3	2	2
CO2	3	3	3	3	2	3	2	3	2	1	2	2	3	2	2
CO3	3	3	3	3	2	3	2	3	2	1	2	2	3	2	2
CO4	3	3	3	3	2	3	2	3	2	1	2	2	3	2	2
CO5	3	3	3	3	2	3	2	3	2	1	2	2	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET204	BUILDING CONSTRUCTION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To study various components of building and foundation concepts in building.
- To understand the different types of masonry used in building construction.
- To introduce the concepts of flooring and roofs in a building.
- To understand the location and materials used for doors, windows and ventilators.
- To study the purpose and learn concepts of plastering, pointing and paints

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

CO1 - Understand the various building components and importance of foundations.(K2)
CO2 - Classify the types of masonry used in building construction. (K2)
CO3 - Gain knowledge on good flooring and roofing used in construction. (K3)
CO4 - Learn various concept in locating doors, windows and ventilators. (K2)
CO5 - Understand the concepts of plastering, pointing and paints(K2)
KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I BUILDING COMPONENTS AND FOUNDATION (9Hrs)
Various Components of building and their functions - Foundation: function and types. Preliminary considerations for shallow and deep foundations. Necessity, excavation, construction, failures of foundation and remedial measures.

UNIT II MASONRY (9Hrs)
Masonry - Types of masonry – functions - composite walls - cavity walls and partition walls - scaffoldings - Construction details and features

UNIT III FLOORS AND ROOFS (9Hrs)
Floors; Requirement of good floor – Types of floor - Components of ground floor, Selection of flooring material, Laying of Concrete. Roof - Requirement of good roof, Types of roof - types of roof coverings.

UNIT IV DOORS, WINDOWS AND VENTILATORS (9Hrs)
Location of doors and windows, technical terms, Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window. Ventilators. Sizes as per IS recommendations

UNIT V PLASTERING, POINTING AND PAINTS (9Hrs)
Purpose, materials and methods of plastering and pointing, defects in plastering-Stucco plastering, lathe plastering. Damp proofing - causes, effects and methods. Paints- Purpose, types, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces
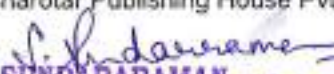
Text Books
1. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publishing (P).Ltd., New Delhi-2, 2012
2. Punmia B. C., Building Construction, Laxmi Publications private ltd, 2005
3. Varghese P. C, Building Construction, PHI Learning Pvt., Ltd., , New Delhi, 2011
4. Sharma S. K., Building Construction, S. Chand & Company, 2019
5. Bhavikatti S. S., Building Material and Construction, Vikas Publishing House, Pvt., Ltd., 2012

Reference Books
1. Sushil Kumar, Building Construction, Standard Publishers Distributors, 2006
2. Gurcharan Singh, Building Construction and materials, Rajsons Publications Pvt., Ltd.,2019
3. S. C. Rangwala, Building Construction, Charotar Publishing House Pvt. Limited, 2009

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

4. G. C Sahu and Joygopal Jena , Building Materials and Construction, McGraw Hill Education, Pvt., Ltd., 2015
5. Saiful Islam andYasirKarim, Building Material And Construction, Vayu Education Of India, 2010

Web References

1. https://nptel.ac.in/courses/105/102/105102088/
2. https://nptel.ac.in/courses/105/106/105106197/
3. https://nptel.ac.in/courses/105/106/105106176/
4. https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2330
5. http://www.nptelvideos.in/2012/11/building-materials-and-construction.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3
CO2	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3
CO3	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3
CO4	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3
CO5	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20ESP218	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	L T P C Hrs
	(Common to MECH,CIVIL and FT)	0 0 2 1 30

Course Objectives

- To introduce practical knowledge for the analysis of laws and theorems.
- To provide the methods to evaluate and test the devices and machines.
- To Study about Electronic components and CRO.
- To study VI characteristics of Diodes the applications of Diode as Half wave rectifier
- To understand Input and output characteristics of Transistors and FETs

Course Outcomes

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

CO1 - Inspect the network theorems and validate the results through simulation. **(K4)**

CO2 - Build the various wiring systems for house, Godown, etc. **(K3)**

CO3 - Estimate the performance of DC and induction motor by conducting load and no load tests.**(K5)**

CO4 - Describe characteristics of semiconductor diode and utilize it for different applications **(K3)**

CO5 - Relate the characteristics of various transistor **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

List of Experiments

PART – A ELECTRICAL EXPERIMENTS

Demonstration on Sources, Ammeters, Voltmeters, Wattmeters, Energy meters and Transducers are Pre Requisite for conducting this electrical engineering Lab.

1. Domestic Wiring Practice
   - Staircase wiring
   - Doctor's room wiring
   - Godown wiring
   - Ceiling fan and fluorescent lamp wiring
2. Verification of Network Theorems (simulation and experimental)
3. Determination of resistance temperature coefficient
4. Simulation of R-L-C Series Circuit for XL>XC, XC>XL
5. Load test on single phase transformer.
6. Measurement of 3-phase power using two wattmeter methods.
7. Load test on DC shunt motor.
8. Load test on single phase induction motor.

PART – B ELECTRONICS EXPERIMENTS

1. Study of Electronic components and equipments: Resistor, Capacitor
2. Measurement of AC signal parameter (Peak-Peak, rms period, frequency) using CRO.
3. VI Characteristics of PN junction diode, Zener diode
4. Input and output characteristics of Common Emitter configuration of BJT
5. Characteristics of JFET
6. Measurement of Ripple factor of HWR

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, india

B.Tech. Civil Engineering

Reference Books

1. A.Sudhakar and Shyam Mohan.S.P, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th edition, 2010.
2. D.P.Kothari and I.J. Nagrath, "Electric Machines", Tata McGraw Hill, New Delhi, 5th Edition, 2017.
3. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, Electrical and Electronics Technology, Pearson Education Limited, New Delhi, 10 th edition 2010.
4. S.K. Sahdev, "Fundamentals of Electrical Engineering and Electronics", DhanpatRai and Co, 2013.
5. David Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
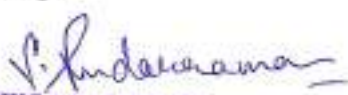
Web References

1. https://www.electronics-tutorials.ws/accircuits/series-circuit.html
2. https://www.allaboutcircuits.com/textbook/experiments/
3. https://www.electrical4u.com/
4. https://www.electronicshub.org/measurements-of-ac-current/
5. http://www.electronics-tutorials.ws

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	2	-	-	-	2	-	-
CO2	3	3	3	3	3	-	-	-	2	-	-	-	2	-	-
CO3	3	3	2	3	3	-	-	-	2	-	-	-	2	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	2	2	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	2	2	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CEP203	FLUID MECHANICS AND MACHINES LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To determine the discharge in pipes and open channels using various devices.
- To determine the Major and Minor losses experimentally in closed conduct.
- To determine the force on stationary vanes
- To study the performance and efficiency of pumps.
- To study the performance and efficiency of turbines.

Course Outcomes

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

CO1 - Students will be able to measure the discharge through the channels and pipes. **(K3)**

CO2 - Students will have a basic knowledge and able to calculate the different losses in pipes. **(K2)**

CO3 - Students will have confidence in calculating the forces on vanes. **(K2)**

CO4 - To estimate performance parameters of a given Centrifugal and Reciprocating pump. **(K3)**

CO5 - To select and analyze an appropriate turbine with reference to given situation in power plants. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS

A. FLUID FLOW LABORATORY

1. Determination of co-efficient of discharge of venturimeter
2. Determination of co-efficient of discharge of Orifice meter.
3. Determination of co-efficient of discharge of Orifice.
4. Determination of co-efficient of discharge of Notches.
5. Determination of frictional losses in pipes.
6. Determination of Minor losses in pipes
7. Study of the impact of jet on vanes.

B. FLUID MACHINERY LABORATORY

1. Study of performance characteristics of centrifugal pump
2. Study of performance characteristics of Reciprocating pump
3. Tests on Turbine

Reference Books

1. Sarbjit Singh. "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. John A. Roberson, "Hydraulic Engineering", John Wiley &Sons, Incorporated, 2013.
3. Streeter, Victor, L. and Wylie, Benjamin E., "Fluid Mechanics", McGraw-Hill Ltd., 2010

Web References

1. https://nptel.ac.in/courses/105/103/105103096/
2. https://nptel.ac.in/courses/105/105/105105203/
3. https://nptel.ac.in/courses/105/103/105103021/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO2	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO3	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO4	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO5	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

U20CEP204	STRENGTH OF MATERIALS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To study the tensile and torsional property of steel bars.
- To determine the hardness of the given specimen
- To determine the ductility of the given material.
- To determine the compression property of wood and spring.
- To study the compression and water absorption property of a brick.

Course Outcomes

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

CO1 - Conduct tension and torsion test on steel and find out its properties. **(K3)**

CO2 -Find out hardness of material and use it to its efficiency. **(K3)**

CO3 -Find out the ductile properties of materials. **(K3)**

CO4 -Conduct compression tests on spring and wood **(K3)**

CO5 -Students will be able to use the suitable brick for the construction purposes based on their properties. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS
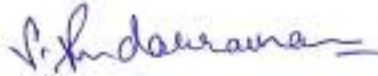
1. Tension Test on Mild steel and Tor Steel rod specimens
2. Direct Shear Test on Steel Rod Specimens
3. Bend and Re-bend Test on Steel Rod Specimens
4. Brinell Hardness Test on Metal Specimens
5. Rockwell Hardness Test on Metal Specimens
6. Impact Test on Metal Specimens using Izod arrangement
7. Impact Test on Metal Specimens using Charpy arrangement
8. Ductility Test on Sheet metals using Erichsen Cupping
9. Torsion Test on Metal Specimens-
10. Spring Test
11. Compression Test on wood Specimens- Parallel and Perpendicular to the Grains.
12. Compression Test on Brick and Water absorption test

Reference Books

1. IS 1608 (2005): Mechanical testing of metals - Tensile Testing
2. IS 10175-(Part 1) 1993 : Mechanical testing of metals -Modified Erichsen cupping test
3. IS1786-2008 (Fourth Revision, Reaffirmed 2013), 'High strength deformed bars and wires for concrete reinforcement – Specification', 2008.

Web References

1. https://www.coursera.org/learn/mechanics-1
2. https://nptel.ac.in/courses/105/104/105104160/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
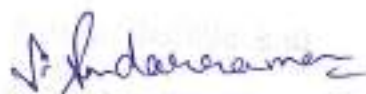Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO2	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO3	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO4	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3
CO5	3	3	3	3	2	3	2	3	2	1	3	2	3	2	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

		L	T	P	C	Hrs
U20CEC2XX	CERTIFICATION COURSE - II	0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40 - 50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CES201	SKILL DEVELOPMENT COURSE 1	L	T	P	C	Hrs
	(Choose any one of the following course)	0	0	2	-	30

1. MS OFFICE – WORD, EXCEL, POWER POINT

Course Content:

This would involve training of students in how to use MS Office applications for office work. This would help in creating professional-quality documents; store, organize and analyze information; arithmetic operations and functions; and create dynamic slide presentations with animation, narration, images, and much more, digitally and effectively.

2. MEASUREMENTS AND CONVERSION

Course Content:

This would involve in training students with basic concepts of units and measurements. This would help the students to learn the concept of conversion factor encompassing metric unit weight or mass, measurement of length, metric unit for liquid measurements and area measurement. By learning measurement and conversion problem solving skills of students can be enhanced.

3. TRADITIONAL CONSTRUCTION IN MODERN AGE

Course Content:

This would help the students to understand the difference between traditional construction and modern construction by involving history of construction, replacement of traditional materials with modern materials and rise of modernism using salient features

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

		L	T	P	C	Hrs
U20CEM202	ENVIRONMENTAL SCIENCE	2	0	0	0	30
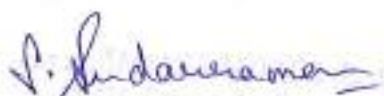
We as human being are not an entity separate from the environment around us rather, we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects this ethos. There is a direct application of this wisdom even in modern times. Idea of an activity-based course on environment protection is to sensitize the students on the above issues through following two type of activities.

(a) Awareness Activities:
i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
ii. Slogan making event
iii. Poster making event
iv. Cycle rally
v. Lectures from experts

(b) Actual Activities:
i. Plantation
ii. Gifting a tree to see its full growth
iii. Cleanliness drive
iv. Drive for segregation of waste
v. To live some big environmentalist for a week or so to understand his work
vi. To work in kitchen garden for mess
vii. To know about the different varieties of plants
viii. Shutting down the fans and ACs of the campus for an hour or so

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

SEMESTER - III
PROBABILITY AND STATISTICS

U20BST324

(Common to CIVIL & AI & DS)

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

This course should enable the students to

- Acquire skills in handling situation including more than one random variable.
- Familiarize the student about the continuous random variables and their applications.
- Study the basic concepts of Statistics.
- Learn the concept of testing of hypothesis using statistical analysis.
- Learn the concept of Small sampling.

Course Outcomes

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

CO1 - Apply the concept of probability in random variables. **(K3)**
CO2 - Apply the Basic rules of Continuous random variables. **(K3)**
CO3 - Understand the basic concepts of Statistics. **(K2)**
CO4 - Derive the inference for various problems using testing of hypothesis in large samples. **(K3)**
CO5 - Solve the problems related to testing of hypothesis in small samples. **(K3)**
KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I DISCRETE RANDOM VARIABLES   (12 Hrs)

Random Variables and their event spaces - The probability mass function - Distribution functions - Binomial - Geometric -Negative Binomial and Poisson.

UNIT II CONTINUOUS RANDOM VARIABLES   (12 Hrs)

Some important distributions - Exponential distribution -Gamma -Weibull- Gaussian distributions. Application of distribution -Reliability - Failure density and Hazard function.

UNIT III STATISTICS   (12 Hrs)

Measures of central tendency - Arithmetic Mean, Median and Mode - Measures of dispersion and Standard deviation -Skewness and Measures of Skewness- Pearson's coefficient of Skewness-Moments - Correlation - Rank correlation and regression.

UNIT IV LARGE SAMPLES   (12 Hrs)

Curve fitting by the method of least squares - Fitting of straight lines - Second degree parabolas and more general curves - Test of significance: Large samples test for single proportions, differences of proportions, single mean, difference of means and standard deviations.

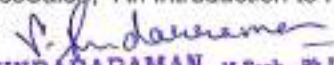## UNIT V SMALL SAMPLES   (12 Hrs)

Test for single mean - Difference of means and correlations of coefficients - Test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text Books

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers - Paperback – 3rdEdition , 2017.
2. T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill Education, 2008.
3. Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1 January 2019.

Reference Books

1. Ravish R. Singh, Mukul Bhatt "Engineering Mathematics", McGraw-Hill, 1stEdition, August 2017.
2. William Mendenhall, Robert J. Beaver, Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning; 15th Edition 2019.
3. Richard .A. Johnson, Irwin Miller and John E. Freund," Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.
4. Vijay K. Rohatgi and A.K. Md. EhsanesSaleh, "An Introduction to Probability and Statistics", Wiley –

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

January 2008.

5. E. Rukmangadachari, "Probability and Statistics", Pearson Education India – January 2012.

Web References

1. http:// www.stat110.net
2. http://www.nptel.ac.in/courses/111105035 (R.V)
3. http:// www.probabilitycourse.com.
4. www.edx.org/Probability
5. http://www2.aueb.gr/users/demos/pro-stat.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
CO3	2	1	-	-	-	1	-	-	-	-	-	1	1	-	-
CO4	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
CO5	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

DATA STRUCTURES

U20EST356   (Common to ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS,CCE)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Impart the basic concepts of data structures and its terminologies.
- Understand concepts about stack and queue operations.
- Understand basic concepts about linked list and its various operations.
- Understand concepts about Tree and its applications.
- Understand basic concepts about Sorting, Hashing and Graph.

Course Outcomes

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

CO1 - Compute time and space complexity for given problems **(K3)**

CO2 - Demonstrate stack, queue and its operation. **(K3)**

CO3 - Illustrate the various operations of linked list. **(K3)**

CO4 - Use the concepts of tree for various applications. **(K3)**

CO5 - Outline the various sorting, hashing and graph techniques. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES   (9 Hrs)

Introduction: Basic Terminologies: Elementary Data Organizations. Data Structure Operations: insertion, deletion, traversal. Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT II STACK AND QUEUE OPERATIONS   (9 Hrs)

Stacks and Queues: ADT Stack and its operations, Applications of Stacks: Expression Conversion and evaluation. ADT Queue: Types of Queue: Simple Queue, Circular Queue, Priority Queue. Operations on each type of Queues.

UNIT III LINKED LIST OPERATIONS   (9 Hrs)

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion in linked list; Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.

UNIT IV TREES   (9 Hrs)

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, Binary Tree Traversals, AVL Tree. Introduction to B-Tree and B+ Tree.

UNIT V SORTING, HASHING AND GRAPHS   (9 Hrs)

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Heap Sort, Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table, Hash Function and its characteristics. Graph: Basic Terminologies and Representations, Graph traversal algorithms.

Text Books

1. Ellis Horowitz, Sartaj Sahni,"Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

1. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition,Addison-Wesley Publishing Company, 1995.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

2. D.Samanta, "Classic Data Structures, Second Edition, Prentice-Hall of India, Pvt. Ltd., India 2012.
3. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c", Prentice-Hall of India, Pvt.Ltd., Second edition, 2007.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second edition, 2006.
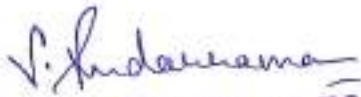5. Balagurusamy, "Data Structures", Tata McGraw-Hill Education, 2019.

Web References

1. https://www.geeksforgeeks.org/data-structures/
2. https://www.javatpoint.com/data-structure-tutorial/
3. https://www.studytonight.com/data-structures/
4. https://www.tutorialspoint.com/data_structures_algorithms/
5. https://www.w3schools.in/data-structures-tutorial/intro/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CET305	MECHANICS OF SOLIDS - II	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

This course should enable the students to

- Understand the deflection concept of beams.
- Get knowledge on Energy principles.
- Understand the concept of indeterminate structures
- Understand the deflection concept of trusses and frames
- Get knowledge on various theories of failure and unsymmetrical bending and shear centre of the sections.

Course Outcomes

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

CO1 - Determine the deflection of various types of beams. **(K4)**

CO2 - Calculate the strain energy for materials. **(K4)**

CO3 - Analyse the indeterminate structures and draw the shear force and bending moment diagrams for continuous beam. **(K4)**

CO4 - Determine the deflection of trusses and frames. **(K4)**

CO5 - Discuss the theories of failure and also to find the unsymmetrical bending and shear centre of the sections. **(K4)**

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I DEFLECTION OF BEAMS (12 Hrs)

Slope and Deflection – Deflection of cantilever and simply supported beams – Macaulay's method and conjugate beam method.

UNIT II ENERGY PRINCIPLES (12 Hrs)

Strain energy due to application of gradual, sudden and impact load- Principle of virtual displacement-Castigliano's theorem.

UNIT III INDETERMINATE BEAMS (12 Hrs)

Introduction – Degree of static indeterminacy for beams and frames. Theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.

UNIT IV DEFLECTION OF TRUSSES AND FRAMES (12 Hrs)

Introduction – Deflection of Trusses and Frames – Unit load method/ Strain energy method.

UNIT V THEORIES OF FAILURE AND UNSYMMETRICAL BENDING (12 Hrs)

Various theories of failure – Unsymmetrical bending of beams – 'L' and 'T' sections. Shear centre – Channel and I sections

Text Books

1. R.K.Bansal, "A Text Book of Strength of materials", Laxmi Publications, Sixth Edition, 2018.
2. R.K.Rajput, "Strength of materials", S. Chand publishers, 7th edition, 2018.
3. R. S. Khurmi, "Strength of Materials", S. Chand and Company Ltd, New Delhi, 26th Edition, 2019.
4. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Strength of Materials", Laxmi Publications, 2013.
5. M. Gere James, "Mechanics of Materials", Cengage, 8 edition, 2013.

Reference Books

1. Ramamrutham, S., "Strength of Materials", DhanpatRaiand Sons, 18th Edition, 2014
2. V.N. Vazirani, M.M.Ratwani, "Analysis of Structures, Vol-1", Khanna Publishers, New Delhi, 2015.
3. Bhavikatti S S, "Structural Analysis II", Vikas Publishing House Pvt. Ltd, New Delhi, 4rd Edition, 2013.
4. Subramanian R. "Strength of materials", 3rd Edition, Oxford University Press, New Delhi, 2016.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

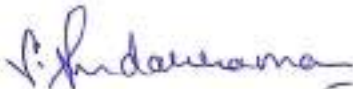5. Dr. R. P. Rathaliya," Mechanics of Solids"AtulPrakashan, 2018.

Web References

1. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m3l15.pdf
2. https://www.youtube.com/watch?v=uMuFpT1gFVl
3. https://youtu.be/6CLEWA2WNqM
4. https://nptel.ac.in/content/storage2/courses/105101085/downloads/lec-24.pdf
5. https://nptel.ac.in/content/storage2/courses/105105109/pdf/m2l12.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET306	SURVEYING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to
- Introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
- Learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
- Introduce the concepts of Control Surveying
- Introduce the basics of Software used in surveying.
- Introduce the principles of various surveying methods and applications to Civil Engineering projects

Course Outcomes

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

CO1 - Understand the basic concepts of surveying and able to solve problems associated with angular measurements and error correction. **(K4)**

CO2 - Learn various methods of taking levels and reducing levels**(K4)**

CO3 - Students are expected to measure horizontal and vertical angles using theodolite. **(K4)**

CO4 - Learn various methods of tacheometric surveying. **(K4)**

CO5 - Understand the advantages of electronic surveying over conventional surveying methods. **(K4)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION AND COMPASS SURVEYING   (9 Hrs)

Definition of surveying – Principles of surveying – Classification of surveying – field and office work – Types of chain – Methods of Ranging.

COMPASS : Prismatic compass – Surveyor's compass – Bearing systems and conversions – Local attraction – Magnetic declination – dip.

UNIT II LEVELING AND APPLICATIONS   (9 Hrs)

Basic terms and definitions – Methods of levelling – levels and staves temporary and permanent adjustments – Direct levelling – Differential leveling - booking and reducing Levels – Balancing of sights curvature and refraction reciprocal leveling - longitudinal and cross sections- traversing – Levelling problems – errors in Levelling Contouring – methods – characteristic and use of contours – plotting

UNIT III THEODOLITE SURVEYING   (9 Hrs)

Theodolite – Vernier and microptic – Description and uses – Temporary and permanent adjustments of vernier transit – Horizontal angles – Vertical angles – TrigonometricalLevelling - Heights and distances – Traversing – Closing error and distribution – Gale's tables – Omitted measurements

UNIT IV TACHEOMETRIC SURVEYING   (9 Hrs)

Tacheometric systems - Tangential, stadia and subtense methods – Stadia systems – Horizontal and inclined sights - Vertical and normal staffing – Fixed and movable hairs - Stadia constants -Anallactic lens - Subtense bar

UNIT V MODERN SURVEYING   (9 Hrs)

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 configuration - signal structure - Orbit determination and representation - Hand Held and Geodetic receivers. Software used in surveying.

Text Books

1. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I and II, Lakshmi Publications Pvt Ltd, New Delhi, 2016

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

2. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 and 2, Pune VidyarthiGrihaPrakashan, Pune, 2014
3. S. K. Duggal, "Surveying, Vol. I and II ", 5th Edition, McGraw Hill, 2019.
4. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2011
5. Subramanian, "Surveying and Levelling", Oxford University Press, 2012

Reference Books

1. Alfred Leick, "GPS satellite surveying", John Wiley and Sons Inc., 4th Edition, 2015.
2. SatheeshGopi, sathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007
3. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.
4. AroraK.R.,"SurveyingVol I and II", Standard Book house, 10th Edition 2016
5. A. M. Chandra, "Plane Surveying" New Age International Publishers 2007.

Web References

1. https://landsurveyorsunited.com/forum/topics/best-software-to-used-in-surveying
2. https://www.capterra.com/survey-software/
3. https://nptel.ac.in/courses/105/107/105107157/
4. https://nptel.ac.in/courses/105/107/105107122/
5. https://www.youtube.com/watch?v=d_DoEB4zWEQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	-	-	3	3	1	3	3	3	3
CO2	3	3	3	3	3	3	-	-	3	3	1	3	3	3	3
CO3	3	3	3	3	3	3	-	-	3	3	1	3	3	3	3
CO4	3	3	3	3	3	3	-	-	3	3	1	3	3	3	3
CO5	3	3	3	3	3	3	-	-	3	3	1	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET307	GEOTECHNICAL ENGINEERING-I	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives
This course should enable the students to
- Impart knowledge on behavior and the performance of soil.
- Gain adequate knowledge in assessing both physical and engineering behavior of soils,
- Understand the concept of soil water and effective stress distribution on soil
- Gain knowledge about shear strength of the soil
- Impart knowledge of both finite and infinite slopes

Course Outcomes
After completion of the course, the students will be able to
CO1 - Classify the soil and assess the Engineering Properties, based on index properties. **(K2)**
CO2 - Assess the stress concepts and seepage in soil. **(K4)**
CO3 - Understand the stress distribution and types of consolidation. **(K2)**
CO4 - Understand the concept shear strength of various types of soil. **(K2)**
CO5 - Analyze the stability of slopes using different methods. **(K5)**
KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I SOIL   (12Hrs)
Formation of soil -Basic definition and phase relationship - Index properties (determination of moisture content, specific gravity and voids ratio , grain size analysis ,Atterberglimits)-classification of soil- BIS Classification system.

UNIT II PERMEABILITY AND RELATED CHARACTERISTICS   (12Hrs)
Soil water- Capillarity in soils- Effective stress concepts in soil - Total, neutral and effective stress distribution in soil- Permeability-Constant and falling head method - Darcy's law- factors affecting permeability- quick sand condition-Seepage-Introduction to flow nets - properties and uses- Application to simple problems.

UNIT III STRESS DISTRIBUTION   (12Hrs)
Stress due to line load -circular and rectangular loaded area - Use of influence charts- Boussinesque formula Westergarrd's equation for point load-Components of settlement - Immediate and consolidation settlement - laboratory consolidation test- Normal Consolidation and Over Consolidation - Application to problems

UNIT IV SHEAR STRENGTH   (12Hrs)
Definitions - Shear strength of cohesive and cohesionless soils- Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests - Drained and undrained behavior of clay and sand- Soil compaction - factors affecting compaction - field compaction methods and monitoring.

UNIT V SLOPE STABILITY   (12Hrs)
Introduction- slopes failure - stability of infinite slope – landslides-Finite slope analysis - Swedish circle method – stability number-Slope stability – improving slope stability by reinforcement and confinement.

Text Books
1. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, (2017).
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

4. Purushothama Raj. P.,"Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013.
5. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005

Reference Books

1. Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017
2. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
3. Modi P N, "Soil Mechanics and Foundation Engineering", Standard Book House, New Delhi, 2010.
4. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
5. B. J. Kasmalkar" Foundation Engineering", Pune VidyarthiGrihaPrakashan, McGraw- Hill Book Company

Web References

1. https://nptel.ac.in/courses/105101201/
2. https://nptel.ac.in/courses/105103097/
3. http://ascelibrary.org/page/books/s-gsp.
4. http://nptel.ac.in/courses/105101084/
5. http://nptel.ac.in/courses/105106142/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	3	3	3	2	2	2	3	3	2
CO2	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3
CO3	3	3	2	3	3	2	3	3	3	3	2	2	3	3	2
CO4	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	2	2	3	3	3	3	2	2	3	3	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CET308	CONCRETE TECHNOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Know the Engineering properties of materials, Cement, Aggregates, Admixtures
- Know the hydration mechanism of Cement and properties of fresh and Hardened concrete
- Understand the properties of concrete.
- Know the methodology of mix design.
- Give an experience in the implementation of Engineering concepts which are applied in field of Civil Engineering

Course Outcomes

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

CO1 - Describe the properties of cement and its ingredients (K2)

CO2 - Use appropriate admixtures in constructions (K2)

CO3 - Describe the properties of aggregates (K2)

CO4 - Carry out mix design for concrete (K2)

CO5 - Describe the properties and durability of concrete (K3)

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I CEMENT (9 Hrs)

Composition of OPC-Manufacture-Modified Portland cements-Hydration process of Portland cements-Structure of Hydrated cement Pastes

UNIT II ADMIXTURES (9 Hrs)

Mineral admixtures – Slags - Pozolanas and Fillers-Chemical Admixtures-Solutes Retarders-Air Entraining Agents-Water proofing compounds-Plasticizers and Super Plasticizers

UNIT III AGGREGATES (9 Hrs)

Shape and Mechanical properties-Absorption and Physical durability-Chemical stability and packing Characteristics

UNIT IV FRESH CONCRETE (9 Hrs)

Mix proportioning-IS and ACI codal methods-Workability-Test -Mixes incorporating Fly-Ash Mixes for High performance concrete - Fibre reinforced concrete

UNIT V PROPERTIES AND DURABILITY OF CONCRETE (9 Hrs)

Interfacial Transition zone-Fracture strength-Mechanical properties-High strength concrete-Shrinkage-Creep-Other properties. Basic consideration-Stability of constituents-Chemical Attack-Corrosion of Reinforcing steel.

Text Books

1. Neville, A.M., "Properties of concrete ", 4th edition, Longman publication, (2012)
2. M. S. Shetty., "concrete technology", S. Chand and. Company Ltd, New Delhi(2019)
3. IS codes (10262, 383, 4031,516,456)

Reference Books

1. Gambhir.M.I, Concrete Technology: Theory and Practice, Tata McGraw Hill Co., New Delhi,2013.
2. Gupta. Yp, Concrete Technologyand Good Construction Practices, New Age International (p)Ltd., 2019.
3. Neville.AM. andBrooks J J.,Concrete Technology, Pearson Education Ltd., 2019.

Web References

1. https://nptel.ac.in/courses/105/102/105102012/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

2. https://nptel.ac.in/courses/105106176/
3. https://nptel.ac.in/courses/105/104/105104030/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20HSP301	GENERAL PROFICIENCY–I (Common to all branches except CSBS)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Enrich strong vocabulary and decoding skills *through comprehension analysis*
- Advance communication and leadership skills pragmatically
- Pronounce English sounds in isolation and in connected speech
- Expand effective written communication skills to meet organizational goals
- Extend knowledge on verbal aptitude and prepare for interviews

Course Outcomes

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

CO1 - Interpret meaning and apply reading strategies in technical and non-technical context **(K2)**
CO2 - Develop interpersonal communication skills professionally **(K3)**
CO3 - Infer the distinct speech sounds and overcome native language influence **(K2)**
CO4 - Demonstrate various forms of formal writing **(K2)**
CO5 - Apply the techniques of verbal aptitude in competitive exams **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I - COMPREHENSION ANALYSIS (6Hrs)

Listening: Listening Comprehension (IELTS based) – **Speaking:** Break the iceberg - **Reading:** Reading technical passage (IELTS based) - **Writing:** Writing Task: 1 (IELTS: Graph/ Process /Chart Description) **Vocabulary:** Synonyms (IELTS)

UNIT II - PERSONALITY DEVELOPMENT (6Hrs)

Listening: Interview Videos- **Speaking:** Extempore& Presentation (Soft Skills) - **Reading:** British & American Vocabulary, Read and review (Books, Magazines) - **Writing:** SWOT Analysis **Vocabulary:** Idioms (IELTS)

UNIT III -INFERENTIAL LEARNING (6Hrs)

Listening: Listening Speech sounds to overcome Mother Tongue Influence, Anecdotes– **Speaking:** Interpersonal Interaction & Situational attribution–**Reading:** Distinguish between facts & opinions - **Writing:** Writing Conversation to different context **Vocabulary:** Phrasal Verbs (IELTS)

UNIT IV - INTERPRETATION AND FUNCTIONAL WRITING (6Hrs)

Listening: Group Discussion videos - **Speaking:** Group Discussion Practice - **Reading:** Interpretation of data - Graph, table, chart, diagram (IELTS based) –**Writing:** Writing Task: 2 (IELTS) **Vocabulary:** Collocations (IELTS)

UNIT V- APTITUDE (6Hrs)

Language Enhancement: Articles, Preposition, Tenses
Verbal Ability Enhancement: Blood Relation, Completing Statements- Cloze test, Spotting Errors –Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(**GATE**)
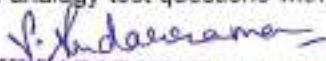
Reference Books

1. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, New Delhi, 2012.
2. Mn,Taylor, and Grant Taylor. "English Conversation Practice". Tata McGraw-Hill Education, 1975.
3. Bailey, Stephen. "Academic writing: A practical guide for students". Psychology Press, 2003.
4. Aggarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
5. Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web References

1. https://www.ielts-exam.net/grammar/
2. https://ieltsfocus.com/2017/08/02/collocations-ielts/
3. https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
4. https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
5. https://www.examsbook.com/word-analogy-test-questions-with-answers

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
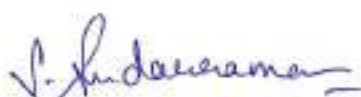
B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	3	-	1	-	1	-
CO2	1	-	-	-	-	-	-	1	-	3	-	1	-	1	-
CO3	1	-	-	-	-	-	-	-	-	3	-	1	-	1	-
CO4	1	-	-	-	-	-	-	-	-	3	-	1	-	1	-
CO5	1	-	-	-	-	-	-	-	-	3	-	1	-	1	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20ESP357	DATA STRUCTURES LABORATORY	L	T	P	C	Hrs
	(Common to CSE, ECE, EEE, IT, ICE,MECH., CIVIL, BME, MECHTRONICS,CCE)	0	0	2	1	30

Course Objectives

This course should enable the students to

- Learn the basic concepts of Data Structures.
- Learn about the concepts of Searching Techniques.
- Learn about the concepts of Sorting Techniques.
- Study about the linear Data Structures.
- Study about non-linear Data Structures.

Course Outcomes

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

CO1 - Analyze the algorithm's / program's efficiency in terms of time and space complexity.**(K3)**

CO2 - Solve the given problem by identifying the appropriate Data Structure.**(K3)**

CO3 - Solve the problems of searching and sorting techniques. **(K3)**

CO4 - Solve problems in linear Data Structures.**(K4)**

CO5 - Solve problems in non-linear Data Structures. **(K4)**

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

List of Exercises

1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list.
   b) Delete an element from list c) Search for a key element in list d) count number of nodes in list.
5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
7. Write a C program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.

8. Write a C program that use recursive functions to traverse the given binary tree in
   a) Preorder b) Inorder and c) Postorder.
9. Write a C program to perform the AVL tree operations.
10. Write a C program to implement Graph Traversal Techniques.

Reference Books

1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd edition, 2019.
2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st edition, 2013.
3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st edition, 2017.
4. Reema Thareja, "Data structures using C", 2nd edition, Oxford University, 2014.
5. Tenebaum Aaron M, "Data Structures using C", Pearson Publisher, 1st edition, 2019.

Web References

1. https://www.tutorialspoint.com/data_structures_algorithms/
2. https://www.w3schools.in/data-structures-tutorial/intro/
3. https://nptel.ac.in/courses/106103069/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College

B.Tech. Civil Engineering

4. https://swayam.gov.in/nd1_noc20_cs70/preview
5. https://nptel.ac.in/courses/106103069/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEP305	SURVEYING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Train the students for using surveying instruments
- Make the students understand various problems in linear and angular measurement associated with field application
- Train the students to get clear idea about handling procedure of Theodolite, Tacheometry
- Make the students to determine the elevation of an objective by various means of surveying associated with vertical and horizontal control
- Provide adequate knowledge about Total station in order to get accurate measurement

Course Outcomes

At the end of Course students will be able to

CO1 – Acquire practical knowledge on handling basic survey instrument like chain, cross staff, ranging rods, etc., **(K3)**

CO2 - Provide hands on exercise and make the students learn the concept of compass surveying. **(K3)**

CO3 - Provide knowledge to make the students learn the concept of leveling and development of contour map of given area. **(K3)**

CO4 - Students completing this course would have acquired practical knowledge on handling basic survey instruments including Theodolite, Tacheometry. **(K3)**

CO5 -Provide clear handling knowledge Total Station and GPS and have adequate knowledge to carryout Triangulation surveying including general field marking for various engineering projects and Location of site etc **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS

CHAIN SURVEY

1. Simple chain survey – calculation of area using cross staff

COMPASS SURVEYING

2. Measurement of bearing of survey lines and arriving included angles by prismatic compass

LEVELLING

3. Reduction of Levels:
    (i) Height of Collimation
    (ii) Rise and Fall method

4. Fly levelling using Dumpy level

THEODOLITE - STUDY OF THEODOLITE
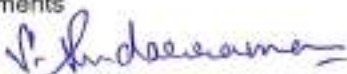
5. Measurements of horizontal angles by reiteration and repetition and vertical angles.

6. Determination of elevation of an object using single plane method when base is accessible/inaccessible.

TACHEOMETRY – TANGENTIAL SYSTEM – STADIA SYSTEM

7. Determination of Tacheometric Constants

8. Heights and distances by stadia Tacheometry

9. Heights and distances by Tangential Tacheometry

TOTAL STATION and GPS SURVEYING.

10. Total Station Surveying – Measurements of Distances and angles, Slope distances, Height, Traversing, setting out, Area and Volume.

11. GPS Surveying – Co-ordinate Measurements

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I and II, Lakshmi Publications Pvt Ltd, New Delhi, 2016
2. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 and 2, Pune Vidyarthi Griha Prakashan, Pune, 2014
3. S. K. Duggal, "Surveying, Vol. I and II ", 5th Edition, McGraw Hill, 2019.
4. Venkatramaiah, Text book of Surveying, University press, New Delhi, 2011
5. Subramanian, "Surveying and Levelling", Oxford University Press, 2012
6. Alfred Leick, "GPS satellite surveying", John Wiley and Sons Inc., 4th Edition, 2015.
7. SatheeshGopi, sathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007

Web References

1. https://www.allenprecision.com/page/how-to-stake-out-points-and-profile-boards-with-a-total-station/
2. https://www.elprocus.com/how-gps-system-works/
3. https://www.johnsonlevel.com/News/TheodolitesAllAboutTheodo

COs/POs/PSOs Mapping

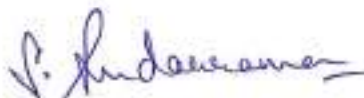| COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	-	-	2	3	-	1	3	3	3
CO2	3	1	1	1	1	1	-	-	3	3	-	1	3	3	3
CO3	3	3	3	3	3	1	-	-	3	3	-	3	3	3	3
CO4	3	3	3	3	3	1	-	-	3	3	-	3	3	3	3
CO5	3	3	3	3	3	1	-	-	3	3	-	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEP306	CONCRETE ENGINEERING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Study the basic concepts of testing on cement
- Learn the properties of fine aggregate and coarse aggregate
- Know the methodology of mix design.
- Study the various properties of workability of concrete and durability characteristics.
- Study the various mechanical properties of concrete.

Course Outcomes

At the end of Course students will be able to

CO1 - Understand the properties of cement and its ingredients **(K2)**

CO2 - Know the properties of fine aggregate**(K2)**

CO3 - Understand the properties of coarse aggregates   **(K2)**

CO4 - Carry out mix design for concrete **(K2)**

CO5 - Understand the various test on workability of concrete**(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS

1. Tests on Cement,
    i. Specificgravity,
    ii. Consistency,
    iii. Setting Time,
    iv. Soundness.
2. Tests on Fine Aggregate: Specific Gravity, Fineness Modulus and Bulking
3. Coarse Aggregate: Specific Gravity, Fineness Modulus
4. Mix Design
5. Tests on fresh concrete: Slump Test, Vee Bee Consistometer, Flow Table, Compaction factor
6. Mechanical Properties: Compressive, Split Tensile, Flexural Strength

Text Books

1. Neville, A.M., "Properties of concrete ", 4th edition, Longman publication, (2012)
2. M. S. Shetty., "concrete technology", S. Chand and. Company Ltd, New Delhi(2019)
3. IS codes (10262, 383, 4031,516,456)

Reference Books

1. Gambhir.M.I, Concrete Technology: Theory and Practice, Tata McGraw Hill Co., New Delhi,2013.
2. Gupta. Yp, Concrete Technology and Good Construction Practices, New Age International (p)Ltd., 2019.
3. Neville.AM. and Brooks J J.,Concrete Technology, Pearson Education Ltd., 2019.

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://nptel.ac.in/courses/105106176/
3. https://nptel.ac.in/courses/105/104/105104030/

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
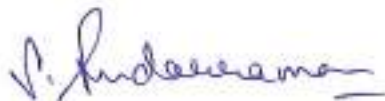Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

		L	T	P	C	Hrs
U20CEC3XX	CERTIFICATION COURSE - III	0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40 - 50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CES302	SKILL DEVELOPMENT COURSE 2	L	T	P	C	Hrs
	(Choose any one of the following course)	0	0	2	-	30

1. BASIC VASTHU

Course Content:
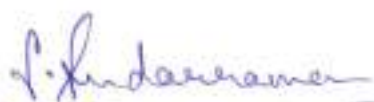
This would involve introducing vasthu to students using various energy patterns. In this student will be given exposure to selection of land, concepts behind planning, sequence of construction as per vasthu rules and rules for various rooms

2. PLANE TABLE SURVEYING

Course Content:

A plane table is a device used in surveying and related disciplines to provide a solid and level surface on which to make field drawings, charts and maps. This would help the students to prepare a map or plan to represent an area on a horizontal plan using plane table surveying by conducting various experiments involving different methods. The students would be able to acquire practical knowledge on handling the plane table survey instruments.

3. AUTO LEVEL SURVEYING

Course Content:

The students would be given exposure to automatic level and circular spirit level. This would provide knowledge of automatic level and advanced surveying instruments using working principles of survey instruments. The students would develop skills in using circular spirit level and analyses data and to measure the horizontal distances. This would help students to improve skills to set out leveling in the field using automatic level.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

				L	T	P	C	Hrs
U20CEM303		**PHYSICAL EDUCATION**		0	0	2	0	30

Physical Education is compulsory for all the Undergraduate students and Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports/extension lectures. The student participation shall be for minimum period of 30 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass/Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

SEMESTER – IV

U20BST434	NUMERICAL METHODS	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

This course should enable the students to

- Know the solution of algebraic and transcendental equations.
- Learn the techniques of solving simultaneous equations.
- Introduce the numerical techniques of differentiation and integration.
- Solve ordinary differential equations by using numerical methods.
- Know the solution of partial differential equations by using numerical methods.

Course Outcomes

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

CO 1– Use of Numerical techniques to solve algebraic and transcendental equations.**(K2)**

CO 2– Find the solution of simultaneous equations.**(K2)**

CO 3–Apply the knowledge of differentiation and integration by using numerical methods.**(K3)**

CO 4– Solve the ordinary differential equations by using various methods.**(K3)**

CO 5–Solve the partial differential equations by numerical methods.**(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I SOLUTION OF ALGEBRAICAND TRANSCENDENTAL EQUATIONS AND EIGEN VALUE PROBLEMS (12Hrs)

Bisection method – Method of false position – Newton Raphson method – Eigen value and Eigen vector by power method.

UNIT II LINEAR SIMULTANEOUS EQUATIONS (12 Hrs)

Solution of linear simultaneous equations and matrix inversion – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT III INTERPOLATION (12 Hrs)

Interpolation: Finite Differences – Relation between operators – Interpolation by Newton's forward and backward difference formula for equal intervals – Newton's divided difference method and Lagrange's method for unequal intervals – Differentiation based on finite differences – Integrations by Trapezoidal and Simpson's rules.

UNIT IV SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (12 Hrs)

Single step methods – Taylor series method – Picard's method – Euler and Improved Euler methods – Runge Kutta method of fourth order only.

UNIT V SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (12 Hrs)

Solution of Laplace and Poisson equations – Leibmann's iterative method – Diffusion equation: Bender-Schmitt method and Crank-Nicholson implicit difference method – Wave equation: Explicit difference method

Text Books

1. B.S. Grewal, "Numerical Methods in Engineering and Science", Mercury learning and Information, Kindle Edition, 2018.
2. Rajesh Kumar Gupta, "Numerical Methods, Fundamentals and its applications", Cambridge University Press, April 2019.
3. M.K. Jain, R.K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering computation", Published by New Age International Pvt. Ltd., (Seventh Edition) 2019.

Dr.S. SUNDARAMURTHY, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. C. Xavier, "C Language And Numerical Methods", New Age International, 2007.
2. P. Siva Ramakrishna Das, "Numerical Analysis", Kindle Edition, 2016.
3. Timo Heister, Leo G. Rebholz, FeiXue, "Numerical Analysisan Introduction", Publisher De Gruyter, 2019.
4. K. SankaraRao,"Numerical Methods for Scientists and Engineers", PHI Learning Pvt.Ltd, New Delhi, 3rd Edition, 2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers"McGraw – Hill Higher Education, 2010.

Web References

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf
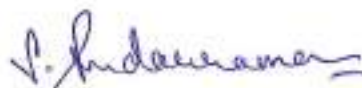
COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	1	-	-	-	-	-	1	1	-	-
CO2	2	1	-	-	-	1	-	-	-	-	-	1	1	-	-
CO3	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
CO5	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20EST467	PROGRAMMING IN JAVA	L	T	P	C	Hrs
	(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS, CCE)	3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain and explore the knowledge of java programming
- Know the principles of inheritances, packages, interfaces
- Get familiarized to generic programming, multithreading concepts.
- Gain and explore the advanced concepts in Java.
- Explore database connectivity

Course Outcomes

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

CO1 - Write a maintainable java Program for a given algorithm and implement the same. **(K2)**

CO2 - Create java applications using exception handling, thread and generic programming. **(K3)**

CO4 - Build java distributed applications using Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**

CO3 - Collections and IO streams. **(K3)**

CO5 - Exemplify simple graphical user interfaces using GUI components and database programs. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION TO JAVA PROGRAMMING   (9 Hrs)

The History and Evolution of Java - Byte code - Java buzzwords - Data types – Variables – Arrays – operators - Control statements - Type conversion and casting. Concepts of classes and objects: Basic Concepts of OOPs, constructors, static keyword, Final with data, Access control, This key word - Garbage collection-Nested classes and inner classes - String class

UNIT II INHERITANCE, PACKAGES AND INTERFACES   (9 Hrs)

Inheritance: Basic concepts - forms of inheritance - super key word -- method overriding, abstract classes, dynamic method dispatch - the Object class. Packages: Defining, Creating and Accessing, importing packages. Interfaces: Defining, implementing, applying, variables and extending interfaces

UNIT III EXCEPTION HANDLING, MULTITHREADING   (9 Hrs)

Concepts of Exception handling, types of exceptions, creating own exception, Concepts of Multithreading, creating multiple threads, Synchronization, inter thread communication. Enumeration - Autoboxing - Generics.

UNIT IV COLLECTIONS, I/O STREAMS   (9 Hrs)

Collections: List –Vector – Stack - Queue - Dequeue –Set - SortedSet. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files.

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC   (9 Hrs)

Events - Delegation event model - Event handling - Adapter classes. AWT: Concepts of components - Font class, Color class and Graphics. - Introduction to Swing – layout management - Swing Components. Java Database Connectivity- Develop real time applications.

Text Books

1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
3. Herbert Schildt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
2. H.M.Dietel and P.J.Dietel, "Java How to Program", Pearson Education/PHI, 11th Edition, 2017.
3. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education,8th Edition, 2008.
4. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA:
5. Programming in Java, S.Malhotra and S.Choudary, Oxford Univ. Press.

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET409	DESIGN OF RC ELEMENTS	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

The course should enable the students to

- Gain knowledge on methods available for designing reinforced concrete structures
- Be familiar with design of beam using limit state method
- Know the behavior of RC beam in shear and torsion
- Be acquainted with the design of slab and column using limit state method
- Understand the design of footing and staircase using limit state method

Course Outcomes

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

CO1 - Select the methods for designing reinforced concrete structures **(K2)**

CO2 - Design the beam using limit state method**(K2)**

CO3 - Design RC members for combined bending shear and torsion using Limit State Method. **(K2)**

CO4 - Design the slab and column using limit state method**(K2)**

CO5 - Design the footing and staircase using limit state method**(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES   (12 Hrs)

Role of structural engineer in structural design – elements of structures – reinforced concrete – ductility versus brittleness – methods of design - advantages of limit state method over other methods - design codes and specification - Introduction to working stress method- Permissible stresses-Factor of Safety- -modular ratio and cracking moment-IS 456 - limit state philosophy as detailed in current IS code.

UNIT II LIMIT STATE DESIGN OF BEAM   (12 Hrs)

Introduction to flexural members - Behaviour of RCC beam under flexure – Design of singly and doubly reinforced rectangular and flanged beams for flexure, bond, shear and torsion.

UNIT III LIMIT STATE DESIGN FOR SHEAR, TORSION, BOND AND ANCHORAGE   (12 Hrs)

Behaviour of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of RC members for combined bending shear and torsion- use of design aids.

UNIT III LIMIT STATE DESIGN OF SLAB AND COLUMN   (12 Hrs)

Design of one way and two way slabs - Design of continuous (one-way only) slabs. Types of columns - design of short columns for axial, uni-axial and bi axial bending - design of long columns- use of design aids

UNIT V LIMIT STATE DESIGN OF FOOTING AND STAIRCASE   (12 Hrs)

Design of Footings - Isolated footing with axial and eccentric loading- Combined Rectangular and Trapezoidal footing for two columns only, Design of Stair Case (ordinary and doglegged)

Text Books

1. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
2. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford and IBH Publishing House, 2017
3. Punmia B.C, Ashok Kumar Jain, ArunK.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2012
4. N. Krishnaraju, and R. N.Pranesh," Reinforced Concrete Design", New Age International Pvt. Ltd.,2009
5. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hall of India, Private, Limited New Delhi, 2008.

Reference Books

1. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company, 2007
2. Syal, I.C. and Goel, A.K., "Reinforced Concrete Structures", A.H. Wheelers and Co. Pvt. Ltd., 2012
3. Ram Chandra.N. andVirendraGehlot, "Limit State Design", Standard Book House, 2004.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

4. Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2013.
5. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2007

Web References
1. https://nptel.ac.in/courses/105/105/105105105/
2. https://www.youtube.com/watch?v=1_SXPr_YTOU
3. https://nptel.ac.in/content/storage2/courses/105105104/pdf/m9l20.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	1	1	3	-	-	-	-	-	-	-	1	-	1
CO3	3	2	1	1	3	-	-	-	-	-	-	-	1	-	1
CO4	3	2	1	1	3	-	-	-	-	-	-	-	1	-	1
CO5	3	2	1	1	3	-	-	-	-	-	-	-	1	-	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CET410	**GEOTECHNICAL ENGINEERING-II**	L	T	P	C	Hrs
		2	2	0	3	60

Course Objectives

This course should enable the students to

- Impart knowledge on common method of sub soil investigation and sampling Methods.
- Learn about the method of improving Bearing capacity of the soil.
- Get knowledge about, investigate the soil condition and to design a suitable foundation.
- Gain Knowledge about design procedure for shallow and deep foundation.
- Know about the earth pressure on cohesion less and cohesive soil.

Course Outcomes

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

CO1 - Analyze the method of soil exploration and sampling. **(K3)**

CO2 - Get knowledge on bearing capacity and testing methods. **(K4)**

CO3 - Select the type of foundation required for the soil at a place and able to design different types of foundation. **(K5)**

CO4 - Determine the load carrying capacity of pile foundation. **(K4)**

CO5 - Gain knowledge about retaining structures and Stability analysis. **(K5)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I SOIL EXPLORATION (12 Hrs)

Site investigation – soil exploration methods- samplers-sampling method- Hand augers and power drills- Wash boring - Spacing and depth of bore holes - Standard Penetration Test - Static Cone Penetration Test - Dynamic Cone Penetration Test- subsurface soundings-geo physical method - Preparation of soil investigation Report.

UNIT II SHALLOW FOUNDATION (12 Hrs)

Classification of foundation- Types and selection criteria-- Methods to determine bearing capacity- Methods to increase BC-Terzaghi Analysis-Codal provision-Factors affecting bearing capacity -Settlement of foundations on granular and clay deposits- Seismic considerations in bearing capacity evaluation.

UNIT III FOOTINGS AND RAFTS (12 Hrs)

Types of Isolated footing-Combined footing- Mat foundation-Codal provision– Contact pressure and settlement distribution -Proportioning of foundation–design of foundation.

UNIT IV DEEP FOUNDATION (12 Hrs)
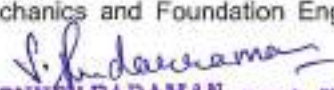
Pile foundations Introduction- classification-selection criteria- Individual and grouppile carrying capacity- static and dynamic approach-pile load tests- under reamed piles-IS Codal provisions. Methods to increase pile carrying capacity – Deep compaction methods – Grouting.

UNIT V RETAINING WALLS (12 Hrs)

Active and passive states –Definitions,Rankine's theory – Cohesion less and cohesive soil – Earth pressure on retaining walls of simple configurations – Culmann's Graphical method – Stability analysis of retaining walls – Codal provisions.

Text Books

1. PunmiaB.C."Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, 2017.
2. Murthy, V.N.S.,"Text book of Soil Mechanics and Foundation engineering", CBS Publishers Distribution Ltd., New Delhi. 2014.
3. Purushothama Raj. P."Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, India 2013

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

4. Varghese, P.C."Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005
5. Dr. Arora, K.R." Soil Mechanics and Foundation Engg",7th edition Standard Publisher and distributors, Delhi, 2010.

Reference Books

1. Venkatramaiah.C.,"Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017
2. Modi P N, "Soil Mechanics and Foundation Engineering", second Edition Standard Book House, New Delhi, 2017.
3. Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.
4. B. J. Kasmalkar" Foundation Engineering", Pune VidyarthiGrihaPrakashan, McGraw- Hill Book Company
5. B.M. Das," Principles of Foundation Engineering", 4th edition PWS Publishing Company Singapore.1999

Web References

1. https://nptel.ac.in/courses/105/101/105101083/
2. https://nptel.ac.in/courses/105105176/
3. http://ascelibrary.org/page/books/s-gsp.
4. http://nptel.ac.in/courses/105101084/
5. http://nptel.ac.in/courses/105106142/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	3	3	3	3	3	3	2	3	2	2
CO2	3	3	3	3	3	3	3	3	3	3	3	2	3	3	2
CO3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	2	3	3	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

	GENERAL PROFICIENCY–II	L	T	P	C	Hrs
U20HSP402	(Common to all branches except CSBS)	0	0	2	1	30

Course Objectives

This course should enable the students to

- Examine various standardized test in English language
- Recognize the key features of various technical writing
- Integrate LSRW skills to endorse multifarious skill set in practical situation
- Understand the factors that influence the usage of grammar
- Understand the basic concepts of logical reasoning skills

Course Outcomes

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

CO1 - Infer ideas to attend international standardized test by broadening receptive and productive skills **(K2)**

CO2 - Interpret the types of writing in different state of affairs **(K2)**

CO3 - Develop language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation **(K3)**

CO4 - Identify the rules of grammar in academic discourse settings **(K3)**

CO5 - Extend the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc.**(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I CAREER SKILLS   (6Hrs)

Listening: Listening at specific contexts **Speaking:** Mock interview (Personal & Telephonic)-**Reading:** Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) **Writing:** Essay Writing (TOEFL) **Vocabulary:** Words at specified context (IELTS)

UNIT II CORPORATE SKILLS   (6Hrs)

Listening: Listening and replicating **Speaking:** Team Presentation (Work Place Etiquettes) **Reading:** Short texts (signs, emoticons, messages)**Writing:** E-mail writing- Hard skills -Resume' Writing, Job Application Letter, Formal Letter **Vocabulary:** Glossary (IELTS)

UNIT III FUNCTIONAL SKILLS   (6Hrs)

Listening: Listening TED Talks – **Speaking:** Brainstorming &Individual Presentation, Persuasive Communication — **Reading:** Text Completion (GRE Based) **Writing:** Expansion of Compound Words **Vocabulary:** Expansion of vocabulary (IELTS)

UNIT IV TRANSFERABLE SKILLS   (6Hrs)

Listening: Listening Documentaries and making notes –**Speaking:** Conversation practice at formal & informal context **Reading:** Read and transform- report, memo, notice and advertisement, **Writing:** Euphemism, Redundancy, and Intensifiers **Vocabulary:** Refinement of vocabulary (IELTS)

UNIT V APTITUDE   (6Hrs)

Transformational Grammar: Phrases & Clauses, Concord, Conditional Clauses, Voice, Modals

Verbal Ability Enhancement: Letter Series, Coding &Decoding, Sentence Completion (GATE), Critical Reasoning & Verbal Deduction (GATE), Syllogism

Reference Books

1. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.
2. Tulgan, Bruce. "Bridging the soft skills gap: How to teach the missing basics to today's young talent". John Wiley & Sons, 2015.
3. Sherfield, Robert M. "Cornerstone: Developing Soft Skills". Pearson Education India, 2009.
4. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training".Cambridge, 2014.
5. Ramesh, Gopalaswamy. "The ace of soft skills: attitude, communication and etiquette for success". Pearson Education India, 2010.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet. Puducherry, India

B.Tech. Civil Engineering

Web References

1. https://www.englishclub.com/grammar/nouns-compound.htm
2. https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/l3p1
3. https://www.grammarwiz.com/phrases-and-clauses-quiz.html
4. https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
5. http://www.englishvocabularyexercises.com/general-vocabulary/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	1	-	3	-	1	-	1	-
CO2	1	-	-	-	-	-	-	1	-	3	-	1	-	1	-
CO3	1	-	-	-	-	-	-	-	-	3	-	1	-	1	-
CO4	1	-	-	-	-	-	-	1	-	3	-	1	-	1	-
CO5	1	-	-	-	-	-	-	-	-	3	-	1	-	1	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20BSP435	NUMERICAL METHODS LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Learn the techniques of nonlinear equation using c program.
- Know the techniques of solving simultaneous equations.
- Introduce the numerical techniques of differentiation and integration using c programming.
- Study about the numerical solution of Laplace equation.
- Understand the numerical solution of ordinary differential equations.

Course Outcomes

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

CO 1 – Find out the root of the Algebraic and Transcendental equations. **(K3)**
CO 2 – Solve the simultaneous equations. **(K3)**
CO 3 – Know the iterative Interpolation formula of integration. **(K3)**
CO 4 – Implement Simpsons Rule formula. **(K3)**
CO 5 – Solve the Laplace equation using Numerical methods. **(K3)**
KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

LIST OF EXPERIMENTS

1. Roots of non – linear equation using bisection method.
2. Roots of non – linear equation using Newton's method.
3. Find the largest Eigen value of a matrix by power - method.
4. Solve the system of linear equations using Gauss - Elimination method.
5. Solve the system of linear equations using Gauss - Jordan method.
6. Solve the system of linear equations using Gauss - Seidal iteration method.
7. Find the area by using trapezoidal rule.
8. Find the area by using Simpson's 1/3 rule.
9. Find the area by using Simpson's 3/8 rule
10. Find the numerical solution of heat equation.

Reference Books

1. C. Xavier, "C Language And Numerical Methods", New Age International, 2007.
2. P. Siva Ramakrishna Das, "Numerical Analysis", Kindle Edition, 2016.
3. Timo Heister, Leo G. Rebholz, FeiXue, "Numerical Analysisan Introduction", Publisher De Gruyter, 2019.
4. K. SankaraRao, "Numerical Methods for Scientists and Engineers", 3rd Edition, PHI Learning Pvt.Ltd, New Delhi, 2018.
5. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers" McGraw – Hill Higher Education, 2010.

Web References

1. http://nptel.ac.in/courses/111107063
2. http://nptel.ac.in/courses/122102009
3. http://nptel.ac.in/courses/111/107/111107105
4. http://www.math.iitb.ac.in/~baskar/book.pdf
5. https://www.math.ust.hk/~machas/numerical-methods.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO2	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO3	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO4	3	2	1	1	-	-	-	-	-	-	-	1	-	-	1
CO5	3	2	1	1	-	-	-	-	-	-	-	1	-	-	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D., B.Tech. Civil Engineering
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20ESP468	PROGRAMMING IN JAVA LABORATORY	L	T	P	C	Hrs
	(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME, MECHTRONICS, CCE)	0	0	2	1	30

Course Objectives

This course should enable the students to

- Acquire programming skill in core java.
- Learn how to design java program and applications.
- Acquire object oriented skills in java.
- Develop the skill of designing applications.
- Explore database connectivity.

Course Outcomes

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

CO1 - Apply and practice logical formulations to solve simple problems leading to specific applications. **(K3)**

CO2 - Demonstrate the use of inheritance, interface and package in relevant applications. **(K3)**

CO3 - Create java applications using exception handling, multithread. **(K3)**

CO4 - Build java distributed applications using Collections and IO streams. **(K3)**

CO5 - Develop simple database programs. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

List of Exercises

1. Develop simple programs using java technologies and testing tools.
2. Develop a java program that implements class and object.
3. Write a java program to demonstrate inheritance.
4. Develop a simple real life application program to illustrate the use of Multi Threads.
5. Implement simple applications using Collections.
6. Develop a simple application and use JDBC to connect to a back-end database.
7. Create a student application with Add, Edit, Delete, Show functions using JDBC.
8. Create a Bill Application to store sales details using JDBC.
9. Create java applications using Exception Handling for error handling.
10. Develop a java program that implements the Packages.

Reference Books

1. E. Balaguruswamy, "Programming with Java", TMH Publ, 2nd Edition, 2005.
2. JAVA How to programming by DIETEL & DIETEL.
3. Herbert Schil dt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.
4. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education, Seventh Edition, 2010.

Web References

1. http://www.ibm.com/developerworks/java/
2. http://docs.oracle.com/javase/tutorial/rmi/.
3. IBM's tutorials on Swings, AWT controls and JDBC.
4. https://www.edureka.co/blog
5. https://www.geeksforgeeks.org

CO-POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	1	3	-	-	-	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,   B.Tech. Civil Engineering
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CEP407	GEOTECHNICAL ENGINEERING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Develop the skill for conducting experiment in different types of soil.
- Determine the index and engineering properties and to characterize the soil based on their properties.
- Determine the field density and compaction characteristic of the soil.
- Determine the shear strength parameters of the soil.
- Determine the penetration value N of the soil

Course Outcomes

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

CO1 - Classify the soil and assess the engineering Properties, based on index properties. **(K4)**

CO2 - Understand the concept of insuit density and compaction characteristic of soil sample. **(K2)**

CO3 - Understand about the techniques and method to determine the index properties and Engineering properties of soil sample. **(K2)**

CO4 - Understand about the techniques and method to determine the Engineering properties of soil sample **(K4)**

CO5 - Understand the concept and method to determine the penetration value N of the soil **(K5)**

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

LIST OF EXPERIMENTS
DETERMINATION OF INDEX PROPERTIES

1. Determination of Grain size distribution (Sieve Analysis, Hydrometer Analysis)
2. Determination of Specific gravity of soil grains (Pycnometer, Density bottle)
3. Determination of Atterberg limits Test
   -Liquid limit,
   -Plastic limit
   -shrinkage limit Test
4. Determination of swell index Test

DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS
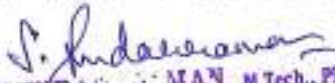
5. Determination of Field density test (Core cutter and sand replacement methods)
6. Determination of moisture - Density relationship using Standard Proctor Test

DETERMINATION OF ENGINEERING PROPERTIES

7. Determination of Permeability (Constant Head, Falling Head methods)
8. Determination of Direct shear test on Cohesion less soil
9. Determination of Unconfined compression test on cohesive soil
10. Determination of Triaxial compression test on cohesive soil
11. Demonstration of one dimensional consolidation Test
12. Demonstration of Standard Penetration Test (SPT)

Reference Books

1. Arora K.R 'Soil Mechanics and Foundation Engineering' Standard Publishers PVt.Ltd, 7TH Edition,(2019).
2. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, (2017).
3. Santosh kumar Garg 'Soil Mechanics and Foundation Engineering (In S.I. Units),Khanna Publishers,(2014).

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Puducherry, India

B.Tech. Civil Engineering

4. "Soil Engineering Laboratory Instruction Manual" published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
5. Indian Standards on Soil Engineering, Part 1 Laboratory Testing of Soils for Civil Engineering Purposes —SP 3 (Part 1): 1987ll, Bureau of Indian Standards, New Delhi, 1987.
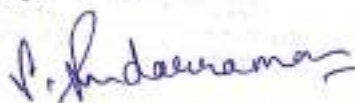
Web Reference

1. https://nptel.ac.in/courses/105103
2. https://nptel.ac.in/courses/105/101/105101083/
3. https://nptel.ac.in/courses/105105176/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	3	2	3	3	3	3	3	2	2
CO2	2	2	2	3	2	2	3	2	3	3	3	3	3	2	2
CO3	2	3	2	3	3	2	3	2	3	3	3	3	3	2	3
CO4	3	3	2	3	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	3	2	3	3	3	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High
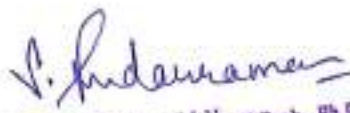
Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engineering
Sri Manakula Vinayagar Engineering College
Madagadipet, Puducherry, India

U20CEC4XX	CERTIFICATION COURSE - IV	L	T	P	C	Hrs
		0	0	4	-	50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40 - 50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.S. SUNDARARAJAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CES403	SKILL DEVELOPMENT COURSE 3	L	T	P	C	Hrs
	(Choose any one of the following course)	0	0	2	-	30

1. SAFETY PRACTICES IN BUIDING CONSTRUCTION

Course Content:

This would involve training students for safety practices in building construction. The students would be given exercise to use the management tools that will allow structuring a safety plan suited to the project, complying with the local laws and regulations in force

2. AIR QUALITY MONITORING
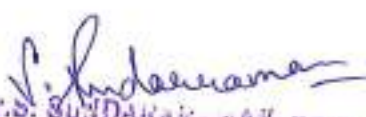
Course Content:

This would help the students to understand the monitoring and measurement of air pollutants by studying about the air quality and preparation of action plan. Students would be given exposure to various sources of pollutants, measuring and assessing them; and how to manage it.

3. EXPERIENCE WITH ON-SITE CONSTRUCTION OBSERVATION AND MANAGEMENT

Course Content:

This would involve training of students with various drawings and specifications by understanding the construction progress and reports for materials and the concept of testing and inspections. In this students would be given exposure to on-site observations, verification of contractor performance, specialty reports for materials such as concrete and asphalt, pre-final and final inspections

Dr.S. SUNDARAKUMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEM404		NSS		L	T	P	C	Hrs
				0	0	2	0	30

NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.

2. The above activities shall be carried out outside class hours.

3. In the above activities, the student participation shall be for a minimum period of 30 hours.

4. The above activities will be monitored by the respective faculty in-charge.

5. Pass /Fail will be determined on the basis of participation, attendance, performance and behavior. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

PROFESSIONAL ELECTIVES

		L	T	P	C	Hrs
U20CEE401	**ENGINEERING GEOLOGY**	3	0	0	3	45

Course Objectives

This course should enable the students to

- Familiarize the students to interior of the earth, plate tectonics.
- Geo-morphological processes and their significance in civil Engineering.
- Provide an insight on minerals, rocks and their geological characteristics to understand their effects and significance in various areas of civil Engineering.
- Facilitate the students to understand various defects associate with geological formation sand to emphasize their significance in the selection of site for various structures.
- Apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor.

Course Outcomes

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

CO1 - Understand the concept of interior of the Earth Surface **(K2)**

CO2 - Understand about the properties of minerals**(K2)**

CO3 - Know the types of rocks**(K2)**

CO4 - Understands the various folds, faults etc., **(K2)**

CO5 - Know about the geophysical method of exploration. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I GENERAL GEOLOGY (9 Hrs)

Geology in civil engineering – branches of geology – structure of earth and its composition weathering of rocks – types of weathering– Fluvial processes, glaciations , wind action, their land forms and their significance in Civil Engineering- Plate tectonics – Earthquake, its causes, classification, measurement, earthquake zones of India, - Landslides, its causes, classification and remediation.

UNIT II MINERALOGY (9 Hrs)

Definition of Minerals and Mineralogy - Physical properties of minerals – Study of the following rock forming minerals - Quartz family, Feldpar family, Augite, Hornblende, Biotite, Muscovite, Calcite – Properties of clay minerals

UNIT III PETROLOGY (9 Hrs)
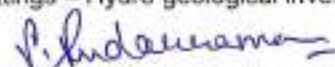
Classification of rocks - Distinction between Igneous, Sedimentary and Metamorphic rocks - Engineering properties of rocks - Description, Occurrence, Engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist - Role of petrology in the field of construction.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL INVESTIGATIONS (9 Hrs)

Introduction to Geological maps – Definition of dip, strike and bedding plane - Study of structures – folds, faults and joints with their classification and relevance to civil engineering - Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT V GEOLOGICAL APPLICATIONS (9 Hrs)

Remote sensing techniques - Study of air photos and satellite images and interpretation for civil engineering projects - Groundwater- Types of aquifers, Properties of geological formations affecting groundwater and its significance in construction. - Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings – Hydro geological investigations and mining.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Text Books

1. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2018.
2. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2017.
3. ChennaKesavulu N. "Textbook of Engineering Geology", Macmillan India Ltd., 2018.
4. Parbin Singh. A "Text book of Engineering and General Geology", Katson publishing house, Ludhiana 2017.
5. Cunningham W.P. and Cunningham M.A. (2002), Engineering Geology for Civil Engineering Prentice, Tata McGraw-Hill Publishing Company, New Delhi.2008

Reference Books

1. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2016.
2. Bell .F.G. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2017.
3. Braja M. Das Textbook of Geology for Engineers, Cengage Leaning, 2009
4. Venkataramiah. C., Textbook of Engineering Geolog, NAIP, 2012.
5. Murthy. V.N.S., A Text Book of Engineering Geology for Civil Engineering Prentice, CBS publishers, 2013
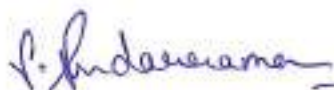
Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. www.iucn.org
4. www.cites.org
5. www.thesummitbali.com/
6. http://engineering geology.gov.in/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEE402	GEOGRAPHIC INFORMATION SYSTEM	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Study about the fundamentals of GIS.
- Learn the types of data models.
- Study about data input and topology.
- Study on data quality and standards.
- Learn the data management functions and data output

Course Outcomes

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

CO1 - Understand the fundamentals of GIS. **(K3)**

CO2 - Understand the types of data models. **(K3)**

CO3 - Get knowledge about data input and topology. **(K3)**

CO4 - Gain knowledge on data quality and standards. **(K3)**

CO5 - Understand data management functions and data output**(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I FUNDAMENTALS OF GIS (9 Hrs)

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS (9 Hrs)

Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models.

UNIT III DATA INPUT TOPOLOGY (9 Hrs)

Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input –Digitiser – Datum Projection and reprojection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency – Non topological file formats - Attribute Data linking – Linking External Databases – GPS Data Integration

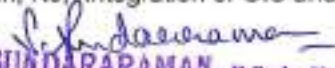### UNIT IV DATA QUALITY AND STANDARDS (9 Hrs)

Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructure

UNIT V DATA MANAGEMENT AND OUTPUT (9 Hrs)

Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS- distributed GIS.

Text Books

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 4th Edition, 2007.
2. Ian Heywood, Sarah Cornelius, Steve Carver, SrinivasaRaju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.
3. Chichester, England ; Hoboken, NJ., Integration of GIS and remote sensing, wiley, 2007

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. Lo.C.P., Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice-Hall India Publishers, 2006
2. Lillesand, T.M. and Kiefer R.W"Remote Sensing and image interpretation", John Wiley and Sons (Asia), Newyork.(2015)
3. Paul A Longley and Michael F Goodchild, "Geographical Information Systems: Principles, Techniques, Management and Applications", wiley, 2nd Edition,2007.
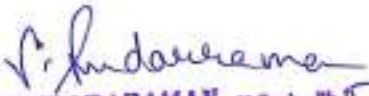
Web References

1. https://nptel.ac.in/courses/105107155/
2. https://nptel.ac.in/courses/105/102/105102015/
3. https://nptel.ac.in/courses/107/105/107105088/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2
CO2	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO3	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO4	3	3	3	3	3	3	2	3	2	3	2	3	3	3	2
CO5	3	3	3	3	3	3	2	3	2	3	2	3	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEE403	BUILDING SERVICES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Know principles of electrical services in buildings
- Know the principles of air conditioning
- Explain lighting in building
- Describe ventilation system
- Know fire protection in building

Course Outcomes

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

CO1 - Find essential services for the building **(K3)**

CO2 - Choose appropriate equipment for building**(K3)**

CO3 - Select lighting facilities in the building**(K2)**

CO4 - Choose suitable air conditioning system for the building**(K3)**

CO5 - Choose fire safety systems for various types of building **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I MACHINERIES   (9 Hrs)

Hot Water Boilers - Lifts and Escalators - Special features required for physically handicapped and elderly - Conveyors - Vibrators - Concrete mixers - DC/AC motors - Generators - Laboratory services - Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS   (9 Hrs)

Basics of electricity - Single / Three phase supply - Protective devices in electrical installations - earthing for safety - Types of earthing - ISI specifications - Types of wires, wiring systems and their choice - Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION AND DESIGN   (9 Hrs)

Design of modern lighting - Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES AND APPLICATIONS   (9 Hrs)
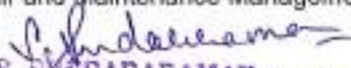
Refrigerants-Refrigerant control devices - Electric motors - Starters - Air handling units - Cooling towers – Window type and packaged air- conditioners - Chilled water plant - Fan coil systems - Water piping - Cooling load – Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems.

UNIT V FIRE SAFETY INSTALLATION   (9 Hrs)

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems.

Text Books

1. R.Udayakumar,'A text book on building services',Eswar Press,Chennai,2007.
2. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 2000.
3. Jain, V.K., "Fire Safety in Buildings", New Age International (P) Ltd., 2nd Edition Year, 2015
4. S. M. Patil, Building Services, Seema Publication, Mumbai 2015
5. P. S. Gahlot, Building repair and Maintenance Management, CBS Publishers & Distribution(P) Ltd., 2015

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet. Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968
3. Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.
4. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1972.
5. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988.
6. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 1980.
7. National Building code of India – 2005, Bureau of Indian Standards, New Delhi

Web References
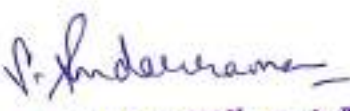
1. https://nptel.ac.in/courses/105/107/105107156/
2. https://nptel.ac.in/courses/105/102/105102176/
3. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce30/
4. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ce09/
5. https://nptel.ac.in/courses/105/102/105102175/

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
CO2	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
CO3	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
CO4	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3
CO5	3	3	2	3	3	3	2	2	3	2	2	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CEE404	RENEWABLE ENERGY SOURCES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Get exposure on solar radiation and its environmental impact to power.
- Know about the various collectors used for storing solar energy.
- Know about the various applications in solar energy.
- Learn about the wind energy and biomass and its economic aspects.
- Know about geothermal energy with other energy sources.

Course Outcomes

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

CO1 - Understand the physics of solar radiation. **(K1)**

CO2 - Classify the solar energy collectors and methodologies of storing solar energy.**(K3)**

CO3 - Gain Knowledge in applying solar energy in a useful way. **(K3)**

CO4 - Learn Knowledge in wind energy and biomass with its economic aspects.**(K4)**

CO5 - Gain Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies. **(K3)**

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I PRINCIPLES OF SOLAR RADIATION   (10 Hrs)

Role and potential of new and renewable source-physics of the sun- the solar constant- solar energy--Environmental impact of solar power- extraterrestrial and terrestrial solar radiation- solar radiation on titled surface- instruments for measuring solar radiation and sun shine- solar radiation data.

UNIT II SOLAR ENERGY COLLECTION   (8 Hrs)

Flat plate and concentrating collectors- classification of concentrating collectors-orientation and thermal analysis-advanced collectors.

UNIT III SOLAR ENERGY STORAGE AND APPLICATIONS   (7 Hrs)

Different methods-Sensible-latent heat and stratified storage-solar ponds. Solar Applications- solar heating/cooling technique- solar distillation and drying- photovoltaic energy conversion-Application.

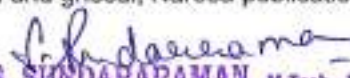## UNIT IV WIND ENERGY   (10 Hrs)

Sources and potentials- horizontal and vertical axis windmills- performance characteristics,-Betz criteria BIO-MASS: Principles of Bio-Conversion- Anaerobic/aerobic digestion,-types of Bio-gas digesters- gas yield-combustion- characteristics of bio-gas- utilization for cooking- I.C Engine operation and economic aspects.

UNIT V GEOTHERMAL ENERGY   (9 Hrs)

Resources- types of wells- methods of harvesting the energy,-potential in India. OCEAN ENERGY: OTEC-Principles utilization-setting of OTEC plants-thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques-mini-hydropower plants, and their economics. DIRECT ENERGY CONVERSION: Need for DEC- Carnot cycle- limitations-and principles of DEC.

Text Books

1. Rai G.D. , "Non-Conventional Energy Sources", Khanna Publishers, 2011
2. Twidell and Wier, "Renewable Energy Resources", CRC Press (Taylor and Francis), 2011
3. .Reneweble energy resources: Tiwari and ghosal, Narosa publication.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007
2. Ramesh R and Kumar K.U , "Renewable Energy Technologies",Narosa Publishing House, 2004
3. Mittal K M , "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003
4. Kothari D.P, Singhal ., K.C., "Renewable energy sources and emerging technologies", P.H.I, New Delhi, 2010
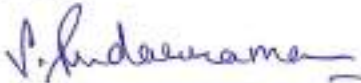
Web References

1. https://nptel.ac.in/courses/121/106/121106014/
2. https://nptel.ac.in/courses/112105051/
3. https://nptel.ac.in/content/storage2/courses/121106014/Week8/lecture24.pdf

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	1	3	2	2	2	3	2	3	3	3	3
CO2	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3
CO3	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3
CO4	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3
CO5	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20CEE405	ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge on energy in building materials
- Aware about different types of alternative building materials
- Understand the Sustainable materials for construction
- Learn about the alternative building technologies
- Understand the concepts of equipment for construction and also planning control.

Course Outcomes

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

CO1 – Understand the various energies involved in the construction **(K2)**
CO2 – Understand the different types alternative materials**(K2)**
CO3 - Identify various eco-friendly materials **(K2)**
CO4 - Recognize suitable alternative building technologies **(K2)**
CO5 - Apply the cost concept involved in the planning of construction **(K3)**
KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I INTRODUCTION   (9 Hrs)

Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Environmental friendly and cost-effective building technologies, Requirements for buildings of different climatic regions.

UNIT II ALTERNATIVE BUILDNG MATERIALS   (9 Hrs)

Characteristics of building blocks for walls - Stones and Laterite blocks - Bricks and hollow clay blocks - Concrete blocks - Stabilized mud blocks - Fal-G Blocks - Manufacture of stabilized blocks.

UNIT III SUSTAINABLE MATERIALS   (9 Hrs)

Fibre reinforced concretes – Types: metal and synthetic - Properties and applications - Fibre reinforced plastics – Types: organic and synthetic - Properties and applications. Building materials from agro and industrial wastes - Types of agro wastes - Types of industrial and mine wastes - Properties and applications

UNIT IV ALTERNATIVE BUILDING TECHNOLOGIES   (9 Hrs)
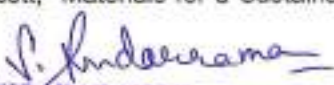
Alternatives for wall constructions, composite masonry, confined masonry, cavity walls, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique, 3D Printing Technology. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs.

UNIT V MACHINES & PLANNING CONTROL   (9 Hrs)

Machines for manufacture of concrete, Equipment for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

Text Books

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International Publishers, 2017.
2. BT Ashwini Manjunath, "Alternative Building Materials and Technology", Medtech Publisher, 2017.
3. Trevor M. Letcher and Janet L. Scott, "Materials for a Sustainable Future", Royal Society of Chemistry, 2012

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. S Christian Johnson, "Concrete Technology", Dipti Press, 2017.
2. G.C Sahu and Jayagopal Jena, "Building Materials and Construction", McGraw hill Publication, 2015.
3. B C Punmia and Ashok kumar jain, "Building Construction", Laxmi Publication, 2019.
4. M.S. Shetty, "Concrete Technology (Theory and Practice)", S. Chand & Company Ltd., 2019.
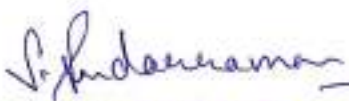5. S.K. Duggal, "Building Materials", 5th edition, New age International Publication, 2020.

Web Reference

1. https://nptel.ac.in/courses/105/102/105102175/
2. https://nptel.ac.in/courses/105/102/105102195/
3. https://alison.com/course/sustainable-architecture-energy-efficiency-and-quality

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	3	3	2	-	2	1	3	3	2	2
CO2	2	-	-	-	3	2	3	2	-	2	1	3	3	3	2
CO3	3	-	-	-	3	3	3	3	-	2	1	3	3	3	2
CO4	3	-	-	-	3	3	3	3	3	3	1	3	3	3	2
CO5	3	-	-	2	2	3	3	3	3	3	1	3	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

OPEN ELECTIVES

U20EEO401	SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS	L	T	P	C	Hrs
	(Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE)	3	0	0	3	45

Course Objectives

- To impart fundamental knowledge of solar cell formation and its properties.
- To understand the various technologies used to improve solar cells.
- To discuss the various components in On-grid connected systems.
- To gain knowledge on components in Off-grid connected systems using Solar PV.
- To design the PV systems for various real load applications with cost benefits.

Course Outcomes

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

CO1 -Explain the fundamentals of solar cells. **(K2)**

CO2 -Recognize the various solar PV technologies and their up gradations along with their benefits. **(K2)**

CO3 -Design and analyze on–grid PV applications. **(K4)**

CO4 -Design and analyze off–grid PV applications. **(K4)**

CO5 -Realize cost benefit analysis of PV installations. **(K4)**

KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I ESSENTIAL BASICS OF SOLAR CELL (9 Hrs)

Solar cell – physics – Photovoltaics in Global Energy Scenario – Fundamentals of Semiconductors, Energy band, Charge carriers – Motion, PN Junction diode, Solar cells – Design characteristics, Solar radiation.

UNIT II COMMERCIAL AND DEVELOPING TECHNOLOGIES (9 Hrs)

Commercial technologies – Mono crystalline and Multi crystalline, Silicon – Wafer based Solar cell, Thin film solar cells – A–Si, Cd–Te and CIGS, Concentrated PV cells, Developing technologies – Organic cells, Dye sensitized cells.

UNIT III SOLAR PV FOR ON-GRID APPLICATIONS (9 Hrs)

Solar cells to solar array – On–Grid PV system – With and Without storage – Balance of system – DC–DC converters – Inverters – Net Metering – Design and analysis – Performance evaluation and monitoring – Field visit – Grid tied PV power plant.

UNIT IV SOLAR PV FOR OFF–GRID APPLICATIONS (9 Hrs)

Off–Grid stand alone PV system – System sizing – Module and Battery – Storage – Batteries for PV systems – Sun Tracking mechanism – Types of tracking – One–axis, Two–axis – Maximum power point tracking – Design and analysis – Performance evaluation and monitoring – Field visit – Off–grid PV system

UNIT V COST BENEFIT ANALYSIS FOR SOLAR PV INSTALLATIONS (9 Hrs)

Cost and manufacturability – Manufacturing economics – Scaling – Pricing – Trends in retail pricing – Energy economics – Grid tied power plant – Solar street lighting system

Text Books

1. C.S. Solanki, "Solar Photovoltaics – Fundamentals, Technologies and Applications", PHI Learning Pvt. Ltd., 2nd Edition, 2011.
2. Martin A. Green, "Solar Cells Operating Principles, Technology, and System Applications", Prentice - Hall, 1st Edition, 2008.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. J. Nelson, "The Physics of Solar Cells", Imperial College Press, 1st Edition, 2003.
2. Thomas Markvart, "Solar Electricity", John Wiley and Sons, 2nd Edition, 2000.
3. Stuart R. Wenham, Martin A. Green, Muriel E. Watt, Richard Corkish , "Applied Photovoltaics", Earthscan, 3rd Edition, 2011.
4. Michael Boxwell, "The Solar Electricity Handbook", Green stream Publishing, 10th Edition, 2016.
5. RikDe Gunther, "Solar Power-Your Home for Dummies", Wiley Publishing Inc, 2nd Edition, 2010.

Web References

1. https://swayam.gov.in/nd1_noc20_ph21/preview
2. https://swayam.gov.in/nd2_nou20_ag13/preview
3. https://www.studentenergy.org/topics/solar-pv
4. https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php
5. https://www.energysage.com/solar/
6. https://www.bca.gov.sg/publications/others/handbook_for_solar_pv_systems.pdf
7. http://www.oas.org/dsd/publications/unit/oea79e/ch05.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	3	-	-	-	-	3	3	3	1
CO2	3	3	3	3	2	-	3	-	-	-	-	3	3	3	1
CO3	3	3	3	3	2	-	3	-	-	-	-	3	3	3	1
CO4	3	3	3	3	2	-	3	-	-	-	-	3	3	3	1
CO5	3	3	3	3	2	-	3	-	-	-	-	3	3	3	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

	ELECTRICAL SAFETY	L	T	P	C	Hrs
U20EEO402	(Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT)	3	0	0	3	45

Course Objectives

- To familiarize the Indian Electricity Rules and Act related with electrical safety.
- To provide a knowledge about electrical shocks and safety precautions.
- To create awareness of the electrical safety associated with installation of electrical equipment.
- To analyze different Hazardous areas for electrical safety.
- To expose knowledge about necessity of safety policy and safety management.

Course Outcomes

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

CO1 - Describe the Indian Electricity (IE) acts and various rules for electrical safety.**(K2)**
CO2 - Expose safety measures to prevent electrical shock in handling of domestic electrical appliances. **(K3)**
CO3 - Evaluate the safety aspects during installation of plant and equipment. **(K3)**
CO4 - Describe the various hazardous area and application of electrical safety in various places. **(K3)**
CO5 - Acquire knowledge about importance of electrical safety training to improve quality management in electrical systems. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS (9 Hrs)

Objective and scope of electrical safety - National electrical Safety code - Statutory requirements – Indian Electricity acts related to electrical Safety - Safety electrical one line diagram - International standards on electrical safety safe limits of current and voltage - Grounding of electrical equipment of low voltage and high voltage systems - Safety policy - Electrical safety certificate requirement

UNIT II ELECTRICAL SHOCKS AND THEIR PREVENTION (9 Hrs)

Primary and secondary electrical shocks - Possibilities of getting electrical shock and its severity - Effect of electrical shock of human being - Shocks due to flash/ Spark over's - Firing shock - Multi storied building - Prevention of shocks - Safety precautions - Safe guards for operators - Do's and Don'ts for safety in the use of domestic electrical appliances - Case studies on electrical causes of fire and explosion

UNIT III SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE (9 Hrs)

Need for inspection and maintenance - Preliminary preparations - Field quality and safety - Personal protective equipment - Safe guards for operators - Safety equipment - Risks during installation of electrical plant and equipment - Effect of lightning current on installation and buildings - Safety aspects during installation -Safety during installation of electrical rotating machines - Importance of earthing in installation– Agricultural pump installation

UNIT IV HAZARDOUS ZONES (9 Hrs)

Primary and secondary hazards - Hazardous area classification and of electrical equipments (IS, NFPA, API and OSHA standards) - Explosive gas area classifications: Class I(Division 1) - Zone 0, Zone 1, zone 2 classified locations, Design Philosophy for Equipment and installations-Classification of equipment enclosure for various hazardous gases and vapors - flash hazard calculation and approach distances- calculating the required level of arc protection

UNIT V SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS (9 Hrs)

Principles of Safety Management - Occupational safety and health administration standards - Safety organization - Safety auditing - Employee electrical safety teams - Electrical safety training to improve Quality management - Total quality control and management – Importance of high load factor - Causes of low power factor - Disadvantages of low power factor - Power factor improvement - Importance of P.F. improvement - Case studies of electrical workplace safety practices.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Text books

1. John Cadick, Mary CapelliSchellpfeffer, Dennis Neitzel, Al Winfield, "Electrical Safety Handbook", McGraw-Hill Education, 4th Edition, 2012.
2. Madden, M. John, "Electrical Safety and the Law: A Guide to Compliance", Wiley publications, 4th Edition, 2002.
3. Mohamed A. El-Sharkawi, "Electric Safety: Practice and Standards", CRC Press; 1st Edition, 2013.

Reference books

1. Rob Zachariason, "Electrical Safety", Delmar Cengage Learning, 1st Edition, 2011.
2. Peter E. Sutherland, "Principles of Electrical Safety", Wiley-IEEE Press; 1st Edition, 2014.
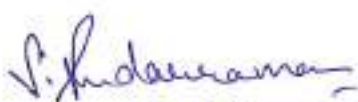
Web References

1. https://www.apeasternpower.com/downloads/elecact2003.pdf
2. https://safetyculture.com/topics/electrical-hazards/
3. https://www.jove.com/science-education/10114/electrical-safety-precautions-and-basic-equipment
4. https://electrical-engineering-portal.com/21-safety-rules-for-working-with-electrical-equipment
5. https://www.electrical4u.com/safety-precautions-for-electrical-system/
6. https://www.constellation.com/energy-101/electrical-safety-tips.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	2	-	-	-	-	-	-	3	3	1
CO2	3	3	3	2	-	2	-	-	-	-	-	-	3	3	1
CO3	3	3	3	2	-	2	-	-	-	-	-	-	3	3	1
CO4	3	3	3	2	-	2	-	-	-	-	-	-	3	3	1
CO5	3	3	3	2	-	2	-	-	-	-	-	-	3	3	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20ECO401	ENGINEERING COMPUTATION WITH MATLAB (Common to EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand basic representation of Matrices and vectors in MATLAB
- To learn various programming structures in MATLAB
- To study built in and user defined functions in MATLAB.
- To become conversant with 2D as well as 3D graphics in MATLAB
- To make a Graphical User Interface (GUI) in MATLAB in order to achieve interactivity

Course Outcomes

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

CO1 - State the basics of MATLAB **(K1)**

CO2 - Explain how to work with matrices, and their operations **(K2)**

CO3 –Use the MATLAB functions relevant to communication engineering. **(K3)**

CO4 –Demonstrates various file operations in MATLAB **(K3)**

CO5 - Applying the plotting capabilities of MATLAB effectively to various systems. **(K3)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION TO MATLAB (9Hrs)

Menus & Tool bars, Variables - Matrices and Vectors - initializing vectors - Data types- Functions – User defined functions - passing arguments - writing data to a file-reading data from a file - using functions with vectors and matrices- cell arrays & structures - Strings - 2D strings-String comparing - Concatenation - Input and Output statements - Script files .

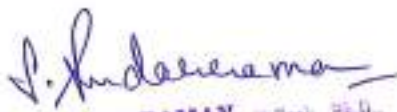## UNIT II LOOPS& CONTROL STATEMENTS (9Hrs)

Introduction; Relational & Logical operations - Example programs - Operator precedence - Control & Decision statements- IF - IF ELSE - NESTED IF ELSE - SWITCH - TRY & CATCH - FOR -WHILE - NESTED FOR - FOR with IF statements, MATLAB program organization, Debugging methods - Error trapping using eval&lastern commands.

UNIT III PLOTS IN MATLAB & GUI (9Hrs)

Basic 2D plots, Labels, Line style, Markers, plot, subplot, LOG, LOG-LOG, SEMILOG-POLARCOMET, Grid axis, labeling, fplot, ezplot, ezpolar, polyval, exporting figures, HOLD, STEM, BAR, HIST, Interactive plotting, Basic Fitting Interface – Polyfit - 3D plots – Mesh - Contour - Example programs. GUI - Creation Fundamentals – Capturing mouse actions

UNIT IV MISCELLANEOUS TOPICS (9 Hrs)

File & Directory management - Native Data Files - Data import & Export - Low Level File I/O – Directory management - FTP File Operations - Time Computations -Date & Time – Format Conversions - Date & Time, Functions - Plot labels - Optimization - zero Finding - Minimization in one Dimension - Minimization in Higher Dimensions- Practical Issues. Differentiation & Integration using MATLAB, 1D & 2D Data Interpolation.

Dr.S. SUNDARARAMAN *M.Tech., Ph.D.*
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

UNIT V SIMULINK & APPLICATIONS   (9Hrs)

How to create & run Simulink, Simulink Designing - Using SIMULINK Generating an AM signal & 2nd order systems - Designing of FWR & HWR using Simulink - Creating a subsystem in Simulink. Applications Programs -Frequency response of filters, Open Loop gain of OPAMP, I/P characteristics of BJT, Plotting the graph between Breakdown voltage & Doping Concentration.

Text Books

1. RudraPratap, Getting Started with MATLAB 6.0 ,1st Edition, Oxford University Press-2004.
2. Duane Hanselman ,Bruce LittleField, "Mastering MATLAB 7", Pearson Education Inc, 2005
3. William J.Palm, "Introduction to MATLAB 6.0 for Engineers", McGraw Hill & Co, 2001.

Reference Books

1. M.Hemiter, "Programming in MATLAB", Thomson Learning, 2001
2. John OkyereAltla, "Electronics and circuit analysis using MATLAB", CRC press, 1999
3. K.K.Sharma, "MATLAB Demustifyied", Vikas Publishing House Pvt Ltd. 2004

Web References

1. https://www.mathworks.com/products/matlab.html
2. https://www.tutorialspoint.com/matlab/index.htm
3. https://www.cmu.edu/computing/software/all/matlab/
4. https://ctms.engin.umich.edu/CTMS/index.php?aux=Home

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	2	3	-	-	-	-	-	-	-	2	-	2
CO2	2	2	-	2	3	-	-	-	-	-	-	-	2	-	2
CO3	2	2	-	2	3	-	-	-	-	-	-	-	2	-	2
CO4	2	2	-	2	3	-	-	-	-	-	-	-	2	-	2
CO5	2	2	-	2	3	-	-	-	-	-	-	-	2	-	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

CONSUMER ELECTRONICS

U20ECO402

(Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To enable the troubleshoot of different types of microphones and loudspeakers
- To make the students to analyze the working of digital console, digital FM tuner and troubleshoot audio systems
- To train and test the working of various colour TV
- To empower them to troubleshoot colour TV receivers
- To equip them to maintain various electronic home and office appliances

Course Outcomes

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

CO1 -Describe the fundamental audio characteristics and measurements, operating principles of microphone and loudspeaker **(K1)**

CO2 -Explain the working of digital console, digital FM tuner and troubleshoot the audio systems **(K2)**

CO3 -Distinguish the salient features of colour TV and Monochrome and troubleshoot TV camera **(K2)**

CO4 -Demonstrate various interfaces in digital TV, the working of DTH receiver, CD/DVD players **(K3)**

CO5 -Explain the working of FAX, Microwave oven, Washing machine, Air conditioner, Refrigerators and camera **(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I AUDIO FUNDAMENTALS AND DEVICES (9Hrs)

Basic characteristics of sound signal, Microphone- working principle, sensitivity, nature of response. Types of Microphone, Loud speaker- working principle, Woofers and Tweeters, characteristics. Types of Loudspeaker. Sound recording
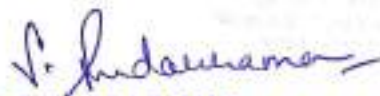
UNIT II AUDIO SYSTEMS (9Hrs)

Introduction to audio system, Digital Console- Block diagram, working principle, applications, FM tuner- concepts of digital tuning, ICs used in FM tuner TD702IT, PA address system- Planning, speaker impedance matching, characteristics, Power amplifier specification

UNIT III TELEVISION SYSTEMS (9Hrs)

Monochrome TV standards, Components of TV system, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal, Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera.

UNIT IV TELEVISION RECEIVERS AND VIDEO STANDARDS (9Hrs)

Colour TV receiver- block diagram, Digital TVs- LCD, LED , PLASMA; HDTV, 3-D TV, projection TV, DTH receiver, Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI, Digital Video Interface, CD and DVD player: working principles, interfaces

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

UNIT V HOME AND OFFICE APPLIANCES (9Hrs)

Microwave Oven: Types, technical specifications. Washing Machine: hardware and software. Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices, picture processing, picture storage

Text Books

1. Bali S.P. , 'Consumer Electronics', copyright 2008,Pearson Education India
2. Bali R and Bali S.P. 'Audio video systems : principle practices & troubleshooting', Khanna Book Publishing Co. (P) Ltd
3. Gulati R.R., 'Modern Television practices', 5th edition, 2015, New Age International Publication (P) Ltd

Reference Books

1. Gupta R.G., 'Audio video systems', 2nd edition,2017, Tata Mcgraw Hill, New Delhi, India
2. Whitaker Jerry & Benson Blair, 'Mastering Digital Television', McGraw-Hill Professional, 2006
3. Whitaker Jerry & Benson Blair, 'Standard handbook of Audio engineering', 2nd edition,2002, McGraw-Hill Professional
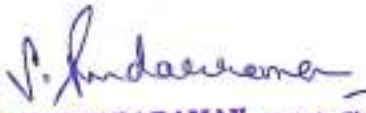
Web Resources

1. http://www.scientificamerican.com/article.cfm?id = experts. Bluetooth - work
2. http://www.cosc.brocku.ca/Offerings/3P92/seminars/HDTV.ppt
3. http://www.circuitstoday.com/blu-ray-technology-working
4. http://www.freevideolectures.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	1	-	1	-	-	-	-	-	-	1	1	1
CO2	2	-	2	1	-	1	-	-	-	-	-	-	1	1	1
CO3	2	-	2	1	-	1	-	-	-	-	-	-	1	1	1
CO4	2	-	2	1	-	1	-	-	-	-	-	-	1	1	1
CO5	2	-	2	1	-	1	-	-	-	-	-	-	1	1	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

	WEB DEVELOPMENT	L	T	P	C	Hrs
U20CSO401	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To study the fundamentals of web application development
- To understand the design components and tools using CSS
- To learn the concepts JavaScript and programming fundamentals.
- To study about advance scripting and Ajax applications.
- To understand the working procedure of XML

Course Outcomes

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

CO1 - Develop basic web applications. **(K5)**

CO2 - Design the web applications using CSS. **(K5)**

CO3 - Validate the web pages using javascripts functions. **(K5)**

CO4 - Demonstrate the web 2.0 application to advance scripts. **(K3)**

CO5 - Update the knowledge of XML Data. **(K4)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION TO WWW & HTML   (9 Hrs)

Protocols, secure connections, application and development tools, the web browser, What is server, dynamic IP, Web Design: Web site design principles, planning the site and navigation. HTML: The development process, Html tags and simple HTML forms, web site structure.

UNIT II STYLE SHEETS   (9 Hrs)

Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2.

UNIT III JAVASCRIPTS   (9 Hrs)

Client side scripting, What is JavaScript, How to develop JavaScript, simple Javascript, variables, functions, conditions, loops and repetition.

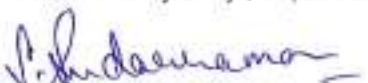### UNIT IV ADVANCE SCRIPT   (9 Hrs)

JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations DHTML: Combining HTML, CSS and Javascript, events and buttons, controlling your browser, Ajax: Introduction, advantages & disadvantages, ajax based web application, alternatives of ajax.

UNIT V XML   (9 Hrs)

Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction toXSL, XML transformed simple example, XSL elements, transforming with XSLT.

Text Books

1. P.J. Deitel AND H.M. Deitel," Internet and World Wide Web - How to Program", Pearson Education, 2009.
2. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.

B.Tech. Civil Engineering

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

3. Semmy Purewal, "Learning Web App Development", O'Reilly Media, Inc.

Reference Books

1. UttamK.Roy, "Web Technologies", Oxford University Press, 2010.
2. Rajkamal, "Web Technology", Tata McGraw-Hill, 2009.
3. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
4. Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web Development ", O'Reilly Media, 2014.
5. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.
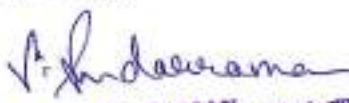
Web References

1. https://www.w3schools.com
2. https://www.geeksforgeeks.org/web-technology/
3. https://www.guru99.com/cakephp-tutorial.html
4. https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business
5. http://Oriel.ly/learning-web-app

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	-	-	3	-	-	-	-
CO2	2	2	2	2	-	2	-	2	-	2	-	2	-	-	-
CO3	3	3	3	3	3	3	3	3	-	-	3	-	-	-	-
CO4	2	2	2	2	-	2	-	2	-	2	-	2	-	-	-
CO5	2	2	2	2	-	2	-	2	-	2	-	2	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CSO402	ANALYSIS OF ALGORITHMS	L	T	P	C	Hrs
	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To analyze the performance of algorithms in terms of time and space complexity
- To understand how the choice of algorithm design methods such as divide and conquer, greedy method impacts the performance of programs.
- To solve problems using Dynamic Programming and derive the time complexity
- To solve problems using Backtracking technique and derive the time complexity
- To solve problems using Branch and Bound technique and derive the time complexity

Course Outcomes

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

CO1 - Choose the appropriate data structure and algorithm design method for a specified application.(K2)

CO2 - Ability to understand the design technique such as divide and conquer, greedy method applied to realistic problems and analyse them. (K3)

CO3 - Ability to understand the dynamic programming design technique and how it is applied to realistic problems and analyze them. (K3)

CO4 - Ability to understand the backtracking design technique and how it is applied to realistic problems and analyze them. (K3)

CO5 - Ability to understand Branch and Bound design technique and how it is applied to realistic problems and analyze them. (K2)

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I INTRODUCTION   (9 Hrs)

Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Time complexity, Space complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation.

UNIT II DIVIDE AND CONQUER METHOD AND GREEDY METHOD   (9 Hrs)

Divide and Conquer method:, Applications- Binary search, Merge sort, Quick sort.
Greedy method: General method, applications -, Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING   (9 Hrs)
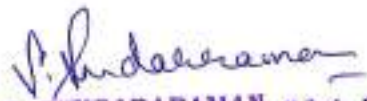
Dynamic Programming: Applications - Multistage graphs, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT IV BACKTRACKING   (9 Hrs)

Backtracking: General method, Applications-N-queen problem, Sum of subsets problem, Graph coloring- Hamiltonian Cycles.

UNIT V BRANCH AND BOUND   (9 Hrs)

Branch and Bound: General method, Applications - Traveling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Text Books

1. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", 2nd Edition, Galgotia Publications, 2010.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", 3rdEdition, PHI/Pearson Education, 2009.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

Reference Books

1. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", 3rd Edition, Pearson Education Asia, 2010.
3. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Revised Re-Third Edition, Addison Wessely, 2011.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.

Web References

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
2. https://www.javatpoint.com/daa-tutorial
3. https://www.guru99.com/design-analysis-algorithms-tutorial.html
4. https://www.geeksforgeeks.org/fundamentals-of-algorithms/
5. https://swayam.gov.in/nd1_noc20_cs71/preview

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	1	-	-	-	-	-	-	-	-
CO2	3	2	3	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	3	3	3	2	2	2	-	2	-	-	-	-	-	-
CO4	3	2	3	3	3	2	2	-	-	-	3	-	-	-	-
CO5	3	3	3	3	2	2	2	-	-	-	3	2	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20ICO401	SENSORS AND TRANSDUCERS (Common to ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- Get to know the methods of measurement, classification of transducers and to analyze error.
- Get exposed to different types of resistive transducers and their application areas
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers
- To introduce about advancements in sensor technology.

Course Outcomes

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

CO1 - Understand the concepts of classification of Transducers. **(K2)**

CO2 - Familiar with the working of resistance Transducer. **(K3)**

CO3 - Familiar with the principle and working of various Inductive and Capacitive transducer **(K1)**

CO4 - Able to design signal conditioning circuit for various transducers **(K3)**

CO5 - Able to identify or choose a transducer for a specific measurement application **(K4)**

KNOWLEDGE LEVEL: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze and K5 – Evaluate

UNIT I CLASSIFICATION OF TRANSDUCERS (9 Hrs)

General concepts and terminology of measurement systems, transducer classification, general input-output configuration, static and dynamic characteristics of a measurement system, Statistical analysis of measurement data.

UNIT II RESISTANCE TRANSDUCERS (9 Hrs)

Resistive transducers: Potentiometers, metal and semiconductor strain gauges and signal conditioning circuits, strain gauge applications: Load and torque measurement, Digital displacement sensors.

UNIT III INDUCTIVE AND CAPACITIVE TRANSDUCERS (9 Hrs)

Transducers: – Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn – Principle of operation, construction details, characteristics of capacitive transducers – Different types & Signal Conditioning – Applications:- Capacitor microphone, Capacitive pressure sensor, Proximity sensor.

UNIT IV OTHER TRANSDUCERS (9 Hrs)

Piezoelectric transducers and their signal conditioning, Seismic transducer and its dynamic response, photoelectric transducers, Hall effect sensors, Magnetostrictive transducers. Eddy current transducers. Hall effect transducers – Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors

UNIT V SMART TRANSDUCER (9 Hrs)

Introduction to semiconductor sensor, materials, scaling issues and basics of micro fabrication. Smart sensors, Intelligent sensor, Mems Sensor, Nano-sensors, SQUID Sensors,- Environmental Monitoring sensors

B.Tech. Civil Engineering

Dr. S. SUNDARARAMAN ⁣, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

Text Books

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, McGraw-Hill Education Pvt. Ltd., 2011.
2. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design, Oxford University Press, Cambridge,2003
3. Neubert H.K.P., Instrument Transducers – An Introduction to their Performance and Design Clarendon, Oxford2nd edition Jacob Fraden - 2010
4. DoeblinE..O. "Measurement System Applications and Design", TMH, 5th Edition, 2004

Reference Books

1. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol.1 ISA/CRC Press, 2003.
2. Bela G. Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th edition, Vol.2 ASME PTC ,2018
3. D. Patranabis, Sensors and Transducers, 2nd edition, Prentice Hall of India, 2010. E.A.
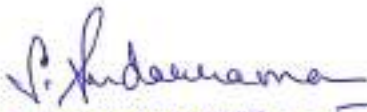4. John P. Bentley, Principles of Measurement Systems, 3rd Edition, Pearson Education, 2000.

Web References

1. www.electrical4u.com
2. https://nptel.ac.in/courses/108108147/
3. https://www.youtube.com/watch?v=1uPTyjxZzyo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	1	2	-	-	-	2	-	-	-	-
CO2	2	-	3	-	-	1	2	-	-	-	2	-	-	-	-
CO3	2	-	2	-	-	1	2	-	-	-	2	-	-	-	-
CO4	2	-	3	-	-	1	2	-	-	-	-	-	-	-	-
CO5	2	-	3	-	2	2	3	-	-	-	2	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20MEO401	**RAPID PROTOYPING** (Common to EEE, ECE, ICE, CIVIL, BME, FT)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the development of RP systems
- To learn the classification of liquid based and solid based rapid prototyping systems
- To understand the powder based rapid prototyping systems
- To learn about the materials for rapid prototyping systems
- To discuss about the reverse engineering and new technologies

Course Outcomes

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

CO1 - Acquire knowledge about the product development **(K1)**

CO2 - Analyse the classification of liquid based and solid based rapid prototyping systems **(K4)**

CO3 - Analyse the powder based rapid prototyping systems **(K4)**

CO4 - Acquire knowledge about the materials for rapid prototyping systems **(K1)**

CO5 - Acquire knowledge about reverse engineering and new technologies **(K1)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION (9 Hrs)

History – Development of RP systems – Applications in Product Development, Reverse Engineering, Rapid Tooling, Rapid Manufacturing- Principle – Fundamental – File format – Other translators – medical applications of RP - On demand manufacturing – Direct material deposition - Shape Deposition Manufacturing.

UNIT II LIQUID BASED AND SOLID BASED RAPID PROTOTYPING SYSTEMS (9 Hrs)

Classification – Liquid based system - Stereolithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing.

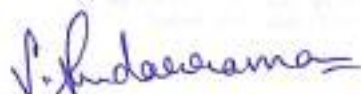## UNIT III POWDER BASED RAPID PROTOTYPING SYSTEMS (9 Hrs)

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses. Three Dimensional Printing – process, major applications, research and development. Direct shell production casting – key strengths, process, applications and uses, case studies, research and development. Laser Sintering System, e-manufacturing using Laser sintering, customized plastic parts, customized metal parts, e-manufacturing - Laser Engineered Net Shaping (LENS).

UNIT IV MATERIALS FOR RAPID PROTOTYPING SYSTEMS (9 Hrs)

Nature of material – type of material – polymers, metals, ceramics and composites liquid based materials, photo polymer development – solid based materials, powder based materials - case study.

UNIT V REVERSE ENGINEERING AND NEW TECHNOLOGIES (9 Hrs)

Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, other applications - Case study.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Text Books

1. Rafiq I. Noorani, Rapid Prototyping – Principles and Applications, Wiley & Sons, 2006.
2. 2. Chua C.K, Leong K.F and Lim C.S, Rapid Prototyping: Principles and Applications, second edition, World Scientific, 2003.
3. Amitav Ghosh Introduction to Rapid Prototyping, North West Publication, New Delhi, 2008.

Reference Books

1. Hopkinson N, R.J.M, Hauge, P M, Dickens, "Rapid Manufacturing – An Industrial revolution for the digital age", Wiley, 2006
2. Ian gibson, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototying", Wiley, 2006
3. Paul F.Jacobs, Rapid Prototyping and Manufacturing, "Fundamentals of Stereolithography", McGraw Hill 1993.
4. Pham D.T and Dimov, "Rapid Manufacturing", Springer Verlog 2001.
5. Liou W.Liou, Frank W.Liou ,"Rapid Prototyping and Engineering applications : A tool box for prototype development", CRC Press, 2007.

Web References

1. https://nptel.ac.in/courses/112/104/112104265/
2. https://www.digimat.in/nptel/courses/video/112104265/L01.html
3. https://nptel.ac.in/courses/112/107/112107078/
4. https://www.youtube.com/watch?v=oDdOqLblmVQ
5. https://www.youtube.com/watch?v=OhNnKTaciVl

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	-	-	-	2	3	2	1
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	2	1
CO3	3	3	3	3	1	-	-	-	-	-	-	2	3	2	1
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	2	1
CO5	3	3	3	3	1	-	-	-	-	-	-	2	3	2	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20MEO402	MATERIAL HANDLING SYSTEM	L T P C	Hrs
	(Common to EEE, ICE, CIVIL, Mechatronics)	3 0 0 3	45

Course Objectives

- To understand the principal groups of material handling equipment's
- To learn about the Flexible hoisting appliances
- To learn about the material handling attachments, hook bearings, crane attachment
- To understand about the basic material handling system, selection
- To introduce concepts of ergonomics of material handling equipment and safety in handling

Course Outcomes

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

CO1 - Describe the principal groups of material handling equipment's. **(K2)**

CO2 - Describe about the flexible hosting appliances. **(K2)**

CO3 - Explains about the material handling attachments, hook bearings, crane attachment. **(K1)**

CO4 - Illustrate the basic material handling system, selection. **(K1)**

CO5 - Define the ergonomics related to material handling equipment. **(K1)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I MATERIAL HANDLING EQUIPMENTS (9 Hrs)

Types of intra plant transporting facility - principal groups of material handling equipments - choice of material handling equipment - hoisting equipment, screw type, hydraulic and pneumatic conveyors - - general characteristics of hoisting machines, surface and overhead equipments, general characteristics of surface and overhead equipments and their applications - Introduction to control of hoisting equipments.

UNIT II FLEXIBLE HOSTING APPLIANCES (9 Hrs)

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains - selection of hemp rope chains and steel wire rope - selection of ropes - fastening of chain sand ropes - different types of load suspension appliances - fixed and movable pulleys, different types of pulley systems, multiple pulley systems - Chain and rope sheaves and sprockets.

UNIT III MATERIAL HANDLING ATTACHMENTS (9 Hrs)

Load handling attachments - standard forged hook, hook weights, hook bearings, cross piece and casing of hook - crane grab for unit and piece loads - carrier beams and clamps - load platforms and side dump buckets - electric lifting magnets - grabbing attachments for loose materials - crane attachments for handling liquid materials.

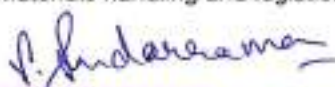### UNIT IV MATERIAL HANDLING SYSTEMS (9 Hrs)

Basic Material Handling systems - Selection, Material Handling method - path, Equipment - function oriented systems.

UNIT V METHODS TO MINIMIZE COST OF MATERIAL HANDLING (9 Hrs)

Methods to minimize cost of material handling - Maintenance of Material Handling Equipments - Safety in handling - Ergonomics of Material Handling equipment - Design, Miscellaneous equipment

Text Books

1. Rudenko N , Materials Handling Equipment , Envee Publishers, New Delhi, 2017
2. Alexandrov M.P Materials Handling Equipment, Mie publications, Moscow, 2013
3. White, John A., Pence, Ira W, Materials handling and logistics, Envee Publishers, New Delhi, 2016

B.Tech. Civil Engineering

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

Reference Books

1. K.C, Arora Vikas, V. Shinde, Aspects of Material handling, Laxmi Publications; First edition, 2015.
2. Siddhartha Ray, Introduction to Material Handling, New Age International, Edition: 2, 2017.
3. RB Chowdary , G. R. N. Tagore,Plant Layout and Material Handling-, Khanna publishers; 2nd edition 2016.
4. James A Apple, Plant layout and Material Handlin, Krieger Pub Co, 2016.
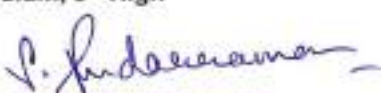5. P.B Mahapatra, Operations Management, PHI, 2016.

Web References

1.https://nptel.ac.in/courses/112/102/112102011/
2. https://nptel.ac.in/courses/112/107/112107142/
3. https://nptel.ac.in/courses/112/107/112107143/
4. https://www.youtube.com/watch?v=WXmIdbVDJqE
5. https://www.youtube.com/watch?v=BBWPIByOEfI

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	1	3	2	2
CO2	3	3	3	3	-	-	-	-	-	-	-	1	2	2	2
CO3	3	3	3	3	-	-	-	-	-	-	-	1	2	2	2
CO4	3	3	3	3	-	-	-	-	-	-	-	1	3	2	2
CO5	3	3	3	3	-	-	-	-	-	-	-	1	3	2	2

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

	BASIC DBMS	**L**	**T**	**P**	**C**	**Hrs**
U20CCO401	(Common to EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME Branches)	3	0	0	3	45

Course Objectives

- To understand about basics of Database Management System.
- To provide a general introduction to relational model and relational algebra.
- To study about normalization and SQL.
- To acquire knowledge about storage indexing and transaction management.
- To gain knowledge about the backup and recovery in database.

Course Outcomes

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

CO1 – Explain the concept of database management system.**(K2)**

CO2 – Create conceptual data model using entity relationship diagram.**(K2)**

CO3 – Analyze the various normalization.**(K4)**

CO4 – Describe the concept of storage indexing and transactions.**(K2)**

CO5 – Explain the database recovery and security.**(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT - I INTRODUCTION TO DATABASE MANAGEMENT (9 Hrs)

Introduction to Database Management systems – History - Characteristics – Users- three-level architecture- Entity-- relationship data model.

UNIT – II - THE RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA (9 Hrs)

Data structures – Mapping E-R Model to Relational model – data manipulation – integrity – advantages – rules for fully relational systems – relational algebra – relational algebra queries.

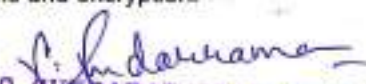## UNIT - III - STRUCTURED QUERY LANGUAGE AND NORMALIZATION (9 Hrs)

SQL – Data definition – manipulation – views SQL in procedural programming – data integrity and constraints – triggers – data control – database security. Normalization – Undesirable properties – single-valued normalization – desirable properties of decompositions – multivalued dependencies

UNIT –IV STORAGE INDEXING AND TRANSACTIONS MANAGEMENT (9 Hrs)

Different types of memories – secondary storage – buffer management – file structures – heap files – sorted files – index and types – indexed sequential file – B-tree – B+ tree. Transaction management – concepts – examples – schedules – serializability – concurrency control – deadlocks – lock and multiple granularity – nonlocking techniques.

UNIT –V DATABASE BACKUP, RECOVERY AND SECURITY (9 Hrs)

Database system failure – backup – recovery and concept of log – log-based recovery techniques – types of recovery – log-based immediate update recovery technique. Database Security – violations – identifications and authentication – authorization / access control – security of statistical databases – audit policy – internet applications and encryption.

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Text Books

1. Gupta.G.K, "Database Management Systems", Tata McGraw Hill, 2011
2. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts 7th Edition, McGraw-Hill International Edition, 2019.
3. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, United States of America, 2018.

Reference Books

1. Silberschatz, Korth.H and Sudarshan.S, "Database System Concepts", 6th Edition, McGraw-HillInternational, 2011.
2. Hector Garcia-Molina, Jeffrey D.Ullman, Jennifer Widom, "Database System The Complete Book, 1st Edition, Pearson 2002.
3. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, 8th Edition, Pearson Education-2006.
4. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill, 2014.
5. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems", 7th Edition, Pearson Education, 2016.

Web References

1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
2. http://dev.mysql.com/doc/
3. http://www.rjsprn.com/PDF/BCA-428%20Oracle.pdf
4. http://www.w3schools.com/
5. https://www.codecademy.com/learn/learn-

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO2	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO3	3	3	1	-	1	-	-	-	-	-	1	1	-	-	1
CO4	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO5	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

U20CCO402	INTRODUCTION TO COMMUNICATION SYSTEMS	L	T	P	C	Hrs
	(Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME)	3	0	0	3	45

Course Objectives

- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communication techniques

Course Outcomes

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

CO1- Comprehend the basic Characteristics of the signals.(K2)

CO2- Comprehend needs of modulation and various analog modulation techniques (K2)

CO3- Illustrate pulse modulation and multiplexing (K3)

CO4- Explain Digital transmission techniques (K2)

CO5- Describe multiple access techniques and advanced communication systems.(K2)

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I SIGNAL ANALYSIS (9 Hrs)

Introduction to Signals- Representation and classification of Signals, Representation of signal in frequency domain, introduction to Spectrum of signal- Introduction to Fourier series and Fourier Transform

UNIT II ANALOG COMMUNICATION (9 Hrs)

Need for Modulation— Block diagram of analog communication System- Amplitude Modulation – AM, DSBSC, SSBSC, modulators and demodulators – Angle modulation – PM and FM – modulators and demodulators – Superheterodyne receivers

UNIT III PULSE COMMUNICATION (9 Hrs)

Low pass sampling theorem – Quantization – PAM – PCM, DPCM, DM, and ADPCM And ADM - Time Division Multiplexing, Frequency Division Multiplexing
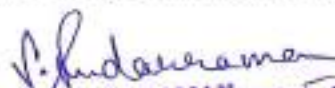
UNIT IV DIGITAL COMMUNICATION (9 Hrs)

Comparison of digital and analog communication system- Block diagram of digital communication system Phase shift keying – BPSK, DPSK, QPSK

UNIT V MULTIPLE ACCESS TECHNIQUES AND ADVANCED COMMUNICATION (9 Hrs)

Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3rd edition, TMH 2007
2. S. Haykin, "Digital Communications", John Wiley, 2005
3. B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

Reference Books

1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
2. B.Sklar," Digital Communications Fundamentals and Applications", 2nd edition Pearson Education 2007.
3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
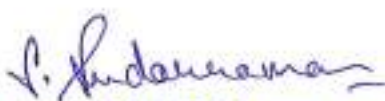5. Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

Web References

1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO2	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO3	3	3	1	-	1	-	-	-	-	-	1	1	-	-	1
CO4	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO5	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

U20ADO401	KNOWLEDGE REPRESENTATIONS AND REASONING (Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To investigate the key concepts of knowledge representation (KR) techniques and different notations.
- To integrate the KR view as knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes

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

CO1 - Analyse and design knowledge based systems intended for computer implementation. **(K3)**

CO2 - Acquire theoretical knowledge about principles for logic-based representation and reasoning. **(K2)**

CO3 - Ability to understand knowledge-engineering process. **(K2)**

CO4 - Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making. **(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I (9 Hrs)

The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic. Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

UNIT II (9 Hrs)

Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.
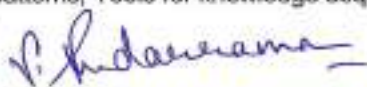
UNIT III (9 Hrs)

Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS (9 Hrs)

Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT V ETHICS AND RECENT TRENDS (9 Hrs)

Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics. Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition.

B.Tech. Civil Engineering

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

Text Books

1. John F. Sowa, Thomson Learning "Knowledge Representation logical, Philosophical, and Computational Foundations", Course Technology Inc. publication, 1999.
2. Ronald J. Brachman, Hector J. Levesque,"Knowledge Representation and Reasoning", Morgan Kaufmann; 1st edition, 2004.
3. Eileen Cornell Way "Knowledge Representation and Metaphor" Springer; 1991st edition, 1991.

Reference Books

1. Trevor Bench-Capon, "Knowledge representation: an approach to artificial intelligence", Academic Press, 2014.
2. Yulia Kahl, Michael Gelfond "Knowledge Representation, Reasoning, and the Design of Intelligent Agents The Answer-Set Programming Approach", Cambridge University Press; 1st edition, 2014.
3. Arthur B. Markman, "Knowledge representation" Psychology Press; 1st edition, 1998.
4. Sanida Omerović, Grega Jakus, V. Milutinovic, Sašo Tomažič "Concepts, Ontologies, and Knowledge Representation" Springer; 2013.
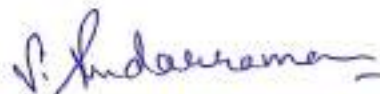5. Bernhard Nebel, Gerhard Lakemeyer "Foundations of Knowledge Representation and Reasoning" Springer, 1994.

Web Resources

1. https://www.javatpoint.com/knowledge-representation-in-ai
2. https://nptel.ac.in/courses/106/106/106106140/
3. https://www.youtube.com/watch?v=kXlr6ydiPAQ

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	3	-	-	-	-	-	-	-	1	1	-
CO2	2	3	2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	1	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO4	1	2	1	2	1	-	-	-	-	-	-	-	-	-	-
CO5	2	1	3	1	3	-	-	2	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering

| U20ADO402 | **INTRODUCTION TO DATA SCIENCE**
(Common to EEE, ECE, CSE, IT, ICE, MECH,
CIVIL, CCE, BME, Mechatronics) | L
3 | T
0 | P
0 | C
3 | Hrs
45 |

Course Objectives
- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving, ethics surrounding privacy and acting of data science applications.

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

CO1 - Explore the fundamental concepts of data science. **(K2)**

CO2 - To understand the Mathematical Knowledge for Data Science.**(K2)**

CO3 - Visualize and present the inference using various tools. **(K3)**

CO4 - To expose the different opportunities in Industries. **(K3)**

CO5 - Learn to think through the ethics surrounding privacy, data sharing and decision-making. **(K2)**

KNOWLEDGE LEVEL: K1 – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I INTRODUCTION TO DATA SCIENCE (9 Hrs)
Definition – Big Data and Data Science Hype – Why data science – Getting Past the Hype – The Current Landscape – Who is Data Scientist? - Data Science Process Overview – Defining goals – Retrieving data – Data preparation – Data exploration – Data modeling – Presentation..

UNIT II MATHEMATICAL PRELIMINARIES (9 Hrs)
Probability: Probability vs. Statistics – Compound Events and Independence – Conditional Probability – Probability Distribution. Descriptive Statistics: Centrality Measures – Variability Measures - Interpreting Variance – Characterizing Distributions. Correlation Analysis: Correlation Coefficient – The Power and Significance – Detection Periodicities. Logarithms: Logarithms and Multiplying Probabilities – Logarithms and Ratios – Logarithms and Normalizing Skewed Distributions.

UNIT III DATA SCIENCE TOOLS (9 Hrs)
Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools – Data Visualization Tools – Tools for Data Science.

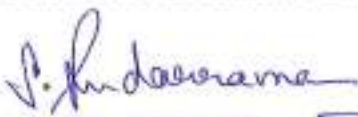### UNIT IV INDUSTRIALIZATION, OPPURTUNITIES AND APPLICATIONS (9 Hrs)
Data Economy and Industrialization – Introduction: Data Economy, Data Industry, Data Services – Data Science Application: Introduction, General Application Guidance - Different Domain – Advertising – Aerospace and Astronomy – Arts, Creative Design and Humanities – Bioinformatics – Consulting Services – Ecology and Environment – Ecommerce and Retail - Education – Engineering – Finance and Economy – Gaming.

UNIT V ETHICS AND RECENT TRENDS (9 Hrs)
Data Science Ethics – Doing good data science – Owners of the data - Valuing different aspects of privacy - Getting informed consent - The Five Cs – Diversity – Inclusion – Future Trends.

Text Books
1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications Co., 1st edition, 2016.
2. Chirag Shah, "A Hands on Introduction to Data Science", Cambridge University Press, 2020.

B.Tech. Civil Engineering

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

3. SinanOzdemir, "Principles of Data Science", Packt Publication, 2016.
4. D J Patil, Hilary Mason, Mike Loukides, "Ethics and Data Science", O' Reilly, 1st edition, 2018.

Reference Books

1. Hector Guerrero, "Excel Data Analysis: Modeling and Simulation", Springer International Publishing, 2nd Edition, 2019.
2. Paul Curzon, Peter W. Mc Owan, "The Power of Computational Thinking", World Scientific Publishing, 2017.
3. Steven S. Skiena, "Data Science Design Manual", Spring International Publication, 2017.
4. Rajendra Akerkar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Spring International Publication, 2016.
5. Longbing Cao "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Spring International Publication, 2018.

Web Resources

1. https://www.youtube.com/watch?v=-ETQ97mXXF0&ab_channel=edureka%21
2. https://www.javatpoint.com/data-science
3. https://www.coursera.org/browse/data-science /

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	2	-	-	-	-	-	-	-	-	-	-
CO2	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	2	1	3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	1	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	2	1	1	2	1	-	-	1	-	-	-	-	-	-	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.S. SUNDARARAMAN, M.Tech., Ph.D.,
Professor & Head
Department of Civil Engg
Sri Manakula Vinayagar Engg. College
Madagadipet, Puducherry, India

B.Tech. Civil Engineering