



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

M1: 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.



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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.



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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.

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.



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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	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
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*

SEMESTER – I										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		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			Credits	Max. Marks		
				L	T	P		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

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**

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
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**

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
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	U20XO4XX	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	U20CES403	Skill Development Course 3*	EEC	0	0	2	-	100	-	100

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

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

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

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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	U20CES809	Skill Development Course 9: NPTEL / MOOC-II	EEC	0	0	0	-	100	-	100
							18	365	335	700

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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

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


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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

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

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

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

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

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

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**

Sl. 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**


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SEMESTER – I

U20BST101	ENGINEERING MATHEMATICS – I	L	T	P	C	Hrs
	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

(12 Hrs)

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.



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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.
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


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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 quantites – spectral quantities – relationship between luminescence and radiant quantities – hemispherical reflectance and transmittance – photometry: cosines law, inverse square law. Vision – photopic, mesopic, 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.


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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.

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


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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 specifiers - 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

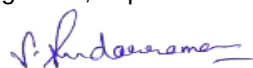
(9 Hrs)

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 –



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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.

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.

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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


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U20EST119	ENGINEERING MECHANICS	L	T	P	C	Hrs
	(Common to Civil, ECE, EEE, MECH, Mechatronics)	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


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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, Wiley student edition, 2016.
3. R.C. Hibbeler, "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)

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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


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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


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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.

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


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U20ESP102

PROGRAMMING IN C LABORATORY(Common to CSE, ECE, EEE, IT, ICE, MECH,
CIVIL,BME,MECHTRONICS, CCE)

L	T	P	C	Hrs
0	0	2	1	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



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4. <https://www.tenouk.com/clabworksheet/clabworksheet.html>
5. <https://fresh2refresh.com/c-programming/>

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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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


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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 Education Publication, 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.


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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/>

COs/POs/PSOs Mapping

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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


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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.
- To 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

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

PLUMBING

1. Different types of pipes, joints, taps, fixtures and accessories used in plumbing.
2. 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

1. Exposure to various building materials like sand, cement, bricks, wood, steel, plastics, aluminum etc and their preliminary testing methods
2. 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"


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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>

COs/POs/PSOs Mapping

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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


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U20CEC1XX

CERTIFICATION COURSE - I

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.



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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


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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 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,


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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.


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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.


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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.

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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.

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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


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


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characteristics of rotating machines – DC Motor and DC Generator - single phase/three phase induction motor, Alternator and synchronous motor (Qualitative approach only)

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


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Web References

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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/117/102/117102059/>

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


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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


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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.
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.

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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


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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.


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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.

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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. Jose and Dr. Sudhi Mary Kurian, "Mechanics of Solids" Pentagon Educational Services, 2nd Edition, 2018.
5. Dr. R. P. Rathaliya, "Mechanics of Solids" AtulPrakashan, 2018.

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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


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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 conservation 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 –


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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.
2. Jain.A.K., "Fluid Mechanics" (Including Hydraulic Machines), Twelfth Edition, Khanna Publishers, 2016
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2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
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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.

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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


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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



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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

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

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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


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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 $X_L > X_C$, $X_C > X_L$
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.


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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

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>

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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


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U20CEP203	FLUID MECHANICS AND MACHINES				L	T	P	C	Hrs
	LABORATORY				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

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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/>


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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



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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.

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


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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


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U20CEC2XX**CERTIFICATION COURSE - II**

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.



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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


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U20CEM202

ENVIRONMENTAL SCIENCE

L	T	P	C	Hrs
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


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SEMESTER – III

	PROBABILITY AND STATISTICS	L	T	P	C	Hrs
U20BST324	(Common to CIVIL & AI & DS)	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.


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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 – 3rd Edition, 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, 1st Edition, 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 – January 2008.
5. E. Rukumangadachari, "Probability and Statistics", Pearson Education India – January 2012.

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

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CO4	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
CO5	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-

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


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U20EST356	DATA STRUCTURES (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.


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Text Books

1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
2. Thomas H. Cormen, 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.
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/>

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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


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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


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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.

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1. Ramamrutham, S., "Strength of Materials", Dhanpat Rai and 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.
5. Dr. R. P. Rathaliya, "Mechanics of Solids" Atul Prakashan, 2018.

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1. <https://nptel.ac.in/content/storage2/courses/105105109/pdf/m3l15.pdf>
2. <https://www.youtube.com/watch?v=uMuFpT1gFVI>
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


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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 – Trigonometrical Levelling - 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


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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
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., "Surveying Vol I and II", Standard Book house, 10th Edition 2016
5. A. M. Chandra, "Plane Surveying" New Age International Publishers 2007.

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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


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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.



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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.
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

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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


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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.


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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)

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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/>
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
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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


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	GENERAL PROFICIENCY-I	L	T	P	C	Hrs
U20HSP301	(Common to all branches except CSBS)	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.


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- 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

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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>

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


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


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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.

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


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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


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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

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

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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


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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. Specific gravity,
 - 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)


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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/>

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


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U20CEC387

CERTIFICATION COURSE - III

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.



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U20CES302

SKILL DEVELOPMENT COURSE 2

(Choose any one of the following course)

L	T	P	C	Hrs
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.



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U20CEM303**PHYSICAL EDUCATION**

L	T	P	C	Hrs
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.



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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 ALGEBRAIC AND 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



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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.

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 Analysis 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.

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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


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U20EST467**PROGRAMMING IN JAVA**

L	T	P	C	Hrs
3	0	0	3	45

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

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.



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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.

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
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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


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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 the slab using limit state method **(K2)**

CO4 - Design the 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 OF SLAB**(12 Hrs)**

Design of one way and two way slabs - Design of continuous (one-way only) slabs.

UNIT IV LIMIT STATE DESIGN OF COLUMN**(12 Hrs)**

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)


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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.
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 & SP 16

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

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	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


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U20CET410**GEOTECHNICAL ENGINEERING-II**

L	T	P	C	Hrs
3	0	0	3	45

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.
- Gain knowledge about, investigate the soil condition and to design a suitable foundation.
- Gain knowledge about design procedure for shallow and deep foundation.
- Understand 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. **(K4)**

CO2 - Get knowledge on bearing capacity and testing methods. **(K3)**

CO3 - Select the type of foundation required for the soil at a place and able to design different types of foundation. **(K4)**

CO4 - Determine the load carrying capacity of pile foundation. **(K5)**

CO5 - Gain knowledge about retaining structures and Stability analysis. **(K4)**

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

UNIT I SOIL EXPLORATION**(12 Hrs)**

Site investigation – Soil exploration methods- Hand augers and power drills- Wash boring - samplers-sampling method - 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 group pile 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.


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Text Books

1. Punmia B.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
4. 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. 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. Michael A. Joyce "Site Investigation Practice", E. & F.N. Spon, 1982

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1. <https://nptel.ac.in/courses/105/101/105101083/>
2. <https://nptel.ac.in/courses/105105176/>
3. <https://nptel.ac.in/courses/105/105/105105039/>

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


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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)


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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.

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


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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.


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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


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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>


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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


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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 insitu 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)

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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).
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): 1987II, 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


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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.



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U20CES403

SKILL DEVELOPMENT COURSE 3

(Choose any one of the following course)

L	T	P	C	Hrs
0	0	2	-	30

1. SAFETY IN BUILDING 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


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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



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SEMESTER – V

U20BST551	OPERATIONS RESEARCH (Common to CIVIL, AI & DS & MECHATRONICS)				
	L	T	P	C	Hrs
	2	2	0	3	60

Course Objectives

This course should enable the students to

- Understand the role of operation research in decision making.
- Provide knowledge and training in using optimization techniques.
- Impart the various operation research models for effective problem solving.
- Understand the basics and the methods of solving game theory and network problems.
- Acquire knowledge in principles of Queuing Theory.

Course Outcomes

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

CO1 - Understand the characteristics of different types of decision-making environments. **(K2)**

CO2 - Solve Transportation Models and Assignment Models. **(K3)**

CO3 - Design new simple models by using critical path method. **(K3)**

CO4 - Understand the applications of game theory. **(K2)**

CO5 - Apply Queuing theory and solve problems related to it. **(K3)**

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

UNIT I LINEAR PROGRAMMING

(12Hrs)

Stages of development of Operations Research – Applications of Operations Research – Limitations of Operations – Introduction to Linear Programming – Graphical Method – Simplex Method – Duality.

UNIT II TRANSPORTATION PROBLEMS

(12Hrs)

Basic feasible solution by different methods - Fixing optimal solutions- Stepping stone method- MODI method- Assignment problem – Formulation – Optimal solution.

UNIT III NETWORKS MODELS

(12 Hrs)

Shortest Path Problem – Floyd's Algorithm – Minimum Spanning Tree Problem - CPM/PERT – Crashing of a Project network.

UNIT IV THEORY OF GAMES

(12 Hrs)

Rectangular games – Minimax theorem – graphical solution of $2 \times n$ or $m \times 2$ games – game with mixed strategies.

UNIT V QUEUING THEORY

(12 Hrs)

Basic Waiting Line Models: $(M/M/1):(GD/\alpha/\alpha)$ – $(M/M/1):(GD/N/\alpha)$ – $(M/M/C):(GD/\alpha/\alpha)$ – $(M/M/C):(GD/N/\alpha)$.


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Text Books

1. Michael W.Carter, Camille C.Price, Ghaith Rabadi, "Operation Research – A Practical Introduction" Chapman and Hall/CRC; 2nd Edition 2018.
2. Jiongmin Yong, "Optimization Theory: A concise Introduction", World scientific publishing company, 2018.
3. John F. Shortle, James M. Thompson, Donald Gross, Carl M. Harris, "Fundamentals of Queuing Theory", 5th Edition, 2018.

Reference Books

1. A. Ravi Ravindran, "Operations Research Methodologies", Taylor and Francis, 2019.
2. Hasting, Kevin J. "Introduction to the Mathematics of Operations Research with Mathematics", Taylor and Francis, 2019.
3. A.M.Natarajan, P.Balasubramane and A.Tamilarasi, "Operations Research", Pearson. 2nd Edition, 2014.
4. J. K. Sharma, "Operations Research Theory and applications", Macmillan India Ltd, 5th Edition, 2013.
5. Hamdy A. Taha, "Operations Research: An Introduction", Pearson Publications, 10th Edition, 2020.

Web References

1. <https://www.researchgate.net/publication/313880623>
2. <https://nptel.ac.in/courses/117/103/117103017/>
3. <https://nptel.ac.in/courses/111/107/111107128/>
4. <https://youtu.be/MrOwmSYqkiE>
5. <https://youtu.be/4U3B5lr-MqM>

COs/POs/PSOs Mapping

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CO3	3	2	1	1	-	1	-	-	-	-	2	1	1	-	-
CO4	2	1	-	-	-	-	-	-	-	-	2	1	1	-	-
CO5	3	2	1	1	-	-	-	-	-	-	2	1	1	-	-

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


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U20CET511

STRUCTURAL ANALYSIS – I

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

This course should enable the students to

- Analyze statically indeterminate beams by using Force method
- Analyze the pin jointed frame by using Force method
- Analyze statically indeterminate beams and frames by using Slope deflection method
- Analyze statically indeterminate beams and frames by using Moment distribution method
- Analyze the statically determinate and indeterminate structures of suspension bridges

Course Outcomes

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

CO1 – Understand the concept of degree of static indeterminacy of force method **(K3)**

CO2 – Apply the concept of redundant frames by using force method **(K3)**

CO3 – Apply the fundamental principles of structural analysis for indeterminate structures **(K3)**

CO4 – Evaluate the structural behavior of indeterminate structures **(K3)**

CO5 – Analyze the behavior of a typical suspension bridges **(K3)**

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

UNIT I FORCE METHOD**(12 Hrs)**

Concept of static and kinematic indeterminacies – Introduction to force and displacement methods - Analysis of continuous beams with maximum three redundant forces by force method

UNIT II ANALYSIS OF FRAMES**(12 Hrs)**

Analysis of trusses with internal and external redundancy with maximum one redundant of simply supported and cantilever truss by force method.

UNIT III SLOPE DEFLECTION METHOD**(12 Hrs)**

Slope deflection equations – Equilibrium conditions – Analysis of continuous beams and portal frames without sway - Non-sway analysis

UNIT IV MOMENT DISTRIBUTION METHOD**(12 Hrs)**

Stiffness and carry over factors – Distribution and carry over moments – Analysis of continuous beams and portal frames without sway - Non-sway analysis

UNIT V SUSPENSION BRIDGES**(12 Hrs)**

Analysis of Suspension bridges with statically determinate structures of two hinged stiffening girders and statically indeterminate structures of three hinged stiffening girders

Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 1 & 2, Laxmi Publications Pvt. Ltd, New Delhi, 2016, 4th Edition
2. Bhavikatti, S.S, Structural Analysis, Vol. 1 & 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, 4th


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Edition

3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Arun Shyam, Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Roy Sujit Kumar, Chakrabarty Subrata, Fundamentals of Structural Analysis: With Computer Analysis and Applications Paperback, S Chand & Company Publisher, 2003, 2nd Edition

Reference Books

1. Dr.R.P. Rethaliya, Structural Analysis-I, Atul Prakashan Publisher, 2020
2. Dr. Suresh R. Parekar, H.M. Somayya, Structural Analysis- I, Nirali Prakashan Publisher, 2014
3. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
4. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
5. Thandavamoorthy, "Analysis of Structures", Oxford and IBH Publishers, New Delhi.2008

Web References

1. <https://nptel.ac.in/courses/105105166/>
2. https://onlinecourses.nptel.ac.in/noc20_ce35/unit?unit=50&lesson=51
3. <https://nptel.ac.in/courses/105101085/>

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	1	1	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3

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


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U20CET512**ENVIRONMENTAL ENGINEERING – I**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the basics, importance, and methods of water supply.
- Gain knowledge on various sources and properties of water.
- Understand the various methods of conveyance and distribution system of water.
- Learn the objectives and methods of water treatment and to study the features and function of different water treatment units.
- Learn the importance of rain water harvesting and water pollution.

Course Outcomes

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

CO1 - Estimate the future population **(K2)**

CO2 - Understand the different water sources and the characteristics of water and their analysis **(K2)**

CO3 - Design the distribution network and Conveyance **(K4)**

CO4 - Understands the various water treatment process **(K2)**

CO5 - Construct the Water Management system **(K2)**

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

UNIT I INTRODUCTION TO WATER SUPPLY**(9 Hrs)**

Environmental Engineering - Role of Environmental Engineer - Water supply - development of public water supply - need for protected water supplies - objectives of water supply systems - water supply scheme-quantity of water - estimating requirements - Design period – per capita consumption - fluctuations in demand pattern - population forecast – Arithmetic, Incremental, Geometric methods.

UNIT II SOURCES, QUALITY AND STANDARDS OF WATER**(9 Hrs)**

Sources of water - surface and ground water sources – Quality of water - physical, chemical and biological aspects - analysis of water - water quality.

UNIT III CONVEYANCE AND DISTRIBUTION SYSTEM**(9 Hrs)**

Intake structures - pipe materials - hydraulics of flow in pipes - laying, jointing, testing of pipes - pumping stations - selection of pumps - methods of distributing water - storage and distribution reservoirs - analysis of distribution system Hardy- cross method of balancing - equivalent pipes.

UNIT IV WATER TREATMENT SYSTEM**(9 Hrs)**

Definition of unit process and unit operations - objectives of water treatment - methods and sequence of treatment of water - aeration , coagulation, flocculation filtration and disinfection – principles, functions and design - sedimentation - flocculation- filter units - miscellaneous methods -iron and manganese removal - defluoridation and demineralization.

UNIT V WATER MANAGEMENT**(9 Hrs)**

Sustainable Development-Rain Water harvesting-Methods-Water Pollution- Causes and effects- Role of regulatory bodies and Local bodies-CPCB-TWAD Board- CMWSSB etc-Water Act 1974-Case Studies related to Effective Water Management.



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Text Books

1. Garg, S.K., - Environmental Engineering I, Khanna Publishers, New Delhi, 2016
2. Modi, P.N., - Environmental Engineering I, Standard Book House, Delhi, 2016
3. Duggal K.N., - Elements of Environmental Engineering S.Chand and Co. Ltd., New Delhi, 2019

Reference Books

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015.
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
3. Gray N.F, Water Technology, Elsevier India Pvt. Ltd., New Delhi, 2016.
4. Birdie, G.S. and Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, 2016.
5. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2016.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements.
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. nptel.ac.in/courses/105/104/105104102/

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	3	3	3	3	3	3
CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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


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U20CET513	INSTRUMENTATION AND SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS				Hrs
	L	T	P	C	
	3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the concept of measurement system
- Familiarise about accuracy and precision
- Understand about different types of sensors
- Understand about sensor installation
- Understand about data analysis

Course Outcomes

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

CO1 - Identify the type of transducer (**K2**)

CO2 - Create mathematical model of transducer (**K4**)

CO3 - Identify the various types of sensor (**K2**)

CO4 - Design the sensor (**K4**)

CO5 - Analyse and interpret the data (**K4**)

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

UNIT I

(9 Hrs)

Generalized scheme of a measurement system –Units and standards – Static calibration – Errors in measurements–Classification of errors, Limiting error and probable error – Error analysis –Classification of transducers – Selection of transducers

UNIT II

(9 Hrs)

Static characteristics: – Accuracy, precision, resolution, sensitivity, linearity, span and range -Dynamic characteristics: – Mathematical model of transducer – Zero, I and II order transducers - Response to impulse, step, ramp and sinusoidal inputs

UNIT III

(9 Hrs)

Fundamentals of Measurement, Sensing and Instrumentation covering definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations;

UNIT IV

(9 Hrs)

Sensor Installation and Operation covering to: i) Predict the response of sensors to various inputs; ii) Construct a conceptual instrumentation and monitoring program; iii) Describe the order and methodology for sensor installation; and iv) Differentiate between types of sensors and their modes of operation and measurement and v) Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty

UNIT V

(9 Hrs)

Data Analysis and Interpretation covering a) Fundamental statistical concepts, b) Data reduction and interpretation, c) Piezometer, Inclinator, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value


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(mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range)

Text Books

1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis

Reference Books

1. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer
2. Patranabis, Sensors and Transducers, Second Edition, PHI Publisher

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements.
2. https://swayam.gov.in/nd1_noc20_ce23/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	2	1	-	-	-	1	-	-	-	-	-	1	-	-	-
CO2	3	2	1	1	-	1	-	-	-	-	-	1	-	-	-
CO3	3	2	1	1	-	1	-	-	-	-	2	1	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	2	1	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	2	1	-	-	-

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


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U20CEP508**MODELING AND ANALYSIS LABORATORY**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

The course should enable the students to:

- Acquire basic understanding of Modeling and Analysis software
- Understand the different kinds of analysis and apply the basic principles
- Find out the stress and other related parameters of beams, frames with loading conditions
- Learn to apply the basic principles to carry out seismic analysis
- Know the natural frequency of different kind of beams

Course Outcomes

At the end of Course students will be able to

CO1 – Demonstrate the basic features of an analysis package (**K3**)

CO2 – Analyze the structure using E-TABS software (**K3**)

CO3 – Design the structure using E-TABS software (**K3**)

CO4 – Performing analysis and interpretation of results for final design (**K3**)

CO5 – Students would have gained knowledge on the usage of the software (**K3**)

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

LIST OF EXPERIMENTS

1. Introduction to Structural Analysis and Design using ETABS
2. Introduction to various commands of ETABS and their applications in detail.
3. Analysis and Design of Trusses
4. Analysis and Design of continuous beams with fixed at both ends
5. Analysis and Design of continuous beams with simply supported at both ends
6. Analysis and Design of Plane Frames
7. Modeling Analysis and Design of G+1 Story building
8. Modeling and Analysis of G+5 Story building
9. Analysis and Design of 2D Reinforced Concrete Frame
10. Seismic Analysis and Design of 10 Story RC building

Software Required

- ETABS

Web References

1. <https://www.youtube.com/watch?v=KgvQxd58BN0>
2. <https://www.youtube.com/watch?v=LOtuwW9-G68>

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	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3

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


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U20CEP509	SENSORS APPLICATIONS IN CIVIL ENGINEERING				L	T	P	C	Hrs
	LABORATORY				0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the different sensors
- Calibration of sensor
- Measurement of signal processing

Course Outcomes

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

CO1 – Identify the sensor (**K2**)

CO2 – Understand the errors in sensor (**K2**)

CO3 – Analyse the digital signal processing (**K2**)

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

LIST OF EXPERIMENTS

1. Instrumentation of typical civil engineering members/structures/structural elements
2. Use of different sensors, strain gauges, inclinometers,
3. Performance characteristics
4. Errors during the measurement process
5. Calibration of measuring sensors and instruments
6. Measurement, noise and signal processing
7. Analog Signal processing
8. Digital Signal Processing
9. Demonstration & use of sensor technologies
10. A comprehensive study of data transmission in wireless sensor network.

Reference Books

1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis

COs/POs/PSOs Mapping

Cos	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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CO1	2	1	-	-	-	1	-	-	-	-	-	1	-	-	-
CO2	3	2	1	1	-	1	-	-	-	-	-	1	-	-	-
CO3	3	2	1	1	-	1	-	-	-	-	2	1	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	2	1	-	-	-
CO5	3	2	1	1	-	-	-	-	-	-	2	1	-	-	-

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


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U20CEP510

REVIT ARCHITECTURE

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

The course should enable the students to:

- Get exposed to the usage of software
- Learn the concepts of planning and orientations.
- Create a full 3D Elements like walls, doors, windows, components, floors, ceilings, roofs, stairs.
- Create a full 3D architectural project model
- Learn the concept of walkthrough in Revit Architecture.

Course Outcomes

At the end of Course students will be able to

CO1 - Describe building information modeling methodology and its benefits. **(K3)**

CO2 - Use different parts of the Revit Architecture user interface and work with different types of architectural elements and families. **(K3)**

CO3 - Use the different views listed in the Project Browser, control the visibility and graphical **(K3)**

CO4 - Representation of objects in architecture model, and work with elevation, section, and 3D views. **(K4)**

CO5 - Set up a project and transfer standards between projects, add and modify levels in project model, create and modify grids. **(K4)**

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

List of Experiments

1. Introduction
2. Core concepts
3. Touring the Revit Workspace
4. Starting a Project in Revit
5. Levels, Grids, and Columns
6. Using walls
7. Doors and Windows
8. How to use components
9. Use of columns and their types
10. Use of stairs and their types
11. Railing in Revit
12. Ramps
13. Floors
14. Roof
15. Text
16. Camera
17. Walk through
18. 3D modeling of Residential building


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Reference Books

4. 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.
5. Dr. N. Kumaraswamy, A. KameswaraRao, Charotar Publishing- Building planning and Drawing, 2017
6. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheebea Publishers, 2018.

Web References

1. https://www.google.com/search?q=revit+architecture+tutorial&rlz=1C1CHBD_enIN877IN877andog=REVIT+ARCHITECTURE+tandags=chrome.1.69i57j0l7.13121j0j8andsourceid=chrome&ie=UTF-8
2. <https://www.youtube.com/watch?v=cJz20pnOGrw>
3. <https://www.pdfdrive.com/revit-architecture-d18827665.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	1	2	1	3	1	-	-	2	3	-	3	3	2	3
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CO3	3	1	2	1	3	1	-	-	2	3	-	3	3	2	3
CO4	3	1	2	1	3	1	-	-	2	3	-	3	3	2	3
CO5	3	1	2	1	3	1	-	-	2	3	-	3	3	2	3

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


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U20CEP511	ESTIMATION COSTING AND VALUATION				L	T	P	C	Hrs
	ENGINEERING				0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the basics knowledge of estimation, costing and valuation of civil engineering works.
- Analyze the estimate gives an idea of time required for the completion of the work.
- Understand the standard schedule of rates of the current year.
- Provide the knowledge on various cost estimate for civil projects
- Analyze the rates and estimate the various construction works

Course Outcomes

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

CO1 - Measure and Estimate various elements in Civil Engineering works **(K2)**

CO2 - Prepare Detailed Estimate for a given building **(K3)**

CO3 - Rate analysis for different types of works **(K2)**

CO4 - Estimate the material quantities, prepare a bill of quantities and tender documents of project **(K2)**

CO5 - Prepare value estimates and report for a residential building. **(K3)**

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

LIST OF EXPERIMENTS

1. Introduction about Estimation, Costing and Valuation
2. To prepare a detailed and abstract estimate of Single roomed building for substructure (Load Bearing Structure)
 - a. Earthwork Excavation for foundations
 - b. P. C. C. (1:4:8) for foundations
 - c. Brick Masonry in CM (1:5) for foundation and basement
 - d. River sand filling for basement
 - e. Plinth beam
3. To prepare a detailed and abstract estimate of Single roomed building for superstructure (Load Bearing Structure)
 - a. Brick Masonry in CM (1:6) for superstructure
 - b. R.C.C (1:2:4) for lintels, beams etc.
 - c. R.C.C (1:2:4) for slabs
 - d. Cement concrete (1:5:10) flooring
 - e. Flooring with mosaic tiles
 - f. Plastering with CM (1:6) for superstructure
 - g. Plastering with CM (1:5) for ceiling
 - h. White washing with two coats
 - i. Color washing with two coats
 - j. Supply and fixing of doors and windows
4. To prepare a detailed and abstract Estimate of Single storied Residential Building (Framed Structure)
5. Estimate of Septic tank with Soak pit
6. Estimate of Isolated column and Footing
7. Estimate of Box Culvert
8. Estimate of Underground Rectangular Water Tank



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9. Estimation of Bar bending schedule
10. Analysis of Rates
11. Valuation

Reference Books

1. D.D Kohli and R.C Kohli, "A Text Book of Estimating and Costing (Civil)", S. Chand and Company Ltd., 2013
2. V. N. Vazirani, S. P. Chandola, Civil Engineering Estimating, Costing & Valuation, Khanna Publishers, 1968
3. Rangwala, Estimation, Costing and Valuation, Charotar Publishing house Pvt Ltd, 17th Edition, 2017
4. S.P. Mahajan, Sanjay Mahajan, Quantity Surveying and Valuation book, Tech India Publication series, 2017
5. Govt of Tamil Nadu PWD – "Standard Schedule of Rates", 2017-18

Web References

1. <https://mis.wbprd.gov.in/Engineering/Document/BoxCulvertorMinorBridgeSampleEstimate.pdf>
2. <https://www.cphbooks.in/product/estimating-costing-and-valuation/>
3. <https://www.flipkart.com/estimating-costing-civil-engineering-theory-practice-including-specification-valuation>

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
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CO3	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	1	-	-	-	-	-	-	-	3	3	3

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


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U20CEC5XX**CERTIFICATION COURSE - V**

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.



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U20CES504	SKILL DEVELOPMENT COURSE 4					L	T	P	C	Hrs
	(Foreign Language / IELTS - I)					0	0	2	-	30

Student should choose the Foreign Language/IELTS course like Japanese/French/Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are to be approved by Academic Council on the recommendation of HOD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting, Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation.


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U20CES505	SKILL DEVELOPMENT COURSE 5	L	T	P	C	Hrs
	(Presentation Skills using ICT)	0	0	2	0	30

The methodology used is “learning by doing”, a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

CT skills

- Understand ICT workflow in cloud computing.
- Manage multitasking.
- Deal with main issues using technology in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Teaching tools

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study and have to prepare a report, running to 15 or 20 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee for a total of 100 marks. The marks attained for this course is not considered for CGPA calculation.


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U20CEM505

INDIAN CONSTITUTION

L	T	P	C	Hrs
2	0	0	-	30

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.


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SEMESTER – VI

U20CET614**DESIGN OF STEEL STRUCTURES**

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

This course should enable the students to

- Gain knowledge on the limit state design of steel structures and the design of connections
- Be familiar with the design concepts of steel structural members subjected to tension.
- Understand the design concepts of the structural steel members subjected to compression.
- Be familiar with the design concepts of structural members subjected to bending.
- Be acquainted with the design of connections

Course Outcomes

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

CO1 – Design steel structural joints using bolts and welds. **(K5)**

CO2 – Design the structural members subjected to tension. **(K5)**

CO3 – Design single and compound compression members and the laced and battened columns. **(K5)**

CO4 – Design laterally supported and unsupported beams subjected to axial bending. **(K5)**

CO5 – Design the steel connection. **(K5)**

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

UNIT– I INTRODUCTION TO LIMIT STATE DESIGN**(12 Hrs)**

Properties of steel - Structural steel sections - types of connections, terminologies, failures in bolted and welded joints, Design of Joints – lap joint, single cover butt joint and double cover butt joint using bolts and welds under axial loading - Efficiency of joints.

UNIT – II DESIGN OF TENSION MEMBERS**(12 Hrs)**

Types of sections - Design of single and double angle tension member under Axial Loading using bolts and welds – Concept of shear lag –Design of tension Splices- Use of Lug Angles.

UNIT – III DESIGN OF COMPRESSION MEMBERS**(12 Hrs)**

Theory of columns - Modes of failures, Design of axially loaded compression members, design of Built- up columns, Design of Lacings and Battens, Design of Column Splices.

UNIT – IV DESIGN OF FLEXURAL MEMBERS**(12 Hrs)**

Modes of failures, Design of beam, design of laterally supported beam, design of laterally unsupported beam, design of built up beam – plate girder.

UNIT – V INDUSTRIAL STRUCTURES AND TRUSSES**(12 Hrs)**

Gantry girder (design procedure) - Design of purlins - Types of roof trusses for different spans- Estimation of dead, live and wind loads.

Text Books

1. N.Subramanian , "Design of Steel Structures" , Oxford University press, 2018.
2. S.K.Duggal, "Limit State Design of Steel Structures", Tata McGraw Hill Education Pvt. Ltd, 2019
3. Dayaratnam.P, "Design of Steel Structures", Wheeler and Co Ltd., Allahabad, 2012
4. S.S.Bhavikatti, "Design of Steel Structures " , I.K. International Publishing House, 2019



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5. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
6. IS 800 -2007, General Construction in Steel - Code of Practice.
7. SP 6-1 (1964): ISI Handbook for Structural Engineers -Part1 Structural Steel Sections [CED 7: Structural Engineering and structural sections]

Reference Books

1. Dr.Ramachandra, Virendra Gehlot, "Limit State Design of Steel Structures", Standard Publishers, 2012
2. Dr. V.L.Shah, S.S.Karve, "Limit State Design of Steel Structures", Structures Publications, 2012.
3. Punmia B.C, Ahok Kumar Jain and Arun Kumar Jain, "Comprehensive Design of Steel Structures", Lakshmi publications (P) Ltd., New Delhi, 2015.
4. Arya, A.S. and Ajmani, J.L., "Design of Steel Structures", Nem Chand and Bros, Roorkee, 2011.
5. Salmon and Johnson, "Steel Structures- Design and Behaviour", Intext Educational Publishers, 1993

Web References

1. <https://nptel.ac.in/courses/105105162/>
2. <https://nptel.ac.in/courses/105106113/>
3. <https://nptel.ac.in/courses/105106112/>

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	1	1	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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


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U20CET615**STRUCTURAL ANALYSIS – II**

L	T	P	C	Hrs
2	2	0	3	60

Course Objectives

This course should enable the students to

- Analyze the arches and cables with same and different level conditions
- Analyze statically determinate and indeterminate beams for ILD by using Rolling load and Muller Breslau's Principle
- Analyze statically indeterminate beams by using Flexibility Matrix method
- Analyze statically indeterminate beams by using Stiffness Matrix method
- Understand the concept of shape factor for various sections and plastic analysis of beams and frames

Course Outcomes

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

CO1 - Apply suitable methods of analysis for various types of structures including arches and cables (**K3**)

CO2 - Analyze the effects of moving loads on structures using influence lines (**K3**)

CO3 - Identify the problem with static indeterminacy of beam by using force method (**K3**)

CO4 – Identify the problem with kinematic indeterminacy of beam by using displacement method (**K3**)

CO5 - Understand the principles of plastic theory and its applications (**K3**)

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

UNIT I ARCHES AND CABLES**(12 Hrs)**

Arches as structural forms - Examples of arch structures - Types of arches - Analysis of three hinged with same and different level and two hinged with same level - Analysis of forces in cables with same and different level (Analysis the problem with C program)

UNIT II INFLUENCE LINES FOR DETERMINATE AND INDETERMINATE STRUCTURES (12 Hrs)

ILD for simply supported Moving loads – single, uniformly distributed load and several point loads – maximum bending moment and maximum shear force –absolute maximum bending moment – Muller - Breslau's Theorem - principle and its application.

UNIT III FLEXIBILITY MATRIX METHOD**(12 Hrs)**

Equilibrium and compatibility - Determinate vs Indeterminate structures - Indeterminacy - Primary structure - Compatibility conditions - Analysis of continuous beams (with redundancy restricted to two).

UNIT IV STIFFNESS MATRIX METHOD**(12 Hrs)**

Displacement method or stiffness method - General – Procedure – Stiffness matrix – Procedure for stiffness matrix – Stiffness coefficient - comparison of Flexibility and Stiffness methods - Analysis of continuous beams (with redundancy restricted to two)

UNIT V PLASTIC ANALYSIS OF STRUCTURES**(12 Hrs)**

Introduction - Plastic modulus - Shape factor - Load factor – Plastic hinge concepts - redistribution of moments – collapse mechanism - Upper and lower bound theorems - Plastic moment of resistance - Plastic analysis of continuous beams and portal frames without sway.


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Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 2, Laxmi Publications Pvt. Ltd, New Delhi, 2017, 3rd Edition
2. Bhavikatti, S.S, Structural Analysis, Vol. 2, Vikas Publishing House Pvt. Ltd., New Delhi, 2018, 4th Edition
3. B.C.Punmia, Ashok Kumar Jain, Arun K. Jain, " Theory of Structures", Laxmi Publications Pvt. Ltd, 2017, 13th Edition
4. Pandit G.S, and Gupta S. P, "Structural Analysis a Matrix Approach", Tata McGraw Hill Publications, New Delhi, 2008
5. L.S. Negi and R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 2017.
2. Jindal, R. L., Indeterminate Structural Analysis, S. Chand and Company. New Delhi, 2000.
3. Thandavamoorthy, "Analysis of Structures", Oxford and IBH Publishers, New Delhi. 2008
4. Arun Shyam, Karuna Basker, Structural Analysis, Medtech Publisher, 2019
5. Roy Sujit Kumar, Chakrabarty Subrata, Fundamentals of Structural Analysis: With Computer Analysis and Applications Paperback, S Chand & Company Publisher, 2003, 2nd Edition

Web References

1. <https://nptel.ac.in/courses/105105166/>
2. https://onlinecourses.nptel.ac.in/noc20_ce35/unit?unit=50&lesson=51
3. <https://nptel.ac.in/courses/105101085/>

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	3	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3

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


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U20CET616	ENVIRONMENTAL ENGINEERING – II	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the basics of sewage, types of sewers and method of collection of sewage
- Learn the features of various sewer materials and appurtenances
- Learn the objectives and methods of sewage treatment and to study the features and function of different primary treatment units.
- Study the features and function of different secondary treatment units.
- Learn the objectives and methods of sewage disposal and methods of solid waste and sludge management.

Course Outcomes

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

CO1 - Study, analysis and design sewerage systems **(K2)**

CO2 - select and use various techniques, materials and modern engineering practices to laying and construction of sewerage system. **(K3)**

CO3 - Design various treatment methods in primary treatment units. **(K4)**

CO4 - Design various treatment methods in secondary treatment units. **(K4)**

CO5 - Gain knowledge in various sewage disposal methods **(K2)**

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

UNIT I INTRODUCTION

(9 Hrs)

Sewage Characteristics – sewer, sewage and sewerage -methods of collection - conservancy system, water carriage system - classification of sewerage systems- quantity of sanitary sewage - fluctuation in sewage flow - design of flow of sewage for separate, storm and combined sewers – full flow and partial flow conditions - design of separate sewers using Manning's formula..

UNIT II SEWAGE MATERIALS, COMSTRUCTION AND APPURTENANCES

(9 Hrs)

Materials for pipe sewers - construction - laying, jointing, dewatering and testing - sewer appurtenances - traps - plumbing system of drainage – one pipe system and two pipe system of plumbing - sanitary fittings.

UNIT III PRIMARY TREATMENT

(9 Hrs)

Primary treatment - objectives - screening - grit chamber and primary sedimentation tanks design.

UNIT IV SECONDARY TREATMENT

(9 Hrs)

Principles, functions and design - activated sludge unit and trickling filter - septic tank - sludge digestion tank - oxidation pond- aerobic reactor- anaerobic reactor.

UNIT V SEWAGE DISPOSAL AND SOLID WASTE MANAGEMENT

(9 Hrs)

Sewage Disposal – Dilution - self-purification of running streams - oxygen sag curve- land disposal - sewage farming - deep well injection - soil dispersion system. Objectives of sludge treatment - properties and characteristics of sludge - sludge digestion - thickening - dewatering - conditioning - drying beds - biogas recovery. Solid waste -generation-collection-conveyance-disposal.


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Text Books

1. Garg, S.K., - Environmental Engineering II, Khanna Publishers, New Delhi, 2016.
2. Modi, P.N., - Environmental Engineering II, Standard Book House, Delhi, 2018
3. Duggal K.N., - Elements of Environmental Engineering II, S.Chand and Co. Ltd., New Delhi, 2019

Reference Books

1. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2013.
2. Metcalf and Eddy, M.C., Wastewater Engineering - Treatment and Reuse II, 4Th Edition, McGraw Hill India, 2016.
3. Birdie, G.S. and Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, 2016.
4. Punmia, B.C., Ashok K Jain and Arun K Jain, "Wastewater Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2016.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/preview
3. nptel.ac.in/courses/105/104/105104102/

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	3	3	3	3	3	3
CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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


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U20CET617**TRANSPORTATION ENGINEERING**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the geometric design of highways
- Gain the knowledge about the pavement components and tests on highway materials.
- Understand the design principles of railway.
- Familiar with the basic elements and design principles of Railway track
- Understand the basic elements of Airport layout and also harbour

Course Outcomes

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

CO1 - Understand & Analyze the geometric design of highways **(K3)**

CO2 - Understand the various test procedures for highway materials and design theories **(K2)**

CO3 - Design the pavement **(K4)**

CO4 - Understand the railway elements **(K3)**

CO5 - Prepare airport layout and understand the various concepts and components of harbor **(K2)**

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

UNIT I HIGHWAY GEOMETRY**(10 Hrs)**

Significance of highway planning –Factors influencing highway alignment -Classification of highways –Typical cross sections - Cross sectional elements - Sight Distances, Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD]- Gradients and its types, Design of Horizontal Alignments - Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments - Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves

UNIT II PAVEMENT COMPONENTS AND ANALYSIS**(8 Hrs)**

Pavement components - Types of pavements - Highway materials — Tests on aggregates and Tests on bitumen - Calculation of stresses – Single layer, Two layer theory, Westergaard's theory, Bradbury theory (Problems in stress calculation)

UNIT III PAVEMENT DESIGN AND MAINTENANCE**(9 Hrs)**

Pavement Design Factors in the design of flexible and rigid pavements- CBR methods - IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58) (Problems in design of flexible pavement) - Highway drainage and its types - Pavement failures - Pavement evaluation –Benkelman beam deflection method

UNIT IV RAILWAY ENGINEERING**(9 Hrs)**

Permanent way and its elements – Functions, requirements and types of Rails, Sleepers and Ballast - Rail fixtures and fastenings - Gauge and its types -Coning of wheels - Defects in rails - Super elevation – Cant deficiency, negative cant (Problems) - Widening of gauge on curves (Problems) - Transition Curves and Shift (Problems) - Points and crossings – Turn outs - Design of turnouts (Problems) – Stations and Yards - classification of stations and yards


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UNIT V AIRPORT AND HARBOUR ENGINEERING**(9 Hrs)**

Components of Airport - Airport organization – Types of airport - Runway orientation - Wind rose diagram (Problems), Basic runway length and corrections, Geometric design of Runway (Problems on Runway length) Runway Marking – Runway Lighting - Design of exit taxiway (Problems), Definition of Terms - Harbors, Ports, Docks, Littoral Drift, Satellite Ports - Requirements and Classification of Harbors - Dry and Wet Docks - Light Houses, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping

Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. S C Saxena and S P Arora, "A Textbook of Railway Engineering", Dhanpat Rai Publication, 2010.
3. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010

Reference Books

1. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2018.
3. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 2018.
4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017

Web References

1. <https://nptel.ac.in/courses/105101087/>
2. <https://nptel.ac.in/courses/105107123/>
3. <https://nptel.ac.in/courses/114106025/>

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	2	1
CO2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
CO4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
CO5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

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


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U20CEP612	TRANSPORTATION ENGINEERING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the procedures of testing of road aggregates
- Understand the procedures of testing of bitumen
- Understand the Marshall mix design
- Understand the procedures of testing of bituminous mix
- Familiar with test on subgrade soil

Course Outcomes

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

CO1 - Carry out the test on aggregate **(K3)**

CO2 - Conduct the test on bitumen **(K3)**

CO3 - Design the pavement **(K4)**

CO4 - Investigate the test on bituminous mix **(K3)**

CO5 - Carry out the test on subgrade soil **(K3)**

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

LIST OF EXPERIMENTS

I. Tests on Aggregate:

1. Shape Tests (Elongation index, Flakiness index, Angularity number)
2. Impact test
3. Crushing value
4. Los Angeles Abrasion test
5. Specific gravity
6. Water absorption

II. Tests on Bitumen:

1. Penetration Value
2. Ductility
3. Softening point
4. Flash & fire point
5. Specific gravity
6. Viscosity of cutback Bitumen

III. Tests on Bituminous Mix

1. Marshall's test on bituminous mixes
2. Bitumen Extraction test by Centrifuge Extractor

IV. Test on Sub-grade soil

1. C.B.R. Test - (on sub grade soil)

Reference Books

1. Kadiyali L R, "Highway Engineering", Khanna Book Publishing Co Pvt Ltd, 2019.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
3. Bureau of Indian Standards (BIS) Publications on Highway Materials


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4. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
5. Indian Standard (IS), Methods of test for soil, Part 16 (Second Revision), IS: 2720 (Part 16) – 1987.

Web References

1. <https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-21.pdf>
2. <https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdf>
3. <https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.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	2	1	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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


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U20CEP613	ENVIRONMENTAL ENGINEERING LABORATORY	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Aware about water and its importance to human survival.
- Understand how to classify and analyze various quality parameters of raw water.
- Prepare water quality assessment report.
- Suggest required type of treatment to purify raw water.
- Analyze different quality requirements for industrial waters and domestic waters.

Course Outcomes

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

CO1 - Discuss about importance of water and its quality analysis. **(K5)**

CO2 - Analyze various physico-chemical and biological parameters of water in case of quality requirements. **(K5)**

CO3 - Assess complete water quality assessment for EIA and domestic supplies. **(K5)**

CO4 - suggest various types of treatment methods required to purify raw water with different contaminants. **(K5)**

CO5 - Apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions. **(K5)**

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

LIST OF EXPERIMENTS

Sampling and preservation methods and significance of characterization of water and wastewater.

PHYSICAL ANALYSIS

1. Determination of Turbidity by using Nephelometer.
2. Measurement of pH
3. Measurement of Conductivity
4. Measurement of Total Solids.
5. Estimation of Suspended, volatile and fixed solids

CHEMICAL ANALYSIS

6. Estimation of Alkalinity.
7. Estimation of Chlorides.
8. Estimation of Hardness.
9. Estimation of Residual Chlorine
10. Estimation of Dissolved Oxygen.
11. Estimation of Manganese.
12. Jar test for the determination of optimum coagulant Dose.
13. COD test for water and waste water..

BIOLOGICAL ANALYSIS

14. BOD test for water and waste water
15. Estimation of E-Coli.


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Text Books

1. Garg, S.K., - Environmental Engineering I and II, Khanna Publishers, New Delhi, 2016
2. Modi, P.N., - Environmental Engineering I and II, Standard Book House, Delhi, 2016
3. Duggal K.N., - Elements of Environmental Engineering S.Chand and Co. Ltd., New Delhi, 2019

Reference Books

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015.
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
3. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2013.
4. Metcalf and Eddy, M.C., Wastewater Engineering - Treatment and Reuse II, 4th Edition, McGraw Hill India, 2016.
5. IS10500 Indian Standards for Drinking Water.
6. IS 2490 Indian Standards for Industrial and sewage effluent discharge.

Web References

1. https://swayam.gov.in/nd1_noc20_ce23/preview
2. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements?force=true

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
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CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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


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U20CEP614	DESIGN AND DRAWING LABORATORY (RCC AND STEEL)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Prepare working drawings for concrete structures
- Prepare working drawings for steel structures
- Preparation of layout of the structure with detailed design details
- Preparation of working drawings with all dimensions required for execution/ fabrication of structures
- Increase ability to communicate with people through drawings

Course Outcomes

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

CO1 – Understand the importance of basic concepts and principles of Design and Drawing. **(K5)**

CO2 – Design steel and concrete structures. **(K5)**

CO3 – Draft various concrete and steel structures / elements. **(K5)**

CO4 – Detail various concrete and steel structures / elements. **(K5)**

CO5 – Use the drawing instruments effectively and able to dimension the given figures. **(K5)**

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

Detailed Design and Drawing of the following RCC elements/Structures:

1. Continuous beams and slab systems.
2. Rectangular Combined footings.
3. Cantilever retaining walls
4. Elevated - circular and rectangular water tanks (excluding staging)
5. Staircases.

Detailed Design and Drawing of the following Steel elements/Structures:

1. Roof trusses and joints including purlins.
2. Stiffened welded seat connections – moment resisting welded connections for beams.
3. Welded plate girder.
4. Gantry girder.
5. Self-supporting chimney

Text Books

1. N.Subramanian , "Design of Steel Structures" , Oxford University press, 2018.
2. S.K.Duggal, "Limit State Design of Steel Structures", Tata McGraw Hill Education Pvt. Ltd, 2019
3. S.S.Bhavikatti, "Design of Steel Structures " , I.K.International Publishing House, 2019
4. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
5. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2012
6. N. Krishnaraju, and R. N.Pranesh," Reinforced Concrete Design", New Age International Pvt. Ltd.,2009
7. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hall of India, Private, Limited New Delhi, 2008.



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Reference Books

1. IS 800 -2007, General Construction in Steel - Code of Practice.
2. SP 6-1 (1964): ISI Handbook for Structural Engineers -Part1 Structural Steel Sections [CED 7: Structural Engineering and structural sections]
3. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2007
4. IS 3370-2 (2009): Code of Practice Concrete structures for the storage of liquids, Part 2: Reinforced concrete structures [CED 2: Cement and Concrete]

Web References

1. <https://nptel.ac.in/courses/105105162/>
2. <https://nptel.ac.in/courses/105106113/>
3. <https://nptel.ac.in/courses/105106112/>
4. <https://nptel.ac.in/courses/105/105/105105105/>
5. https://www.youtube.com/watch?v=1_SXPr_YTOU

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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


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U20CEC6XX**CERTIFICATION COURSE - VI**

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.



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U20CES606	SKILL DEVELOPMENT COURSE 6	L	T	P	C	Hrs
	(Foreign Language / IELTS – II)	0	0	2	0	30

Student should choose the Foreign Language/IELTS course like Japanese/French/ Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation.


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U20CES607	SKILL DEVELOPMENT COURSE 7	L	T	P	C	Hrs
	(Technical Seminar)	0	0	2	0	30

Course Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

Course Outcomes

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

CO1 - Review, prepare and present technological developments.

CO2 - Face the placement interviews.

Method of Evaluation:

- During the seminar session each student is expected to prepare and present a topic on engineering/technology, for duration of about 20 minutes.
- In a session of three periods per week, 8 to 10 students are expected to present the seminar.
- Each student is expected to present atleast twice during the semester and the student is evaluated based on that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
- Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.


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U20CES608**SKILL DEVELOPMENT COURSE 9**

(NPTEL / MOOC - I)

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation



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U20CEM606	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE				L T P C Hrs 2 0 0 - 30
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Course Objectives

This course should enable the students to

- To get a knowledge in Indian Culture
- To Know Indian Languages and Literature and the fine arts in India
- To explore the Science and Scientists of Medieval and Modern India

Course Outcomes

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

CO1 - Understand philosophy of Indian culture.

CO2 - Distinguish the Indian languages and literature.

CO3 - Learn the philosophy of ancient, medieval and modern India.

CO4 - Acquire the information about the fine arts in India.

CO5 - Know the contribution of scientists of different eras.

UNIT I INTRODUCTION TO CULTURE

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT II INDIAN LANGUAGES, CULTURE AND LITERATURE

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature

UNIT III RELIGION AND PHILOSOPHY

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY & ENGINEERING)

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V EDUCATION SYSTEM IN INDIA

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Reference Books

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN:81246033375,2005
2. "Science in Samskrit", Samskrita Bharti Publisher,ISBN13:978-8187276333,2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450494-X,200
4. S.Narain, "ExaminationsinancientIndia",AryaBookDepot,1993
5. SatyaPrakash,"FoundersofSciencesinAncientIndia",VijayKumarPublisher,1989
6. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978-8120810990,2014


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SEMESTER – VII**U20CET718****CONSTRUCTION MANAGEMENT**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives*This course should enable the students to*

- Understand the importance and basic functions of construction management
- Gain knowledge about various organization and planning system of construction
- Understand the scheduling and network analysis of project
- Impart the basic concepts of Contract and Tender
- Understand the M.I.S and labor, safety and related regulation

Course Outcomes*After completion of the course, the students will be able to***CO1** - Understand construction management importance (**K2**)**CO2** –Understand the various organization in the construction (**K2**)**CO3** –Become aware on scheduling and analysis (**K5**)**CO4** - Become aware on Contract and Tender (**K2**)**CO5** - Understand the M.I.S and labor, safety and related regulation (**K2**)**KNOWLEDGE LEVEL:** **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate**UNIT I CONSTRUCTION PROJECT MANAGEMENT****(9 Hrs)**

Construction Project - Project Categories, Management objectives, functions - Project Development Process - Project Life Cycle - Project Team - Role of Project Manager - Management failure.

UNIT II ORGANIZATION AND PLANNING**(9 Hrs)**

Definition, Levels of Organization, Principles of Organization, process of organizing, Span of Control, Authority, Responsibility and Delegation – Forms of Organizations - merits and demerits of each.

UNIT III SCHEDULING AND NETWORK ANALYSIS**(9 Hrs)**

Scheduling: Definition, objectives, Importance of Planning, Scheduling and Controlling of Projects. Network Techniques in Construction Management - PERT, CPM, Time & cost optimization.

UNIT IV CONTRACTS**(9 Hrs)**

Contract and Types of Contract, Contract document, Specification, Condition of Contract, Tender and Tender documents – Arbitration - M. Book - Muster roll.

UNIT V M.I.S APPLICATIONS AND CONSTRUCTION**(9 Hrs)**

Labour Legislations - Safety in Construction: Objectives, Steps in Safety Programme, Safety Costs, Safety Codes, Occupational Safety and Hazards, Accidents - Causes of Accident


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Text Books

1. Clifford J Schexnayder, Kraig Knutson, Construction Management Fundamentals, Tata McGraw-Hill, 2011.
2. Ps Gahlot, Bm Dhir, Construction Planning & Management, New Age International (P) Ltd., 2014
3. Srinath,L.S., "PERT and CPM Principles and Applications ", Affiliated East West Press, 2015

Reference Books

1. Ravindra.S.V., Krishnamurthy.K.G., Construction & Project Management, CBS Publishers, 2010.
2. Steven McCabe, "Quality Improvement Techniques in Construction." Longman, 2016
3. Moder.J., C.Phillips and Davis, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1995.
4. Shrivastava. U.K, Construction Planning & Management, Galgotia Publications Pvt. Ltd., 2014.
5. Chitkara.K.K., Construction Project Management Planning Scheduling and Controlling, Tata McGraw-Hill, 2014

Web References

1. <https://nptel.ac.in/courses/105/104/105104161/>
2. <https://nptel.ac.in/courses/105/103/105103093/>
3. <https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce20/>

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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CO3	3	3	2	3	3	2	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	3	2	-	-	-	-	-	-	3	3	3
CO5	3	2	2	3	3	2	-	-	-	-	-	-	3	3	3

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


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U20CET719**HYDROLOGY AND WATER RESOURCE
ENGINEERING**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the hydrologic cycle, precipitation and its estimation.
- Understand the features of precipitation, rain gauge density, DAD curve, evaporation, transpiration and infiltration.
- Understand the occurrence, movement and augmentation of ground water through Darcy's law, recuperation test, pumping test and artificial recharge methods.
- Gain knowledge about runoff, estimation, modeling of runoff, and hydrograph.
- Gain knowledge about estimation, forecasting, control of flood, and concept of Muskingum method.

Course Outcomes

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

CO1- Understand the different forms of precipitation and also capable to analysis the missing precipitation data.(K2)

CO2 - Gain the knowledge in the various techniques and methods involved to quantify the total evaporation loss for water from the water bodies(K3)

CO3 - Understand the ground water concepts and identify the yield capacity of any given ground water sources (K2)

CO4 - Capable to solve and analyses the runoff problems (K4)

CO5 - Capable to solve and analyses the flood problems (K4)

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

UNIT I PRECIPITATION AND SURFACE WATER HYDROLOGY**(9 Hrs)**

Hydrologic cycle, precipitation, stream flow, evaporation, transpiration and infiltration, types and measurement of precipitation, gauge networks, hyetographs, average depth of precipitation over the basin, mass rainfall curves, intensity duration curves – estimates of missing data and adjustment of records.

UNIT II EVAPO-TRANSPIRATION AND INFILTRATION**(9 Hrs)**

Evaporation, factors affecting, measurement and estimation of evaporation, transpiration, factors affecting and determination of transpiration, methods of estimating evapo-transpiration, factors affecting and measurement of infiltration, infiltration indices.

UNIT III GROUND WATER HYDROLOGY**(9 Hrs)**

Occurrence and movement of ground water - Permeability and Transmissibility - Darcy's Law – Ground water yield - Aquifers and their types - Infiltration wells and Infiltration galleries - Measurement of yield - Recuperation test - Pumping test – Steady flow analysis only - Artificial recharge – Methods.

UNIT IV RUNOFF**(9 Hrs)**

Runoff - Components of stream flow - Catchment characteristics - Factors affecting runoff - Estimation of runoff - Flow duration curve - Rainfall-runoff modeling - Hydrograph - Unit hydrograph - S-curve hydrograph - Synthetic hydrograph - Application.


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UNIT V FLOOD ESTIMATION AND FORECASTING**(9 Hrs)**

Estimation of peak flood - Flood frequency studies - Methods of flood control - Flood routing through a reservoir - Channel flow routing - Muskingum method - Flood forecasting and warning.

Text Books

6. Santosh kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, 2018.
7. Satyanarayana murthy.C., Water Resources Engineering Principles & Practice, New Age International (P) Ltd, 2019.
8. Subramanya.K, Engineering Hydrology, Tata McGraw-Hill, 2019.

Reference Books

1. Varshney, R.S., Engineering Hydrology, Nem Chand & Bros., 2017.
2. Larry W Mays, Ven Te Chow, David R Maidment, Applied Hydrology, Tata McGraw-Hill, 2016.
3. Jayarami Reddi.P, Text Book of Hydrology, Lakshmi Publications, 2017.
4. Todd D.K., "Groundwater Hydrology", John Wiley & Sons, Inc, New York, 2015.
5. Bear J., "Hydraulics of Groundwater", McGraw-Hill, New York, 2012.

Web References

1. <https://nptel.ac.in/courses/105/101/105101002/>
2. <https://nptel.ac.in/courses/105/104/105104103/>
3. <https://nptel.ac.in/courses/105/108/105108130/>

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CO3	3	3	3	2	2	-	-	-	-	-	-	1	2	3	-
CO4	3	3	2	2	3	-	-	-	-	-	-	1	2	2	3
CO5	3	3	2	2	3	-	-	-	-	-	-	1	1	2	3

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


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U20HSP703	BUSINESS BASICS FOR ENTREPRENEUR	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Develop a clear understanding on Business Plans and their significance.
- Be familiar with various forms of business appropriate for an individual entrepreneur
- Understand various ways of judging a successful opportunity for an entrepreneur
- Know the ways to formulate a successful Operation Plan
- Be aware of things to know to prepare effective financial and marketing plans

Course Outcomes

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

- CO1** - Impact comprehensive knowledge of an entrepreneurial ecosystem. **(K6)**
- CO2** - Understand the need and significance of Business Plan in the success of an Enterprise. **(K2)**
- CO3** - Understand the ways to judge the economic and business viability of proposed venture. **(K2)**
- CO4** - Utilize the elements of success of entrepreneurial ventures. **(K3)**
- CO5** - Evaluate the effectiveness of different entrepreneurial strategies. **(K5)**

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

UNIT I THE ENTREPRENEURIAL PERSPECTIVE (6 Hrs)

Entrepreneurship and Family Business Management, Entrepreneurship theory and practice, The Nature and Importance of Entrepreneurs, The Entrepreneurial and Intrapreneurial Mind, The Individual Entrepreneur, International Entrepreneurship Opportunities

UNIT II CREATING AND STARTING THE VENTURE (6 Hrs)

Creativity and the Business Idea, Legal Issues for the Entrepreneur, the Business Plan, the Marketing Plan, the Financial Plan, the Organizational Plan

UNIT III FINANCING THE VENTURE (6 Hrs)

Raising Finance, scaling up the venture, NDA'S and term sheet, Sources of the Capital, Informal Risk Capital and Venture Capital

Report Submission:

- Grooming Entrepreneurial Mind-set
- Interaction with Business Leaders/Bankers/Venture Capitalists
- Finding and evaluating an idea
- Develop a business plan
- Financing for a company start-up
- Setting up a company-legal entity
- Entrepreneurial development and employment creation
- Effects of creativity and innovation on the entrepreneurial performance of family business

Text Books

1. Friend, G., & Zehle, S. (2004). Guide to business planning. Profile Books Limited.
2. Lasher, W. (2010). The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your business. Broadway Books.


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3. Arjun Kakkar. (2009). Small Business Management: Concepts and Techniques for improving Decisions. Global India Publications.

Reference Books

1. Alexander Osterwalder and Yves Pigneur – Business Model Generation.
2. Arthur R. DeThomas – Writing a Convincing Business Plan.
3. Ben Horowitz – The Hard Thing About Hard Things.
4. Guy Kawasaki – The Art of Start 2.0
5. Hal Shelton – The Secrets to Writing a Successful Business Plan.

Web References

1. <https://www.waveapps.com/blog/entrepreneurship/importance-of-a-business-plan>
2. <https://www.entrepreneur.com/article/200516>
3. <https://smallbusinessbc.ca/article/how-to-use-viability-to-test-if-you-should-invest-in-your-business/>
4. <https://www.infoentrepreneurs.org/en/guides/strategic-planning/>
5. <http://www.marketingmo.com/strategic-planning/marketing-plans-budgets/>
6. <https://www.mbda.gov/page/loan-documentation>

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	2	1	1	3	3	2	3	1	2	1	2	1
CO2	1	2	2	2	2	2	3	3	3	2	1	2	2	2	1
CO3	1	2	2	1	2	2	3	3	3	3	2	3	1	2	3
CO4	1	3	2	2	2	2	3	3	3	3	2	3	1	2	2
CO5	1	3	2	2	2	2	3	3	3	2	2	3	1	3	2

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


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U20CEP715	IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- Understand the concepts of hydraulic design and to draw detailed drawings of hydraulic Structures.
- Introduce the design concepts of major units associated with water and sewage treatment

Course Outcomes

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

CO1 - Design and draw plan, elevation and sections of irrigation structures in detail. **(K3)**

CO2 - Design the sewage treatment plant units and draw the general arrangement **(K3)**

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

LIST OF EXERCISES

PART A

1) TANK IRRIGATION STRUCTURES

Detailed drawings of foundation details, plan and elevation

- Tank surplus weirs
- Tank sluices weirs

2) CANAL TRANSMISSION STRUCTURES

Detailed drawings of foundation details, plan and elevation

- Canal head works and Canal regulator
- Canal drops and Notch type

PART B

- General layout of water and Waste treatment of plant.
- Design and drawing of infiltration gallery.
- Drawing of raw water - Intake towers - Manholes - Sewer lines
- Design and drawing Slow sand filter - Rapid sand filter
- Design and drawing of Trickling filters - Activated Sludge process
- Design and drawing of Septic tanks and disposal arrangements

Reference Books

- Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGraw- Hill Book Co., New Delhi, 1995.
- Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill, New Delhi, 2010.
- Qasim, S.R., Motley, E.M and Zhu.G. "Water works Engineering – Planning, Design and Operation", Prentice Hall, New Delhi, 2009.
- Qasim, S. R. "Wastewater Treatment Plants, Planning, Design and Operation", CRC Press, New York, 2010
- Varshney, R.S., Engineering Hydrology, Nem Chand & Bros., 2017


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Web References

1. <https://nptel.ac.in/courses/126/105/126105010/>
2. <https://nptel.ac.in/courses/105/105/105105110/>
3. <https://nptel.ac.in/courses/105/102/105102159/>

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	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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


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U20CEP716	SIMULATION SOFTWARE LABORATORY (ANSYS)	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

This course should enable the students to

- To give exposure to software tools needed to analyse engineering problems
- Model the structures
- Analyze the structures
- Design the structures
- To expose the students to different applications of simulation and analysis tools

Course Outcomes:

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

CO1 - MATLAB to solve simple problems in vibration (**K4**)

CO2 - Analyze the structural components using software (**K5**)

CO3 – Analysis using link elements in Trusses, cables (**K5**)

CO4 - Vibration analysis of spring-mass systems (**K3**)

CO5 – Model analysis of beams (**K3**)

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

LIST OF EXPERIMENTS

A. Simulation

1. MAT LAB basics, dealing with matrices, Graphing-functions of one variable and two variables
2. Use of MATLAB to solve simple problems in vibration
3. Mechanism Simulation using multi body dynamic software

B. Analysis

1. Force and stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
 - (i) Shear force and Bending Moment diagram of simply supported beam with Point Load
 - (ii) Shear force and Bending Moment diagram of cantilever beam with end point load
3. Stress analysis of flat plates and simple shells.
4. Vibration analysis of spring-mass systems.
5. Model analysis of beams.
6. Fixed and Free Column Buckling Analysis

Web References

1. <https://www.youtube.com/watch?v=xK1B61XfqQU>
2. https://www.youtube.com/watch?v=VKRGtG_hpig


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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	1	2	-	-	-	1	-	-	2	3	3	3
CO2	3	3	3	1	2	-	-	-	1	-	-	2	3	3	3
CO3	3	3	3	1	2	-	-	-	1	-	-	2	3	3	3
CO4	3	3	3	1	2	-	-	-	1	-	-	2	3	3	3
CO5	3	3	3	1	2	-	-	-	1	-	-	2	3	3	3

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



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U20CEP717**COMPREHENSIVE VIVA VOCE**

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To assess the overall knowledge of the student in the relevant field of Engineering acquired over 4 years of study in the undergraduate program.

Course Outcomes

CO 1 - The students will be able to attend the various Competitive examinations such as GATE, IES Examination etc. **(K3)**

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

Description

- Students' batch will be formed and each batch will prepare MCQ's question for concerned subjects.
- The student will be tested for his understanding of basic principles of the core Civil Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective type from all the core subjects. The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

COs/POs/PSOs Mapping

	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	3	3	-	-	-	-	-	-	-	3	3	3

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


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U20CEW701**PROJECT PHASE - I**

L	T	P	PW	C	Hrs
0	0	0	4	2	60

Course Objectives

This course should enable the students to

- Encouraged to get hands on experience to work in various area of civil engineering.

Course Outcomes

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

CO1 - Perceive the problems and to find suitable solutions. **(K5)**

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

Description

The students to work in groups of not more than four members in each group need to plan and design a building as per National Building Code requirements. In addition, each group is required to do literature survey, formulate the problem & form a methodology for the field problems they proposed to carryout in Project Phase II. The student is required to do and form a methodology in arriving at the solution of the problem. Each project shall have an internal guide. The report of each group shall be submitted for evaluation. The evaluation is based on internal review committee and guide for 50 marks. The End Semester Examination for the project work shall consist of an evaluation of the project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner (25 marks) and an internal examiner (25 marks).

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

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


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U20CEW702**INTERNSHIP/INPLANT TRAINING**

L	T	P	C	Hrs
0	0	0	2	3 to 4 Weeks

Course Objectives

This course should enable the students to

- Expose to the industrial environment
- Understand and sharpen the real time technical / managerial skills required in the civil engineering job.
- Expose on the current technological developments relevant to civil engineering domain.
- Communicate effectively on complex engineering activities
- Create conditions conducive to quest for knowledge and its applicability on the job.

Course Outcomes

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

CO1 - Be a source of highly motivated pre-professionals. **(K3)**

CO2 - Bring new perspectives to problem solving. **(K4)**

CO3 - Implement/Develop Technology solutions which will improve quality of life **(K4)**

CO4 - Develop an ability to communicate effectively (oral and written communication, report writing, presentation skills) **(K4)**

CO5 - Identify and to address their own educational needs in a changing world. **(K4)**

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

DESCRIPTION

Students may undergo training or internship during summer / winter vacation at Industry/ Research organization / University (after due approval from the Mentor, Class advisor and Departmental Consultative Committee (DCC). In such cases, the internship/training should be undergone continuously (without break) in one organization. Normally no extension of time is allowed. However, DCC may provide relaxation based on the exceptional case. The students are allowed to undergo three to four weeks internship in established industry / Esteemed institution during vacation period.

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
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CO2	3	3	2	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	1	2	-	-	-	-	-	-	-	3	3	3
CO4	1	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

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


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U20CEM707

PROFESSIONAL ETHICS

L	T	P	C	Hrs
2	0	0	-	30

Course Objectives

This course should enable the students to

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes

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

CO - Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

UNIT I HUMAN VALUES**(6 Hrs)**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS**(6 Hrs)**

Senses of „Engineering Ethics“ — Variety of moral issues — Types of inquiry — Moral dilemmas — Moral Autonomy — Kohlberg’s theory — Gilligan’s theory — Consensus and Controversy — Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION**(6 Hrs)**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS**(6 Hrs)**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES**(6 Hrs)**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility

Reference Books

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
3. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009
5. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
6. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001
7. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social



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- Responsibility” Mc Graw Hill education, India Pvt. Ltd., New Delhi 2013.
8. World Community Service Centre, " Value Education", Vethathiri publications, Erode, 2011

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org



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SEMESTER VIII

U20CET820**ARCHITECTURE AND TOWN PLANNING**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Learn the history of Architecture and its development
- Understand the methods and materials used in ancient Architecture
- Understand interior planning and design
- Know the various planning ideologies in town planning
- Understand the concept of city, housing and landscape planning

Course Outcomes

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

CO1- Understand the history and architectural developments **(K2)**

CO2 - Comprehend the past, follows present, ascendance the future **(K2)**

CO3 - Design interior building services **(K3)**

CO4 - Understand and plan for site development **(K3)**

CO5 - Plan and design sustainable cities and town **(K3)**

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

UNIT I ARCHITECTURE AND ITS DEVELOPMENT**(9 Hrs)**

Indian Indus valley, Vedic, Buddhist, Indo-Aryan, Dravidian and Mughal periods; European Egyptian, Greek, Roman, medieval and renaissance periods- construction and architectural styles; vernacular and traditional architecture. Architectural developments and impacts on society since industrial revolution; influence of modern art on architecture.

UNIT II SKILLS FOR AN ARCHITECTURAL UNDERSTANDING**(9 Hrs)**

Understanding the construction methods and materials through study of Egyptian, Greek, Roman, European, Indian Architectural History - Modern Architecture Thinking & Analytical Skills - Empathy - Philosophical Understanding from Idea to Form - Psychological and Social Understanding.

UNIT III BUILDING SERVICES**(9 Hrs)**

Water supply, sewerage and drainage systems; sanitary fittings and fixtures; plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings; elevators & escalators, their standards and uses; air-conditioning systems; firefighting systems, building safety and security systems

UNIT IV TOWN PLANNING**(9 Hrs)**

Objectives and Principles of Town Planning, Stages of Town Development (Indian), Levels of planning, Different types of plan, land use planning, Zoning – Principles, advantages, classification. Planning ideologies - Drainage and water supply in the selection of site for the development – Residential – Commercial – Industrial – Public – Transportation, Utility and services – Agriculture


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UNIT V CITY, HOUSING AND LANDSCAPE PLANNING**(9 Hrs)**

Evolution of cities; principles of city planning; types of cities & new towns; planning regulations and building byelaws; eco-city concept; sustainable development. Concept of housing; neighbourhood concept; Principles of landscape design and site planning; environmental considerations in landscape planning.

Text Books

1. De Charia & Callender, Architecture, Mc. Graw Hill, (2012).
2. Vaishali S. Limaye, Rajani Deshmukh, Supriya.B, Architecture and Town Planning, Nirali Prakashan Publication, Edition 2016
3. Satish Chandra Agarwal, Architecture and Town Planning,
4. Dhanpat Rai & Co. Edition 2014.
5. Sajjan V.Wagh, Pravin R.Minde, Architecture and Town Planning, Tech –Max Publications, Pune, Edition 2016.
6. V.S.Limaye, A.D.Pawar, Architectural Planning And Design Of Buildings, Nirali Prakashan Publication, Edition 2016

Reference Books

1. Gallion, Urban pattern City planning and design, Charotar Publishing House, (2010).
2. Modak & Ambedkar, Town and Country Planning and Housing, (2001).
3. Arian Mostaedi, 'Sustainable Architecture: Low Tech Houses', CarlesBroto,2002

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1. <https://archive.nptel.ac.in/courses/124/107/124107158/>
2. <https://archive.nptel.ac.in/courses/124/105/124105016/>
3. https://onlinecourses.swayam2.ac.in/cec20_ar01/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	-	-	-	-	-	2	1	2	-	-	-	3	3	1	2
CO2	-	-	-	1	1	2	1	1	1	-	-	2	3	1	-
CO3	2	2	2	1	2	2	1	1	-	-	1	2	2	3	-
CO4	1	1	1	1	2	1	2	2	1	-	-	2	2	2	3
CO5	3	2	2	-	2	1	2	1	-	-	1	3	1	2	3

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


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U20HSP804	ENTREPRENEURSHIP MANAGEMENT	L	T	P	C	Hrs
		0	0	2	1	35

Course Objectives

This course should enable the students to

- Develop an ability to identify the critical challenges hindering growth of entrepreneurs
- Understand the significance of Finance Skills, Branding, and Sales Skills for an Entrepreneur
- Be aware of various Government Schemes and Subsidies available for Entrepreneurs

Course Outcomes

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

- CO1-** Develop and demonstrate the business models. **(K2)**
CO2 - Practice cash management, brand building and enhancing turnover. **(K5)**
CO3 - Understand various schemes and subsidies that are offered by various Government agencies. **(K2)**
CO4 - Effectively tackle growth challenges of their venture. **(K5)**
CO5 - Manage and grow their business in terms of expansion and look for partnerships. **(K3)**
KNOWLEDGE LEVEL: **K1** – Remember, **K2** – Understand, **K3** – Apply, **K4** – Analyze and **K5** – Evaluate

UNIT I ENTREPRENEURIAL SKILLS 1

(6 Hrs)

Introduction to Business Model Generation , Developing Lean Business Model for the Business Idea, Developing Prototype and Evaluating assumptions in Business Model using prototype cheaply, Presentation of Business Model, Business Fair

UNIT II ENTREPRENEURIAL SKILLS 2

(6 Hrs)

Financial Skills – Cash Management – Problems of Poor Cash Management – Learning to be Frugal. Branding – Building a 'niche' follower for your product/service – Developing and Establishing a Brand, Sales skills – KPI of Success of Entrepreneurship – Ensuring Growth in Turnover

UNIT III ENTREPRENEURIAL OPPORTUNITIES

(6 Hrs)

Awareness of Government Schemes and Subsidies for various Entrepreneurial Categories – Special Schemes for Women Entrepreneurs – Understanding the Procedure and Documentation Process for availing the Government Schemes – Venture Capital – Crowd funding – Angel Investors.

Report Submission:

1. How can I get first 100 customers to pay for my products/services?
2. Information technology as a resource
3. Marketing skill and promotion for entrepreneurs
4. Assessment of factors affecting performance of women entrepreneurs
5. Entrepreneurship as a tool for sustainable employment
6. Examination of problem facing small scale business
7. Survival strategies in small business
8. The role of insurance in minimizing business risk


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Text Books

1. Storey, D. J., & Greene, F. J. (2010). Small business and entrepreneurship. Financial Times/Prentice Hall.
2. Scarborough, N. M. (2011). Essentials of entrepreneurship and small business management. Prentice Hall.
3. Gupta C.B., & Srinivasan N.P. (2020). Entrepreneurial Development. Sultan Chand and Sons

Reference Books

1. Brian Tracy – The Psychology of Selling.
2. Dale Carnegie – How to Win Friends & Influence People.
3. Robert Kiyosaki and Sharon Lechter – Rich Dad, Poor Dad.
4. Reid Hoffman – The Startup of You: Adapt to the Future, Invest in Yourself, and Transform Your Career.
5. Michael E. Gerber – The E-Myth Revisited.
6. Chris Guillebeau – The Art of Non-Conformity.
7. Eric Ries – The Lean Startup.
8. Kevin D. Johnson – The Entrepreneur Mind.

Web References

1. <https://www.helpguide.org/articles/stress/stress-management.htm>
2. <https://bscdesigner.com/8-entrepreneurial-kpis.htm>
3. <https://www.inc.com/ilya-pozin/5-problems-most-entrepreneurs-face.html>
4. <https://www.inc.com/jessica-stillman/how-to-network-with-super-successful-people.html>
5. <https://www.entrepreneur.com/article/251603>
6. <https://seraf-investor.com/compass/article/understanding-crowdfunding>

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
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CO2	1	1	2	2	1	1	3	2	2	3	3	2	2	2	2
CO3	1	2	1	1	1	2	3	2	2	3	3	2	1	2	3
CO4	1	2	2	2	2	3	3	3	3	3	2	3	2	2	2
CO5	1	2	2	2	2	3	3	3	3	3	2	3	2	2	2

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


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U20CEW803**PROJECT PHASE- II**

L	T	P	PW	C	Hrs
0	0	0	16	8	240

Course Objectives

This course should enable the students to

- Expose students to design problem related to various disciplines of civil engineering.

Course Outcomes

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

CO1 - Take up any challenging practical problems and find solution by formulating proper methodology.

(K5)

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

DESCRIPTION

The students will be encouraged to handle the field problems independently in Project work phase II with the extension of the project work Phase-I started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal review committee for 40 marks. The End Semester Examination for the project work shall consist of an evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted by a committee consisting of the external examiner (25 marks) , an internal examiner (25 marks) and Publication of paper / Prototypes / Patents , etc (10marks).

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	3	2	2	-	-	-	-	-	-	-	3	2	2

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


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U20EES809**SKILL DEVELOPMENT COURSE 9****(NPTEL / MOOC - II)**

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation



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PROFESSIONAL ELECTIVES
Professional Elective – I (Offered in Semester IV)

U20CEE401	ENGINEERING GEOLOGY	L	T	P	C	Hrs
		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, Feldspar 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.



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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.

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 Learning, 2009
4. Venkataramiah. C., Textbook of Engineering Geology, 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


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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.



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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

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


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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.



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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

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

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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


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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 tilted 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.



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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. Renewable energy resources: Tiwari and ghosal, Narosa publication.

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

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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


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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 BUILDING 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.


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Text Books

KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International Publishers, 2017.

BT Ashwini Manjunath, "Alternative Building Materials and Technology", Medtech Publisher, 2017.

Trevor M. Letcher and Janet L. Scott, "Materials for a Sustainable Future", Royal Society of Chemistry, 2012

Reference Books

S Christian Johnson, "Concrete Technology", Dipti Press, 2017.

G.C Sahu and Jayagopal Jena, "Building Materials and Construction", McGraw hill Publication, 2015.

B C Punmia and Ashok kumar jain, "Building Construction", Laxmi Publication, 2019.

M.S. Shetty, "Concrete Technology (Theory and Practice)", S. Chand & Company Ltd., 2019.

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
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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


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Professional Elective – II (Offered in Semester V)

U20CEE506

GROUND IMPROVEMENT TECHNIQUES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Study the geotechnical problems in various types of soils and suggestions
- Learn the suitable dewatering techniques
- Learn the appropriate grouting materials and techniques to strengthen the soil.
- Study the stabilization techniques.
- Understand the various geo synthetic materials for soil.

Course Outcomes

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

CO1 - Assess the geo-technical problems in various types of soils and suggest suitable ground improvement techniques. **(K4)**

CO2 - Choose suitable dewatering techniques for construction sites where the ground water table is at a higher level. **(K4)**

CO3 - Select the appropriate grouting materials and techniques to strengthen the soil. **(K2)**

CO4 - Apply the stabilization techniques for soil. **(K3)**

CO5 – Understand the design and application of geo synthetics materials.

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

UNIT I INTRODUCTION**(9 Hrs)**

Introduction: Need – methods – suitability – Mechanical modification: principle - Surface compaction: Field compaction and equipments, compaction specification and controls. Vibration methods: dynamic consolidation, vibratory rollers, Vibro floatation.

UNIT II DRAINAGE AND DEWATERING**(9 Hrs)**

Drainage methods: Well point systems, deep well drainage, vacuum dewatering system, design of dewatering system – field permeability tests, dewatering by electro osmosis. Preloading, sand drains, wick drains- Thermal methods case studies.

UNIT III GROUT TECHNIQUES**(9 Hrs)**

Grouting: Classification – Methods – Types – grouts – equipments, grouting design and layout, grout monitoring – applications – Case studies.

UNIT IV STABILIZATION**(9 Hrs)**

Stabilization: cement stabilization, Lime stabilization – chemical stabilization - methods, principles, applications and field control. Stabilization using reinforcement – rock anchor- soil tie backs.

UNIT V GEO SYNTHETICS**(9 Hrs)**

Geo synthetics: Geotextiles, Geogrids, Geomembranes, Geonets, Geomats, Geomeshes, principles Design and applications – Case studies.

Text Books

1. Purushothama Raj, P. "Ground Improvement Techniques", Laxmi Publications, 2020.
2. NiharRanjanPatra, Ground Improvement Techniques, S.Chand Publishers 2012
3. Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, 2013.



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Reference Books

1. Das, B.M. – “Principles of Foundation Engineering” 7th edition, Cengage learning, 2016
2. Robert M. Koerner , "Designing with Geosynthetics Vol. 1and2", Xlibris; 6 edition, 2012
3. Jie Han, Principles and Practice of Ground Improvement, John Wiley and Sons, 2015

Web References

1. <https://nptel.ac.in/courses/105/108/105108075/>
2. <https://nptel.ac.in/courses/105/103/105103097/>
3. <https://nptel.ac.in/courses/105/101/105101201/>

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	2	-	1	-	-	-	-	-	1	2	2	2
CO2	2	3	3	3	1	2	2	-	-	-	-	1	2	2	2
CO3	3	3	2	2	2	1	-	-	-	-	2	1	2	2	2
CO4	2	1	-	-	-	-	-	-	-	-	2	1	2	2	2
CO5	3	3	3	3	2	-	-	-	-	-	2	1	2	2	2

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


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U20CEE507

FUNDAMENTALS OF NANO SCIENCE

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain a general knowledge on Nano science and Nanotechnology
- Understand the classification of nanostructure.
- Understand the properties and design aspects of nanomaterial.
- Understand the surface modification of nanoparticles.
- Understand the smart materials and its behavior for product development.

Course Outcomes

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

CO1 - Recognize the history, background and the nature of the Nano science and technology. **(K2)**

CO2 - State the different type of nanostructures and analyze the top down and bottom up approach for nano scale device preparation and differentiate the different properties of nano materials. **(K2)**

CO3 - Distinguish the functionality of nanostructures and their characteristic evaluation and designing it. **(K3)**

CO4 - Recognize the surface modification of nanoparticles by surface functionalization and their application. **(K5)**

CO5 - Appraise the different smart materials like thermos-responsive, piezo electric electrostrictive and biometric materials, smart gel, shape memory and their application towards product formation. **(K4)**

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

UNIT I INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY**(9 Hrs)**

History, background scope and interdisciplinary nature of nanoscience and nanotechnology, scientific revolutions, nanosized effects surface to volume ratio, atomic structure, molecules and phases, energy at the nanoscale molecular and atomic size, quantum effect.

UNIT II CLASSIFICATION OF NANOSTRUCTURES**(9 Hrs)**

Zero dimensional, one-dimensional and two dimensional nanostructure materials - semiconductors, ceramics and nanocomposites, size dependent phenomena, quantum dots, nanowires, nanotubes, nano sheets, nano and mesopores, misnomers and misconception of nanotechnology.

UNIT III PROPERTIES OF NANOMATERIALS AND DESIGN**(9 Hrs)**

Mechanical properties - Thermo physical properties - Electric properties - Electrochemical properties - Magnetic properties - Optical properties, Catalytic properties, properties of gas permeation and separation membranes. Functionality of nanostructures and their characteristic evaluation, Size effect in semiconductor nanoparticles- Particle size, shape density - Melting point, surface tension, wettability - Specific surface area and pore-assembly of nanoparticles and functionalization, Self-assembly. Nanoparticle dispersion and aggregation behavior.

UNIT IV SURFACE MODIFICATION OF NANOPARTICLES**(9 Hrs)**

Surface modification of inorganic nanoparticles by organic functional groups, Development of photo catalyst inserted into surface of porous alumino silicate - Dispersion control of nanoparticles in solvents - development of biodegradable PLGA nano spheres and application.



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UNIT V SMART MATERIALS AND SYSTEMS**(9 Hrs)**

Thermo responsive materials, piezoelectric materials, electrostrictive and magnetostrictive materials, ER and MR fluids, biomimetic materials, smart gel, shape memory alloys.

Text Books

1. Edward L. Wolf, "Nanophysics and Nanotechnology - An Introduction to Modern Concepts in Nanoscience" Second Edition, John Wiley and Sons, 2006.
2. K.W. Kolasinski, —Surface Science: Foundations of Catalysis and Nanosciencell, Wiley, 2002.
3. G.A. Ozin and A.C. Arsenault, — Nanochemistry : A chemical approach to nanomaterials II, Royal Society of Chemistry, 2005.
4. Nanostrucruces and Nanomaterials synthesis, properties and applications, G. Cao, Imperaial College press 2004.

Reference Books

1. Y-WVladimir P. Torchilin (2006) Nanoparticulates as Drug Carriers, Imperial College Press.
2. M. Reza Mozafari (2007) Nanomaterials and Nanosystems for Biomedical Applications, Springer.
3. Nanotechnology – Basic Science and Emerging Technologies, Chapman and Hall/CRC 2002.
4. Nanomaterials Nanotechnologies and Design: An introduction for Engineers and architects, Micheal F. Ashby, P.J. Ferreria, D.L.Schodek.

Web Reference

1. <https://nptel.ac.in/courses/118/104/118104008/>
2. <https://nptel.ac.in/courses/113/106/113106093/>
3. <https://nptel.ac.in/courses/118/102/118102003/>
4. <https://nptel.ac.in/courses/118/107/118107015/>

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	2	-	1	-	-	-	-	-	1	2	2	1
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CO3	3	3	2	2	2	1	-	-	-	-	2	1	2	2	1
CO4	2	1	-	-	-	-	-	-	-	-	2	1	2	2	1
CO5	3	3	3	3	2	-	-	-	-	-	2	1	2	2	1

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


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U20CEE508**SMART CITY**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To familiarize the basic of smart techniques
- To understand the IoT methods to government and international e-practice
- To learn the current practices and future trends about smart city
- To introduce the capacity of critique the current practice and provide recommendations
- To understand about the various devices and uses

Course Outcomes

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

CO1 - Understand the fundamental knowledge of the sustainable and smart city (**K2**)

CO2 - Understand the technologies used for sustainable and smart cities (**K2**)

CO3 - Integrate and apply the learnt knowledge to conduct a case study in an organized way (**K3**)

CO4 - Present the study clearly to audiences (**K2**)

CO5 - Demonstrate critical thinking and discovery (**K3**)

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

UNIT I INTRODUCTION AND APPLICATIONS**(9 Hrs)**

Introduction and Applications - Smart mobility - smart environment - smart people - smart governance - smart economy - smart living

UNIT II INTERNET OF THINGS**(9 Hrs)**

IoT and Low Energy Consuming Sensors – Processing - Transmission – Operating systems

UNIT III APPLICATION OF VARIOUS BUILDINGS**(9 Hrs)**

Methods to redesign and redefine back and front offices in order to build smarter and transparent governments.

UNIT IV SERVICES AND TECHNIQUES**(9 Hrs)**

Methodologies for user involvement, profiling customers and identifying needs; test methodologies to transfer these needs in appropriate services; and test techniques to fit the right channel to the specific services and customers thereby are setting a framework for a higher level of e-services in the NSR.

UNIT V TECHNOLOGIES AND APPLICATION**(9 Hrs)**

Pilot new service channels, Bluetooth services for public transport, online forms in mobile phones and wireless city services.

Text Books

1. Christopher Grant Kirwan, Zhiyong Fu, Smart Cities and Artificial Intelligence Convergent Systems for Planning, Design, and Operations, Elsevier Publisher, 2020
2. G.R. Kanagachidambaresan, Internet of things in smart technologies for sustainable urban development, Springer publisher, 2020
3. Jonathan Roichental, Smart cities for Dummies, The MIT Press, 2020
4. Ben Green, The Smart Enough City: Putting Technology in Its Place to Reclaim Our Urban Future, MIT Press, 2019
5. Anthony M, Townsend, Smart Cities – Big Data, Civic Hackers, and the Quest for a New Utopia, W. W.



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Reference Books

1. Rajendra Joshi, Smart Cities : Breaking the Poverty Barrier, Notion Press, 2019
2. Madrid, Lorenzo, Bower, Linda, Smart City 3.0, 2019
3. Smart City on Future Life - Scientific Planning and Construction by Xianyi Li
4. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by NicosKomninos
5. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend

Web References

1. http://smartcities.gov.in/content/city_challenge.php?page=city-challenge--website.php
2. http://smartcities.gov.in/upload/smart_solution/5a277bcb24008BHUBANESWAR%20E-MOBILITY%20PLAN.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	-	-	3	-	-	-	-	-	-	1	2	2	1
CO2	2	1	-	-	3	-	-	-	-	-	-	1	2	2	1
CO3	3	2	1	1	3	-	-	-	-	-	-	1	2	2	1
CO4	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2
CO5	3	2	1	1	3	-	-	-	-	-	-	1	2	2	2

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


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U20CEE509

AIR AND NOISE POLLUTION

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain a basic knowledge on the air pollution on environment
- Understand the interaction of air pollutants on the meteorological parameters
- Understand about the control measures of air pollutants from various sources
- Understand the sources and control of indoor air pollution
- Understand the importance of Control of Noise pollution.

Course Outcomes

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

CO1 - Identify the types and sources of air pollutants(**K2**)

CO2 - Predict the effects of air pollutants on human health and the environment(**K2**)

CO3 - Choose appropriate technologies for removal of particulates and gaseous pollutants(**K2**)

CO4 - Measure the pollutant concentration in indoor environment(**K2**)

CO5 - Suggest the control techniques for Noise pollution. (**K2**)

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

UNIT I INTRODUCTION**(9 Hrs)**

Air pollutants – Sources – Classification of air pollutants – Particulates and gaseous pollutants – Effects of air pollutants on human health, vegetation and property – Global issues and air pollution – Global warming – Ozone layer depletion – Ambient air quality and emission standards – Air pollution indices – Air act.

UNIT II METEOROLOGY AND AIR POLLUTION**(9 Hrs)**

Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height –Plume behaviour – Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling.

UNIT III CONTROL OF PARTICULATE POLLUTANTS**(9 Hrs)**

Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers.

UNIT IV GASEOUS POLLUTION CONTROL**(9 Hrs)**

Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers, Incineration –Equipment description.

UNIT V NOISE POLLUTION CONTROL**(9 Hrs)**

Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise -Environmental and industrial noise - Noise control legislation.

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 2018.
2. Rao.C.S., Environmental Pollution Control Engineering , New Age International Publishers, 2017.

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 2016.



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2. Stern, A.C., Air Pollution ,Vol.I, II and III, Academic Press, 2015.
3. Cuniff, P.F., Environmental Noise Pollution, John Wiley and Sons, 2017.

Web References

1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
2. https://swayam.gov.in/nd1_noc20_ce23/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
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CO2	3	2	2	2	3	3	3	3	2	3	2	2	3	2	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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


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U20CEE510 ADVANCED DESIGN OF RCC STRUCTURES

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the unified analysis of reinforced concrete structures
- Gain knowledge about the design of special reinforced concrete elements
- Understand the concept on yield line theory of slabs and to design flat slabs.
- Understand the design RCC slab culvert and bridge
- Analyze the prestressed concrete sections and design of beams.

Course Outcomes

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

CO1 - Analyze reinforced concrete structures **(K4)**

CO2 – Design special reinforced concrete elements **(K4)**

CO3 – Create an awareness on yield line theory of slabs and to design flat slabs. **(K2)**

CO4 - Design RCC slab culvert and bridge **(K5)**

CO5 - Analyze prestressed concrete sections and design of beams. **(K5)**

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

UNIT I INTRODUCTION TO ANALYSIS OF REINFORCED CONCRETE STRUCTURES (9 Hrs)

Introduction to strut-tie model, equilibrium truss model, Bernoulli compatibility truss model, Mohr compatibility truss model, Introduction to nonlinear behavior of structures.

UNIT II DESIGN OF SPECIAL REINFORCED CONCRETE ELEMENTS (WSM) (9 Hrs)

Design of Deep Beams (using C programming), Checking for Local Failures, Detailing of Deep Beams, Design of shear walls, Design of Corbels, Design of Nibs, Design of pile cap. Reinforcement detailing for all design.

UNIT III FLAT SLABS (9 Hrs)

Elements of flat slabs, Codal procedure for design of flat slabs, Behavior of flat slab in shear, One way and two way shear, Equivalent Frame Method, Openings in flat slabs, Effect of pattern loading in flat slabs

UNIT IV YIELD LINE THEORY (9 Hrs)

Design of slabs of various shapes and having various support conditions using yield line analysis approach.

UNIT V DESIGN OF BEAM COLUMN JOINTS (9 Hrs)

Types of joints, Joints in multistoried buildings, Forces acting on joints, Design of joints for strength, Anchorage requirement in joints and detailing of reinforcement in joints.

Text Books

1. Varghese.P.C, “Advanced Reinforced Concrete Design”, Pretince-Hall India, 2005..
2. Unnikrishna Pillai.S and Devadas Menon, “Reinforced Concrete Design,” Tata MacGraw Hill Publishing Company Limited, Second Edition, New Delhi, 2010
3. Krishnaraju .N, Pranesh .R.N, “Design of Reinforced concrete IS: 456-2000”, New age International Publication (P) Ltd., New Delhi, 2003.



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Reference Books

1. Krishnaraju .N, "Prestressed Concrete", Tata McGraw-Hill Education, 2008, New Delhi.
2. Punmia.B.C, Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications, New Delhi, 2007..
3. Johnson Victor.D, "Essentials Of Bridge Engineering", 6/E, Oxford & IBH Publishing Company Pvt. Ltd.,Fourth edition, 2007.
4. IS : 456-2000 - Plain and Reinforced Concrete - Code of Practice
5. SP – 16 - Design Aids for Reinforced Concrete
6. IS : 1343:2012 - Prestressed concrete-code of practice
7. IRC 6-2010 - Standard Specifications and Code of Practice for Road Bridges Section : II Loads And Stresses

Web References

1. <https://nptel.ac.in/courses/105/105/105105105/>
2. <https://nptel.ac.in/courses/105/105/105105104/>
3. <https://nptel.ac.in/courses/105/106/105106176/>

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	3	3	3	3	3	1	3	3	3	3
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CO3	3	3	3	3	1	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	2	1	3	3	3	3	3	1	3	3	3	3

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


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Professional Elective – III (Offered in Semester VI)

U20CEE611	ROCK ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Impart knowledge on fundamentals of rock mechanics
- Apply its application in solving simple problems associated with rock slopes and underground openings.
- Understand the estimation of stresses by using various method
- Gain the knowledge on the mechanics of rock and its applications in underground structures and rock slope stability analysis.
- Understand the knowledge of rock stabilization

Course Outcomes

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

CO 1 - Understand classification of the rock, study the index properties of rock systems. **(K2)**

CO 2 - Understand the modes of rock failure, stress-strain characteristics, failure criteria. **(K3)**

CO 3 - Estimate the stresses in rocks. **(K4)**

CO 4 - Apply rock mechanics in engineering. **(K3)**

CO 5 - Get knowledge on rock stabilization **(K2)**

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

UNIT I CLASSIFICATION AND INDEX PROPERTIES**(9 Hrs)**

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose

UNIT II ROCK STRENGTH AND FAILURE CRITERIA**(9 Hrs)**

Modes of rock failure – Strength of rock – Laboratory measurement of shear, tensile and compressive strength. Stress - strain behavior of rock under Hydrostatic compression and deviator loading – Mohr –Coulomb failure criteria and Hock

UNIT III INITIAL STRESSES AND ITS MEASUREMENTS**(9 Hrs)**

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – measurements of in-situ stresses

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING**(9 Hrs)**

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence

UNIT V ROCK STABILIZATION**(9 Hrs)**

Introduction – Rock support and Rock reinforcement – Principles – Support reaction curves – Shotcreting.

Text Books

1. Goodman, P.E. "Introduction to Rock Mechanics", John Wiley and Sons, 1999.
2. Stillborg B., "Professional User Handbook for rock Bolting", Tran Tech Publications, 1996.
3. Ramamurthy T., "Engineering in Rocks for Slopes Foundations and Tunnels", PHI Learning Pvt. Ltd., 3rd Edition, 2014
4. Brown, E.T. "Rock Characterisation Testing and Monitoring". Pergaman Press 1991.
5. Arogyaswamy, R.N.P., "Geotechnical Application in Civil Engineering", Oxford and IBH, 1991.



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Reference Books

1. Braday, B.H.G. and Brown, E.T., Rock mechanics for underground mining (Third Edition), Kluwer Academic Publishers, Dordrecht, 2006
2. Vutukuri, V.S., Lama, R.D. and Saluja, S.S. Handbook on Mechanical Properties of Rocks. Vol. 1, Trans Tech. Publications, 1975.
3. Zhang Lianyang. Engineering Properties of Rocks. Elsevier, 2005.
4. Bieniawski, Z.T.. Engineering Rock Mass Classifications. John Wiley and Sons, 1989.
5. John Jaeger and N. G. Cook. Fundamentals of Rock Mechanics. Wiley-Blackwell. 2007

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1. <https://nptel.ac.in/courses/105/101/105101001/>
2. <https://nptel.ac.in/courses/105/105/105105106/>

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
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CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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


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U20CEE612**INTELLECTUAL PROPERTY RIGHTS**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- know general Knowledge about Intellectual Property Rights
- Understand about trademarks, Patents and Industrial Design
- know International Treaties and Conventions on IPRs and patents of India
- Gain an idea about different laws in IPR
- understand the concept of different IPR with case studies.

Course Outcomes

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

CO1- gain about Intellectual Property Rights.

CO2- Make details on trademarks, Patents and Industrial Design

CO3- Get details about Agreements and Legislations

CO4- Gain knowledge about different laws in IPR

CO5- Manage Intellectual Property portfolio to enhance the value of the firm.

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

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs**(10 Hrs)**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.

UNIT III AGREEMENTS AND LEGISLATIONS**(10 Hrs)**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW**(9 Hrs)**

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs**(7 Hrs)**

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

Text Books

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, "Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002
3. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow


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1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

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1. <https://nptel.ac.in/courses/109/106/109106137/>
2. <https://nptel.ac.in/courses/109/105/109105112/>
3. <https://nptel.ac.in/courses/110/105/110105139/>

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	2	3	3	3	3	3	3	3	2	2	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	2	2	3	3	3

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



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U20CEE613 SHORING SCAFFOLDING AND FORM WORK

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge about the latest methods of form construction.
- Understand the materials associated with formwork
- Understand the design aspects of formwork under various requirements
- Understand the planning and erection aspects of form work
- Understand about a few special types of forms

Course Outcomes

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

CO1 - Understand few other special types of forms **(K2)**

CO2 - Study the planning and erection aspects of form work for buildings. **(K2)**

CO3 - Know the design of forms and shores. **(K3)**

CO4 - Study the design aspects of formwork under various requirements. **(K3)**

CO5 - Study the materials associated with formwork. **(K2)**

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

UNIT I PLANNING, SITE EQUIPMENT AND PLANT FOR FORM WORK (9 Hrs)

Introduction - Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples. Overall Planning - Detailed planning - Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories.

UNIT II MATERIALS ACCESSORIES PROPRIETARY PRODUCTS AND PRESSURES (9 Hrs)

Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel - Aluminum - Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

UNIT III DESIGN OF FORMS AND SHORES (9 Hrs)

Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.

UNIT IV BUILDING AND ERECTING THE FORM WORK (9 Hrs)

Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.

UNIT V FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS (9 Hrs)

Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details - Forms for Thin



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Academic Curriculum and Syllabi R-2020

Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles -Types - advantages - Functions of various components - Planning -Desirable characteristics of concrete - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold -Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

Text Books

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 2006.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 2003
3. Robert L. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures, McGraw -Hill, 2006. "Guide for Concrete Formwork", American Concrete Institute, Box No. 9150, Michigan 48219.
4. "Safety Requirements for Scaffolding", American National Standards Institute, New York, 1994

Reference Books

1. Michael P. Hurst, Construction Press, London and New York, 2003.
2. "Safety Requirements for Scaffolding", American National Standards Institute. Broadway, New York, 10018.
3. Indian Concrete Institute, "Technical Monograph for Formwork", 2002.
4. Tudor Dinescu and Constantin Radulescu, "Slipform Techniques", Abacus Press, Turn Bridge Wells, Kent, 1992.
5. "Guide for Concrete Formwork", American Concrete Institute Detroit, Michigan, 1996.

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2. <https://nptel.ac.in/courses/105/102/105102195/>
3. <https://nptel.ac.in/courses/105/102/105102088/>

COs/POs/PSOs Mapping

	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	2	3	3	3	-	3	-	2	3	2	2	3
CO2	3	2	3	3	2	3	3	-	3	-	3	3	2	2	3
CO3	3	2	2	2	3	3	3	-	3	-	2	3	2	2	3
CO4	3	2	2	2	3	3	3	-	3	-	2	3	2	2	2
CO5	3	2	2	2	3	3	3	-	3	-	2	3	2	2	2

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


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U20CEE614	MUNICIPAL SOLID WASTE MANAGEMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Impart knowledge on sources and generation of municipal solid waste.
- Gain adequate knowledge in reduction and recycle of waste.
- Understand the concept of collection methods and routes.
- Gain knowledge about the transport method of municipal solid waste
- Impart knowledge of disposal method of waste.

Course Outcomes

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

CO 1 - Understand the nature and characteristics of municipal solid wastes.(K2)

CO 2 - Understand the concept of reduction, reuse and recycling of waste. (K4)

CO 3 - Plan and design systems for storage, collection, transport, processing and disposal of municipal solid Waste.(K3)

CO 4 - Understand the issues on solid waste management from an integrated source.(K4)

CO 5 - Design and operate sanitary landfill.(K5)

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

UNIT I SOURCES AND CHARACTERISTICS**(9 Hrs)**

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics –functional Elements of solid waste management – Requirements and salient features of Solid waste management rules (2016) -Role of public and NGO"s- Public Private participation – Elements of integrated Municipal Solid Waste Management Plan.

UNIT II SOURCE REDUCTION, WASTE STORAGE AND RECYCLING**(8 Hrs)**

Waste Management Hierarchy –3R-Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers - segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics, and Construction/Demolition wastes.

UNIT III COLLECTION AND TRANSFER OF WASTES**(8 Hrs)**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance- options under Indian conditions – Field problems- solving.

UNIT IV PROCESSING OF WASTES**(12 Hrs)**

Objective(s) of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste -composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V WASTE DISPOSAL**(8 Hrs)**

Land disposal of solid waste- Sanitary landfills – site selection- design and operation of sanitary landfills – Landfill liners– Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation.


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Text Books

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York.
3. George Tchobanoglous et al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993.
4. B. Bilitewski, G. Hardhe, K. Marek, A. Weissbach, and H. Boeddicker, "Waste Management", Springer, 1994.

Reference Books

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization. Government of India, New Delhi.
2. George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste management, McGraw Hill, New York.
3. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
4. R.E. Landreth and P.A. Rebers, "Municipal Solid Wastes – problems and Solutions", Lewis Publishers, 1997.

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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	3	3	3	3	3	3	2	3	3	3	3	2
CO2	3	3	2	3	3	3	3	2	3	2	2	3	3	3	3
CO3	3	3	3	2	2	2	3	3	3	3	2	3	3	3	2
CO4	2	3	2	3	2	3	2	3	3	2	2	3	3	3	3
CO5	3	3	3	2	3	3	3	3	3	2	3	3	3	3	2

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


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U20CEE615**DESIGN OF INDUSTRIAL STRUCTURES**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand about the planning and layout of buildings and its components.
- Have information about the functional requirements of industries.
- Perceive the design concepts of steel storage structures.
- Be acquainted with the design concepts of concrete storage structures.
- Familiarize the general principles of prefabrication and the functional requirements for precast concrete units

Course Outcomes

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

CO1 - Describe the general requirements for industries like cement, chemical and steel plants. **(K2)**

CO2 - Relate the functional requirements such as lighting, ventilation and fire safety of industries **(K2)**

CO3 - Design the steel storage structures like bunkers and silos **(K5)**

CO4 - Design the concrete storage structures like bunkers and silos **(K5)**

CO5 - Illustrate the functional requirements of Pre cast concrete units **(K2)**

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

UNIT I PLANNING**(9 Hrs)**

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS**(9 Hrs)**

Lighting – Ventilation – Acoustics – Fire safety – Guidelines from factories act

UNIT III DESIGN OF INDUSTRIAL STEEL STRUCTURES**(9 Hrs)**

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos.

UNIT IV DESIGN OF INDUSTRIAL RCC STRUCTURES**(9 Hrs)**

Silos and bunkers – Chimneys (Using C programming) – Principles of folded plates and shell roofs.

UNIT V PREFABRICATION**(9 Hrs)**

Principles of prefabrication and erection – Prestressed precast roof trusses- Functional requirements for Precast concrete units- Introduction to design of industrial mezzanine building

Text Books

1. Mohamed A. El-Reedy, "Construction Management and Design of Industrial Concrete and Steel Structures", CRC Press, 2010
2. Varghese.P.C., " Limit State Design of Reinforced Concrete", Prentice Hall of India Eastern Economy Editions, 2 nd Edition, 2003.
3. Bhavikatti.S.S., "Design of Steel Structures", J.K. International Publishing House Pvt.Ltd., 2009.

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1. Henn W. "Buildings for Industry", Vol.I and II, London Hill Books, 2017
2. SP32-1986, Handbook on Functional Requirements of Industrial buildings, Bureau of Indian Standards,



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3. Structural Engineering Research Centre, Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Madras, 1982
4. Koncz.J., "Manual of Precast Construction", Vol.I and II, Bauverlay GMBH, 1971.
5. Ashoke Kumar Dasgupta, "Design of Industrial Structures Reinforced Cement Concrete and Steel", CRC Press, 2021
6. IS: 9178-PART-I: Indian code of practice criteria for design of steel bins for storage of bulk materials, PART-II: General requirements and assessment of loads, PART-III: Design criteria and Bins designed for mass flow and funnel flow
7. IS:5503(PART- I)-1969: Indian Code of practice for silos for grain storage
8. IS 4995-1 (1974): Criteria for design of reinforced concrete bins for storage of granular and powdery materials, Part 1: General requirements and assessment of bin loads

Web References

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2. <https://nptel.ac.in/courses/105/105/105105162/>
3. <https://nptel.ac.in/courses/105/105/105105105/>

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	3	3	3	3	3	3	3	2	3	3	3	3
CO2	3	1	1	3	3	3	3	3	3	3	2	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO5	3	1	1	3	3	3	3	3	3	3	2	3	3	3	3

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


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Professional Elective – IV (Offered in Semester VII)

U20CEE716	SITE INVESTIGATION METHODS AND PRACTICES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the site investigation, its types and applications
- Gain the knowledge about the geological methods and its characterization
- Familiar with the logging methods, classification and its factors
- Understand the site exploration methods and its factors
- Understand the technical report preparation on site works

Course Outcomes

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

CO1 – Understand the methods of site investigation through various maps & records. **(K2)**

CO2 – Characterize the rocks & its test procedures. **(K2)**

CO3 – Classify the bore hole & prepare a log report for bore hole. **(K2)**

CO4 – Familiarize with the different insitu tests & sampling procedures. **(K2)**

CO5 – Write technical report for various site works. **(K2)**

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

UNIT I INTRODUCTION**(9 Hrs)**

Objective(s) of site investigation - various stages in site investigation process - Planning and Desk Study - topographic maps, aerial photographs - interpretation of aerial photographs, applications in site investigation, Geological maps, minerals and mining records, soil planning maps, site reconnaissance and local enquiries.

UNIT II GEOLOGICAL METHODS**(9 Hrs)**

Geological methods - different stages, Geological exploration methods –Areal mapping, site mapping and construction mapping-Rock mass characterization- Discontinuities in rocks, Rock core descriptors, Rock mass classification, RQD, Rock mass rating, Rock structure rating, Q-system- General principle distribution of physical field in subsurface – Electrical resistivity, Seismic refraction methods, their principle, methods of survey, correction to field data, Interpretation and limitations. Index and Mechanical properties of rocks, Laboratory and insitu tests.

UNIT III GEOPHYSICAL EXPLORATION**(9 Hrs)**

Trial pits, shafts, tunnels, auguring, and different types of drilling methods, their merits and demerits, Bore hole logging techniques (subsurface geophysical exploration) - Need for logging techniques, classification and different types logging methods.

UNIT IV SAMPLING METHODS**(9 Hrs)**

Soil Exploration methods, samples, sampling procedure, sample disturbances, samplers, Factors controlling spacing and depth of bore hole, Insitu tests, SPT, SCPT, Pressure meter tests, interpretation and application, Index properties, Laboratory testing.

UNIT V REPORT PREPARATION**(9 Hrs)**

Technical Report writing, report format, recommendations for earth work structures, highway excavations and drainage works, dams, check report site preparation, investigation during construction and operation.


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Text Books

1. Francis Longstreth Thompson "Site planning in Practice: an Investigation of the Principles of Housing Estate Development" Palala Press, 2016.
2. Craig. C "Advances in site investigation practice" Thomas Telford Ltd, 1996
3. Joyce, M.D. 'Site Investigation Practice; ESN. SPON Publishers, 1982.

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1. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2006.
2. Bell .F.G.. "Fundamentals of Engineering Geology", B.S. Publications. Hyderabad 2011.
3. Dobrin, M.B "An introduction to geophysical prospecting", McGraw Hill, New Delhi, 1988.
4. Legget and Karrow, Hand book of Geology in Civil Engineering, McGraw Hill Publishers, 1983.
5. Hunt, R.E., Geotechnical Engineering Analysis and Evaluation, McGraw Hill Book Company, 1986.

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2. <https://nptel.ac.in/courses/105104167/>
3. <http://www.digimat.in/nptel/courses/video/105103182/L15.html>
4. <https://nptel.ac.in/courses/105/108/105108075/>
5. <https://nptel.ac.in/courses/105/105/105105185/>

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	3	2	2
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CO3	2	1	-	-	1	-	-	-	-	-	-	2	3	2	2
CO4	1	1	-	2	1	-	-	-	-	-	-	2	3	2	2
CO5	-	-	2	-	-	2	-	-	-	-	-	3	3	2	2

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


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U20CEE717	URBAN PLANNING AND DEVELOPMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge about urbanisation and suburbanisation
- Understand about principles of planning, goals and objectives.
- Evaluate various developmental plans in different zones
- Understand the implementation process of the urban projects and its design problems.
- Understand about the Standards and Regulations of urban system.

Course Outcomes

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

CO1 - Describe basic issues in urban planning. **(K2)**

CO2 - Formulate plans for urban and rural development. **(K2)**

CO3 - Plan and analyze socio economic aspects of urban and rural planning. **(K2)**

CO4 - Implement project formulation activities. **(K2)**

CO5 - Know about the legislation and regulations about the urban planning system. **(K2)**

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

UNIT I BASIC ISSUES**(9 Hrs)**

Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.

UNIT II PLANNING PROCESS**(9Hrs)**

Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objective(s), Delineation of Planning Areas, Surveys and Questionnaire Design.

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION**(9 Hrs)**

Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights , Special Economic Zones- Development of small town and smart cities-case studies

UNIT IV PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS**(9 Hrs)**

Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM**(9 Hrs)**

Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries

Text Books

1. Goel, S.L “Urban Development and Management”, Deep and Deep publications, New Delhi 2003
2. George Chadwick, “A Systems view of planning”, Pergamon press, Oxford 1978
3. Singh V.B, “Revitalised Urban Administration in India”, Kalpaz publication, Delhi, 2002


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Reference Books

1. "Tamil Nadu Town and Country Planning Act 1971", Government of Tamil Nadu, Chennai
2. Thooyavan, K.R., Human Settlements – "A Planning Guide to Beginners", M.A Publications, Chennai, 2005
3. "CMDA, Second Master Plan for Chennai", Chennai 2013
4. Edwin S.Mills and Charles M.Becker, "Studies in Urban development", A World Bank publication, 2010
5. Catanese A J, "Urban Planning", McGraw Hill publication January 2014.

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2. <https://nptel.ac.in/courses/127/101/127101014/>
3. <https://www.youtube.com/watch?v=URLOGQhJWj0>

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
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CO5	3	2	3	3	-	-	-	-	-	-	-	-	2	2	2

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


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Course Objectives

This course should enable the students to

- Gain knowledge about the investigation of Bridges and loading standards.
- Understand the Bridge substructure.
- Understand the Bridge superstructure
- Understand the design concepts in bridges.
- Familiar about bridge maintenance and rehabilitation techniques adopted in bridge

Course Outcomes

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

CO1 - Gain knowledge on investigation and loading standards of bridge. **(K2)**

CO2 - Select the suitable types of foundation, design of abutment, wing walls and setting out piers and abutment. **(K2)**

CO3 - Compare and choose the right types of super structure. **(K2)**

CO4 - Design steel and concrete bridges. **(K3)**

CO5 - Choose the suitable maintenance and rehabilitation techniques of bridge. **(K2)**

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

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to bridges Investigations of minor and major bridge – Topography, catchment, hydrology, Geotechnical aspects, Construction Resources. Loading standard for road and railway bridges

UNIT II SUBSTRUCTURE**(9 Hrs)**

Choice of Foundation for piers and abutments –Types. Load on Foundation – Design of Well foundation, sinking process, tilt correction. Design of Pile Foundation. Design of wing wall and abutment. Setting out for piers and abutments for Major and Minor Bridges.

UNIT III SUPERSTRUCTURE**(9 Hrs)**

Choices of superstructure types Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge - Temperature Analysis - Distortional Analysis - Effects of Differential settlement of supports. Bearing and types.

UNIT IV DESIGN OF BRIDGE**(9 Hrs)**

Design of Bridges – IRC code – Pigeaud's method – Coulomb's method – design of Slab Bridge – T Beam Bridge. Design of Truss Bridges – Design of Plate girder bridges.

UNIT V MAINTENANCE**(9 Hrs)**

Maintenance-Inspection of bridges, Maintenance of substructure girders-Load testing on bridges-Temporary and movable bridges. Causes of bridge failure. Rehabilitation techniques for concrete bridges

Text Books

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 2010
2. M. K. Pant, Bridge Engineering, S.K Kataria and Sons, 2016
3. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 2017.



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Reference Books and Syllabi R-2020

1. Victor.D.J, Essentials of Bridge Engineering, Oxford IBH Publishers 2013.
2. David Blockey, Bridges, Oxford University Press, 2013.
3. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
4. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013
5. Raina, V.K., Analysis, Design and Construction of Bridges, Tata McGraw Hill(2010)

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1. <https://nptel.ac.in/courses/105/102/105102088/>
2. <https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce23/>
3. <https://nptel.ac.in/courses/105/105/105105165/>

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	3	2	-	-	-	-	-	-	1	3	1	2
CO2	2	3	1	2	2	-	-	-	-	-	-	1	3	1	-
CO3	3	3	3	2	2	-	-	-	-	-	-	1	2	3	-
CO4	3	3	2	2	3	-	-	-	-	-	-	1	2	2	3
CO5	3	3	2	2	3	-	-	-	-	-	-	1	1	2	3

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


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U20CEE719**POLLUTION CONTROL AND MONITORING**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the factors that must be satisfied for Water pollution control.
- Gain knowledge about air pollution, sources and its effects on human.
- Gain adequate knowledge about environmental, industrial noise and control legislation.
- Understand about the sources, collection and disposal method of solid waste.
- Understand the relationship between social, legislative and biological constraints in a modern developed society

Course Outcomes

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

CO1 - Describe the principles of the biological and chemical treatment processes that are required to ensure adequate quality and quantities of potable water. **(K2)**

CO2 - Analyze the sources, effect of air pollution, air quality monitoring and control system. **(K3)**

CO3 - Use advanced methods for monitoring and modeling for noise pollution and preventive temporal patterns for noise pollution. **(K3)**

CO4 - Understand the generation and preventive measures of solid waste. **(K2)**

CO5 - Analyze the method of sanitation for various field **(K3)**

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

UNIT I WATER POLLUTION & CONTROL**(9 Hrs)**

Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.

UNIT II AIR POLLUTION AND CONTROL**(9 Hrs)**

Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation.

UNIT III NOISE POLLUTION AND CONTROL**(9 Hrs)**

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.

UNIT IV SOLID WASTE MANAGEMENT**(9 Hrs)**

Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.


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UNIT V ENVIRONMENTAL SANITATION**(9 Hrs)**

Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurization of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment.

Text Books

1. Noel de Nevers, "Air Pollution Control Engineering", Waveland press, Inc 2017.
2. S. M. Khopkar "Environmental Pollution Monitoring and Control", New age international (P) Limited 2004
3. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, Springer Science + Science Media LLC, 2004.

Reference Books

1. Vesilind (1997), Introducing to Environmental Engineering, PWS Publishing Company.
2. Gerard Kiley (1997), Environmental Engineering, Irwin McGraw-Hill.
3. Rao C.S. (1996), Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi.
4. Ahmed El-Nemr, 2010, Impact, Monitoring and Management of Environmental Pollution.
5. Marquita K. Hill, 2010 Understanding Environmental Pollution

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2. <http://www.ilocis.org/documents/chpt55e.htm>
3. <https://nptel.ac.in/courses/105/102/105102089/>

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	3	-	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	1	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	2	3
CO4	2	3	3	3	-	-	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	-	3	2	3

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


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U20CEE720	ADVANCED STRUCTURAL ANALYSIS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Analyze the portal frames by using approximate method
- Analyze the indeterminate beams by Muller Breslau's theorem
- Analyze the trusses by using stiffness and flexibility method
- Gain the knowledge of space and cables structures by tension coefficient method
- Understand the concepts of developing finite elements and finite element packages.

Course Outcomes

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

CO1 - Understand the analysis of portal frames by Portal and Cantilever method (**K4**)

CO2 - Gain and draw influence lines for indeterminate beams by Muller Breslau's theorem (**K3**)

CO3 - Understand the pin jointed frames by Method of Joints (**K4**)

CO4 - Gain the knowledge about common feature in modern building construction, large roof spans in commercial and industrial buildings (**K2**)

CO5 - Understand FEM method is fast, accurate and innovative approach to solving your most challenging design problems (**K2**)

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

UNIT I ANALYSIS OF MULTISTORIED FRAMES (9 Hrs)

Introduction – Substitute frame method - Portal Method – Cantilever Method – Analysis of frames

UNIT II ILD FOR INDETERMINATE STRUCTURES (9 Hrs)

Influence line diagram - Muller - Breslau's principle – I.L.D for Propped cantilever, Fixed beams, Continuous beams.

UNIT III ANALYSIS OF PIN JOINTED PLANE FRAMES (9 Hrs)

Analysis of pin jointed plane frames with two or three unknowns by Stiffness method - Lack of fit - Temperature stress

UNIT IV SPACE AND CABLE STRUCTURES (9 Hrs)

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – Suspension bridges with two and three hinged stiffening girders

UNIT V INTRODUCTION TO FINITE ELEMENT METHOD (9 Hrs)

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain - Triangular elements


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Text Books

1. Vaidyanathan R and Perumal P, Structural Analysis, Vol. 2, Laxmi Publications Pvt. Ltd, New Delhi, 2017, 3rd Edition
2. Bhavikatti, S.S, Structural Analysis, Vol. 2, Vikas Publishing House Pvt. Ltd., New Delhi, 4th Edition, 2018
3. Pandit G.S, and Gupta S. P, "Structural Analysis a Matrix Approach", Tata McGraw Hill Publications, New Delhi, 2014
4. L.S. Negi and R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003.
5. Reddy.J.N., " Introduction to the Finite Element Method", Tata McGraw Hill, 2013

Reference Books

1. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.
2. Devdas Menon, Advanced structural analysis, Narosa, 2009
3. C.S. Reddy, Basic Structural Analysis, Tata Mc-Graw hill, 2015
4. Wang C. K., "Intermediate Structural Analysis" Tata McGraw - Hill Education 2010.
5. Sujit Kumar Roy and Subrata Chakrabarty, "Fundamentals of Structural Analysis" S. Chand & Co., 2010

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1. <https://nptel.ac.in/courses/105105109/>
2. <http://www.digimat.in/nptel/courses/video/105101086/L01.html>
3. <https://nptel.ac.in/courses/105/106/105106176/>

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	3	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	2	2	-	-	-	-	-	-	-	-	3	2	2
CO3	3	2	3	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	2	3	3	-	-	-	-	-	-	-	-	3	3	3
CO5	3	2	3	3	-	-	-	-	-	-	-	-	3	3	3

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


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Professional Elective – V (Offered in Semester VIII)

U20CEE821	STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the concept of degree of freedom
- Gain the knowledge about the multiple degree of freedom
- Familiar with the basic knowledge on Earthquake Engineering
- Know the basic response of structures to earthquake
- Study the design aspects on earthquake engineering

Course Outcomes

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

CO1 - Understand the concept of degree of freedom **(K3)**

CO2 - Gain the knowledge on Multiple degree of freedom **(K3)**

CO3 - Understand with the basic knowledge on Earthquake Engineering. **(K3)**

CO4 - Know the basic response of structures to earthquake **(K3)**

CO5 - Understand the design on Earthquake Engineering **(K4)**

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

UNIT I SINGLE DEGREE OF FREEDOM**(9 Hrs)**

Definition of degree of freedom – Degree of freedom – idealization of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alembert's principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM**(9 Hrs)**

Formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING**(9 Hrs)**

Elements of Engineering Seismology – Definitions, introduction Seismic hazard, Earthquake phenomenon – Seismotectonic - Seismic Instrumentation- Characteristic of strong earthquake motion – Estimation of earthquake parameters.

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE**(9 Hrs)**

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra – Lessons learnt from past earthquakes.

UNIT V DESIGN METHODOLOGY**(9 Hrs)**

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Lateral load analysis – Design and detailing as per IS:13920 – 1993.



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Text Books

1. Chopra, A.K., "Dynamics of Structures: Theory and Applications to Earthquake Engineering", Pearson, 5th Edition, 2017.
2. Clough R.W, and Penzien J, "Dynamics of Structures", 2nd Edition, McGraw- Hill International Edition, 2003.
3. Mario Paz, "Structural Dynamics Theory and Computations", 5th Edition, CBS Publishers, 2012.

Reference Books

1. Kappos, A., "Dynamic Loading and Design of Structures", CRC Press, 2014
2. Craig, R.R., Kurdila, A.J., "Fundamentals of Structural Dynamics", John Wiley and Sons, 2nd Edition, 2011.
3. Bollinger, G.A., "Blast Vibration Analysis", Courier Dover Publications, 2018
4. Dr. K. Jagannadha Rao Er. Srinavas Vasam, "Structural Dynamics And Earthquake Engineering" S.K. Kataria Publisher, 2018
5. Gopinath R, "Structural Dynamics and Earthquake Engineering", Yes Dee Publishing Pvt Ltd, 2021

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2. <https://nptel.ac.in/courses/105/101/105101006/>
3. <https://nptel.ac.in/courses/105/104/105104189/>

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
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	3	2
CO3	3	-	-	-	-	-	-	-	-	-	-	-	2	2	3
CO4	-	2	2	-	-	2	2	2	-	-	-	-	3	2	3
CO5	-	3	3	2	3	2	2	2	1	1	1	1	3	2	3

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


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U20CEE822**HOUSING - PLANNING AND MANAGEMENT**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Train a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
- Study and understand the latest construction techniques applied to engineering Construction
- Become familiar with Building Byelaws
- Focuses on cost effective construction materials and methods.
- Emphasis is given on the principles of sustainable housing policies and programmes

Course Outcomes

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

CO 1 - Understand various strategies of housing planning in different level. **(K2)**

CO 2 - Get knowledge about various housing programs and schemes in governmental organization. **(K2)**

CO 3 - Formulate the housing Projects and design problems associated to implementation. **(K3)**

CO 4 - Undergo Performance Evaluation in various aspects. **(K2)**

CO 5 - Understand the concept of cost effective analysis of housing projects and to understand project appraisal techniques. **(K3)**

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

UNIT I INTRODUCTION TO HOUSING**(10 Hrs)**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES**(10 Hrs)**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods-Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects, Role of Public housing agencies, and Private sector in supply, quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS**(9 Hrs)**

Formulation of Housing Projects – Land Use and Soil suitability analysis - Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS**(8 Hrs)**

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concept - Building Centers – Concept, Functions and Performance Evaluation.


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UNIT V HOUSING FINANCE AND PROJECT APPRAISAL**(8 Hrs)**

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy - Public Private Partnership Projects – Viability Gap Funding - Pricing of Housing Units.

Text Books

1. Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.
3. "Development Control Rules for Chennai Metropolitan Area, CMA", Chennai, 2004.

Reference Books

1. Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012
2. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata McGraw Hill Edition, 2011
3. Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd Edition, USA 2010
4. "Development Control Rules for Chennai Metropolitan Area, CMA", Chennai, 2004.
5. W Addington Willis, "Housing and Town Planning in Great Britain", March 2019

Web References

1. <https://nptel.ac.in/courses/124107001/>
2. <https://nptel.ac.in/courses/105106188/>
3. <https://www.youtube.com/watch?v=VI3Ef1Rytz8>

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	3	3	2	2	-	-	-	-	-	-	3	2	2
CO2	3	2	3	3	2	2	-	-	-	-	-	-	3	2	2
CO3	3	2	3	3	2	2	-	-	-	-	-	-	3	2	2
CO4	3	2	3	3	2	2	-	-	-	-	-	-	3	2	2
CO5	3	2	3	3	2	2	-	-	-	-	-	-	3	2	2

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


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U20CEE823**TALL STRUCTURES**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure).
- Understand the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure).
- Understand the concept of shear wall and bracing structures in high rise building
- Understand the concept of lateral deformation of rigid frame buildings structures
- Know the parameters of designing tall buildings

Course Outcomes

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

CO1 - Explain the design aspects and the various innovative materials which can be used for the construction of tall buildings **(K2)**

CO2 - Apply the knowledge of engineering fundamentals to characterize various types of loading which could be considered for the analysis of tall building. **(K2)**

CO3 - Identify various structural systems, their behavior and performance under different loading conditions. **(K2)**

CO4 - Analyze the structures as an integral unit for drift and twist **(K2)**

CO5 - Design tall structures under different conditions like stability considerations, creep, shrinkage, and temperature and fire resistance. **(K2)**

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

UNIT I DESIGN CRITERIA AND MATERIALS**(9 Hrs)**

Design Philosophy - Modern concepts – Materials used - High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self-Compacting Concrete, High strength steel, Composites

UNIT II LOADING**(9 Hrs)**

Gravity Loading – Dead load, Live load – Live load reduction techniques, Impact load, Construction load, Sequential loading. Wind Loading – Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading – Equivalent lateral Load analysis, Dynamic Analysis, Combination of Loads

UNIT III BEHAVIOUR OF STRUCTURAL SYSTEMS**(9 Hrs)**

Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, in filled frames, Shear walls, Coupled Shear walls, Wall – Frames, Tubular and Outrigger – Hybrid systems.

UNIT IV ANALYSIS**(9 Hrs)**

Modeling for approximate analysis, accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for drift and twist. Computerized 3D analysis.



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UNIT V DESIGN PARAMETERS**(9 Hrs)**

Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance, Stability of Tall Structures - $P\Delta$ Effects, Buckling analysis Of Tall Buildings.

Text Books

1. Bryan Stafford Smith and Alex Coull, Tall Building Structures, Analysis and Design, John Wiley and Sons, Inc., 2011.
2. Taranath B.S, Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, McGraw Hill, 2011.
3. Mark Sarkisian, "Designing Tall Buildings : Structure as Architecture", Routledge, 2016
4. Wolfgang Schueller, "High-rise building Structures", John Wiley and Sons, New York 1977.

Reference Books

1. Coull, A. and Smith, Stafford, B. "Tall Buildings", Pergamon Press, London, 1997.
2. Lin T.Y. and Burry D. Stotes, "Structural Concepts and Systems for Architects and Engineers", John Wiley, 1994.
3. Lynn S. Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1996.
4. Bungale S. Taranath, "Tall Building design: Steel Concrete, and Composite systems"
5. Kolousek V, Pimer M, Fischer O and Naprstek J, Wind effects on Civil Engineering Structures. Elsevier Publications. 1984.

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1. <https://onlinelibrary.wiley.com/page/journal/15417808/homepage/forauthors.html>
2. <https://www.elsevier.com/physical-sciences-and-engineering/engineering/journals/damping-technologies-for-tall-buildings-new-trends-in-comfort-and-safety>

COs/POs/PSOs Mapping

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CO3	-	2	2	1	2	-	-	-	-	-	-	-	3	-	3
CO4	-	3	3	-	3	2	-	2	-	-	1	1	3	3	2
CO5	-	3	3	-	2	2	2	2	1	-	1	1	3	2	2

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


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U20CEE824	INDUSTRIAL WASTE DISPOSAL AND TREATMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Have a knowledge on the uses of water by industries
- Understand the process involved in industries and their waste water production
- Learn about the treatment of waste water.
- Learn about the treatment safe disposal of treated effluents.
- Study the impact due to Textiles Tanneries, Pulp and Paper, Metal finishing, Petroleum refining, chemical industries, Sugar and distilleries, Dairy, Iron and Steel.

Course Outcomes

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

CO1- An ability to use the recent techniques. **(K3)**

CO2 - Describe the importance of Pretreatment Methods **(K3)**

CO3 - Apply the various techniques for Treatment Methods of Industrial Wastes **(K3)**

CO4 - Describe the solve problems related to Industrial Waste Water management and Disposal **(K3)**

CO5 - Carry out Industry and power plants studies case studies **(K3)**

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

UNIT I PRECIPITATION

(9 Hrs)

Uses of water by Industry - Sources and types of wastewaters, quality criteria, effluent standards- Individual and common effluent treatment plants - Population equivalent, Effects of industrial wastes on streams, land, air and waste water treatment plants

UNIT II PRETREATMENT METHODS

(9 Hrs)

Pretreatment Methods: Process modification – methods and materials changes – Reduce, reuse and recycle methods, housekeeping etc. to reduce waste discharge and strength of the waste and established methods for by products recovery within the plant operations.

UNIT III TREATMENT METHODS OF INDUSTRIAL WASTES

(9 Hrs)

Equalization – Neutralization - Oil separation – Floatation – Precipitation – Adsorption - Aerobic and anaerobic biological treatment - High rate reactors. Chemical oxidation – Ozonation – Ion Exchange – Membrane technologies.

UNIT IV TREATMENT METHODS OF RESIDUALS

(9 Hrs)

Residuals of Industrial waste treatment – Characteristics of sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge.

UNIT V CASE STUDIES

(9 Hrs)

Industry and power plants - manufacturing process description - wastewater characteristics and waste treatment flow sheet for typical industries – Textiles – Tanneries – Pulp and Paper – Metal finishing – Petroleum refining – Chemical industries - Sugar and distilleries – Dairy – Iron and Steel- Fertilizers – Nuclear power plants.


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Text Books

1. Eckenfelder. W.W., Industrial Water Pollution Control, McGraw Hill, 2017.
2. Arceivala.S.J. Wastewater Treatment for Pollution Control, Tata Mc.Graw Hill. 2018
3. Santosh kumar Garg, Industrial Waste Disposal and Treatment, Khanna Publishers, 2018.

Reference Books

1. Nemerow,N.L., Theories and Practices of Industrial Wastes Treatment, Addisson and Wesley, 2015.
2. Gurnham,C.F., Principles of Industrial Waste Treatment, John Wiley, New York,2012.
3. Varshney, R.S., Industrial Waste Disposal and Treatment,, Nem Chand & Bros., 2017.
4. Jayarami Reddi.P, Text Book of Industrial Waste Disposal and Treatment, Lakshmi Publications, 2017.
5. Bear J., " Industrial Waste Disposal ", McGraw-Hill, New York, 2012

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1. <https://nptel.ac.in/courses/105/106/105106119/>
2. <https://nptel.ac.in/courses/105/105/105105178/>
3. <https://nptel.ac.in/content/105/107/105106056/>

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	3	2	-	-	-	-	-	-	1	3	1	2
CO2	2	3	1	2	2	-	-	-	-	-	-	1	3	1	-
CO3	3	3	3	2	2	-	-	-	-	-	-	1	2	3	-
CO4	3	3	2	2	3	-	-	-	-	-	-	1	2	2	3
CO5	3	3	2	2	3	-	-	-	-	-	-	1	1	2	3

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


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U20CEE825**PREFABRICATED STRUCTURES**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Learn various distress and damages to concrete structures
- Assess the durability of concrete due to various non-destructive testing
- Suggest the suitable materials and techniques for repair
- Implement various rehabilitation and retrofitting techniques
- Select suitable demolition techniques for structures

Course Outcomes

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

CO1 - Gain knowledge of maintenance and various assessment techniques **(K2)**

CO2 - Understand the methods of non-destructive testing systems **(K2)**

CO3 - Understand the types and properties of repair material **(K2)**

CO4 - Understand the corrosion and damaged structures **(K2)**

CO5 - Gain knowledge of strengthening of structures **(K3)**

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

UNIT I INTRODUCTION**(9 Hrs)**

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS**(9 Hrs)**

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III DESIGN PRINCIPLES**(9 Hrs)**

Disuniting of structures – Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINT IN STRUCTURAL MEMBERS**(9 Hrs)**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V DESIGN FOR ABNORMAL LOADS**(9 Hrs)**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse

Text Books

1. Poonam I. Modi and Chirag N. Patel, "Repair and Rehabilitation of concrete structures", PHI Learning Pvt. Ltd., 2015
2. P.C.Varghese, "Maintenance, Repair & Rehabilitation & Minor Works of Buildings", PHI Learning Pvt. Ltd., 2014
3. Riadh Al-Mahaidi, Robin Kalfat, "Rehabilitation of Concrete Structures with Fiber-Reinforced Polymer", Matthew Deans, 2018



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Reference Books and Syllabi R-2020

1. R.T.L. Allen, S.C. Edwards, and J.D.N. Shaw, "The Repair of Concrete Structures", Blackie Academic & Professional, 2005
2. Walter F. Silva-Araya. Oladis T. De Rincon and Luis Pumarada O'Neill, "Repair and Rehabilitation of Reinforced Concrete Structures", ASCE Publications, 1997.
3. Anibal Costa, Joao Miranda Guedes, Humberto Varum, "Structural Rehabilitation of Old buildings", Springer, 2014
4. V.M. Malhotra, "Repair, Rehabilitation and Maintenance of Concrete Structures, and innovations in design and construction", American Concrete Institute, 2000
5. Thomas Dyer, "Concrete Durability", CRC Press, 2014

Web References

1. <https://nptel.ac.in/courses/105/106/105106202/>
2. <https://onlinelibrary.wiley.com/doi/abs/10.1002/pse.140>
3. <https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470015902.a0021403.pub2>

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	3	2	1	2	-	-	-	-	-	-	2	3	3
CO2	3	2	3	3	1	2	-	-	-	-	-	-	2	3	3
CO3	3	3	3	3	1	2	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	2	-	-	-	-	-	-	2	3	3
CO5	3	3	3	3	1	2	-	-	-	-	-	-	2	3	3

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


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U20CEE826	COASTAL AND OFFSHORE STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the various components in Harbour and offshore structures.
- Understand the planning and design principles of various components in Docks and harbours.
- Gain knowledge about types, forces, design concepts and foundation for offshore structures.
- Understand about the types of offshore structure.
- Understand about the design and installation of offshore pipelines.

Course Outcomes

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

CO 1 - Understand the classification of Harbours and details of different ports **(K2)**

CO 2 - Learn the terminology and fundamental concepts of planning **(K2)**

CO 3 - Students able to designing coastal and types of dock structures **(K3)**

CO 4 - Understand the types of offshore structures with different environmental conditions. **(K2)**

CO 5 - Learn the costal foundation and Submarine pipelines **(K2)**

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

UNIT I GROWTH OF PORTS**(9 Hrs)**

History of Port – Classification of Harbours - Factors affecting the growth of Port. Requirement of a Harbour - General Planning - Site investigation. Description of selected Indian ports.

UNIT II HARBOUR PLANNING (TECHNICAL)**(9 Hrs)**

Harbour entrance - Navigational Channel – Depth of harbour – Turning basin – berthing area – Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals. Navigational aids – Light house.

UNIT III HARBOUR STRUCTURES**(9 Hrs)**

Break waters: Types – Selection – Forces and – Design principles of break waters. Berthing structures: Types – Loads – Selection and design principles of berthing structures – Selection and Design principles of Dock fenders and Mooring accessories. Types of dock structures, Dredging.

UNIT VI OFFSHORE STRUCTURE**(9 Hrs)**

Types of offshore structures – selection – function - Physical, environmental and geotechnical aspects of marine and offshore construction – Loads and responses of offshore structures.

UNIT V CONSTRUCTION OF OFFSHORE STRUCTURES**(9 Hrs)**

Foundations for offshore structures – Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines

Text Books

1. Narasimhan and S. kathiroli, Harbour and Coastal Engineering (Indian Scenario) Vol - I and Vol – II, NIOT- Chennai
2. Chakrabarti.,S.K., Hand Book of Offshore Engineering (Vols. 1 and 2)” Elsevier Publications
3. Offshore Structures, Marine Foundations and Sediment Processes (v. 2) (Handbook of Coastal and Ocean Engineering), Gulf Publishing Co, 1990



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Reference Books and Syllabi R-2020

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures, McGraw-Hill, 2007
3. Harbour Dock & Tunnel Engineering, R. Srinivasan, Charotar Publishing House pvt. Ltd.; 27th edition
4. C.M. Wang, Large Floating Structures: Technological Advances, Springer; 2015th edition, 2014
5. Angus Mather, Offshore Engineering, Witherby Seamanship International; Third Edition, 2011

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2. <https://nptel.ac.in/courses/114/106/114106011/>
3. <https://nptel.ac.in/courses/114/106/114106035/>

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	2	1
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	1	2
CO3	2	1	2	-	1	-	-	-	-	-	-	-	3	3	2
CO4	2	-	-	-	-	-	-	-	-	-	-	-	2	2	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-	3	3	2

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


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U20CEE827**PAVEMENT ENGINEERING**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the various stresses in the pavement
- Gain knowledge about the design of flexible pavement
- Familiar with the design of flexible pavement
- Understand the basic distresses in the pavement
- Gain knowledge on basic elements of soil stabilization

Course Outcomes

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

CO1- Design the stresses and deflection of the pavement **(K3)**

CO2 - Design the flexible pavement **(K4)**

CO3 - Design the rigid pavement **(K4)**

CO4 - Understand the pavement evaluation methods **(K3)**

CO5 - Understand the various soil stabilization techniques **(K3)**

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

UNIT I PAVEMENT AND STRESS DISTRIBUTION**(9 Hrs)**

Introduction – Pavement as layered structure – Pavement types (rigid and flexible) - Stress and deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS**(9 Hrs)**

Flexible pavement design - Factors influencing design of flexible pavement - Empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads

UNIT III DESIGN OF RIGID PAVEMENTS**(9 Hrs)**

Cement concrete pavements - Factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE**(9 Hrs)**

Pavement Evaluation - Causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index - Pavement maintenance

UNIT V STABILIZATION OF PAVEMENTS**(9 Hrs)**

Stabilization for highway pavements – Choice of stabilizers – Testing and field control - Stabilization for rural roads in India – Use of Geosynthetics in roads


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Text Books

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2015.
2. Kadiyali L R, "Highway Engineering", Khanna Book Publishing Co Pvt Ltd, 2019.
3. Thom Nicholas, "Principles of Pavement Engineering". ICE Publishing, 2008

Reference Books

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Fifth Revision), IRC: 37-2018
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC: 58-2017
3. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2019.
4. Yoder, E.J. and Witchak M.W. "Principles of Pavement Design", John Wiley 2011
5. Huang, "Pavement Analysis and Design", Pearson Education, 2008.

Web References

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2. <https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-28.pdf>
3. <https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-29.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	2	-	-	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	-	-	-	-	-	-	-	-	1	1	2
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	2
CO4	2	-	2	1	3	-	-	-	-	-	-	-	2	2	1
CO5	1	-	-	2	3	-	-	-	-	-	-	-	3	3	2

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


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U20CEE828	REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Learn various distress and damages to concrete structures
- Assess the durability of concrete due to various non-destructive testing
- Suggest the suitable materials and techniques for repair
- Implement various rehabilitation and retrofitting techniques
- Select suitable demolition techniques for structures

Course Outcomes

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

CO1 - Gain knowledge of maintenance and various assessment techniques **(K2)**

CO2 - Understand the methods of non-destructive testing systems **(K2)**

CO3 - Understand the types and properties of repair material **(K2)**

CO4 - Understand the corrosion and damaged structures **(K2)**

CO5 - Gain knowledge of strengthening of structures **(K3)**

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

UNIT I MAINTENANCE AND REPAIR STRATEGIES**(9 Hrs)**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II DAMAGE DIAGNOSIS AND ASSESSMENT**(9 Hrs)**

Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement.

UNIT III REPAIR TECHNIQUES**(9 Hrs)**

Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.

UNIT IV CORROSION OF STEEL IN CONCRETE**(9 Hrs)**

Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns)

UNIT V STRENGTHENING OF CONCRETE STRUCTURES**(9 Hrs)**

Introduction – Plate bonding method - RC Jacketing of column and beams with reinforced concrete – FRP methods – Strengthening of RC members in flexure, shear, confinement using FRP

Text Books

1. Poonam I. Modi and Chirag N. Patel, "Repair and Rehabilitation of concrete structures", PHI Learning Pvt. Ltd., 2015
2. P.C.Varghese, "Maintenance, Repair & Rehabilitation & Minor Works of Buildings", PHI Learning Pvt.



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Ltd., 2014

3. Riadh Al-Mahaidi, Robin Kalfat, "Rehabilitation of Concrete Structures with Fiber-Reinforced Polymer", Matthew Deans, 2018

Reference Books

1. R.T.L. Allen, S.C. Edwards, and J.D.N. Shaw, "The Repair of Concrete Structures", Blackie Academic & Professional, 2005
2. Walter F. Silva-Araya. Oladis T. De Rincon and Luis Pumarada O'Neill, "Repair and Rehabilitation of Reinforced Concrete Structures", ASCE Publications, 1997.
3. Anibal Costa, Joao Miranda Guedes, Humberto Varum, "Structural Rehabilitation of Old buildings", Springer, 2014
4. V.M. Malhotra, "Repair, Rehabilitation and Maintenance of Concrete Structures, and innovations in design and construction", American Concrete Institute, 2000
5. Thomas Dyer, "Concrete Durability", CRC Press, 2014

Web References

1. <https://nptel.ac.in/courses/105/106/105106202/>
2. <https://onlinelibrary.wiley.com/doi/abs/10.1002/pse.140>
3. <https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470015902.a0021403.pub2>

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	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO3	3	3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO5	3	2	3	3	2	-	-	-	-	-	-	-	2	3	3

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


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U20CEE828	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Gain knowledge on the various environmental protection laws and acts in India
- Decide appropriate technologies to quantify the impact.
- Gain knowledge on the various mitigation measures for air, water and land quality
- Understand about the steps in performing socio economic impact assessment
- Gain knowledge about the impacts of economic profile of the community

Course Outcomes

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

CO 1-Understand the concept of Environmental protection laws-(K2)

CO 2-Understand about EIA methodologies-(K2)

CO 3-Analyze the various mitigation measures- (K4)

CO 4-Understand the concept of socio economic impact assessment –(K2)

CO 5-Assess the concept about economic profile of the community-(K3)

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

UNIT I LAWS AND ACTS**(9 Hrs)**

Historical perspective of environmental protection laws and acts in India - Definition of EI, EIA, EIS - Industrial policy statement of the Government of India. Legal and Regulatory aspects in India - Types and Limitations of EIA - Minimum National Standards – Bureau of Indian Standards – WHO standards.

UNIT II METHODOLOGIES**(9 Hrs)**

EIA methodologies – Appropriate Methodologies, Quantification, - Cost benefit analysis - Risk assessment, Test Model format - Preliminary assessment

UNIT III AIR QUALITY IMPACT**(9 Hrs)**

Background - Typical considerations and factors, air quality impact of industry, transport systems, mitigation methods. Water quality impact: Water quality criteria and standards, Field Surveys waterquality- impacts by developmental projects –Land and soil quality impacts- Soil fertility and remediation. Noise impact: Noise and sound, the effects of noise on people, noise scales and rating methods, estimating transportation noise impact.

UNIT IV ENERGY IMPACT**(9 Hrs)**

Energy impact considerations, data sources, energy conservation data, EIA of hydro, thermal and nuclear power plants, Vegetation and Wild life impact: Biological concepts and terms, impact on flora and fauna, mitigating measures, alternatives - Types, steps in performing socio economic impact assessment, analysis of public services and facilities, impacts, social impacts

UNIT V SUMMARIZATION OF ENVIRONMENTAL IMPACTS**(9 Hrs)**

Environmental Management plan, Public involvement - impacts of economic profile of the community, Exchange of information - comparison of alternatives-Training



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Text Books

1. Trivedi.P.R, Trivedi, P.R, Environmental Impact Assessment, APH Publishing, 2011.
2. S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye "Environmental Impact Assessment" 2010
3. Larry Canter "Environmental Impact Assessment" McGraw Hill publications.1995
4. Rau Whoooten "Environmental Impact Analysis Handbook" McGraw Hill publications. 1980
5. R K Jain "Environmental Impact Analysis – A Decision Making Tool"

Reference Books

1. Canter, L.W (1996) Environmental Impact Assessment, Mc Graw Hill.
2. Petts, J (1999) Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Science, London.
3. Kuala Lumpur(1983) "Environmental assessment of development projects", United Nations Asia and Pacific Development Centre.
4. John, G. Rau and David C. Wooten (1980), Environmental Impact Analysis Hand Book, McGraw Hill Book Co.
5. Judith Petts "Handbook of Environment Impact Assessment" McGraw Hill publications.

Web References

1. <http://environmentclearance.nic.in>
2. <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ge22/>
3. <http://www.gpcet.ac.in/wp-content/uploads/2017/03/>

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
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CO4	3	3	2	2	3	-	-	-	-	-	-	1	2	2	3
CO5	3	3	2	2	3	-	-	-	-	-	-	1	1	2	3

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


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U20CEE830	PRE- STRESSED CONCRETE STRUCTURES	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

This course should enable the students to

- Understand the need for pre-stressing in a structure.
- Explain the methods, types and advantages of pre-stressing to the students.
- Aware of Design of compression and Tension Members
- Understand about methods and analysis of Composite Beams and Continuous Beams.
- Describe the principles of pre tensioned and post tensioned concrete bridge decks.

Course Outcomes

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

CO 1 - Understand the behaviour of pre-stressed concrete members and able to analyze the pre-stressed Concrete beams. **(K2)**

CO 2 - Design the pre-stressed concrete members for flexure and shear as per the relevant design code (IS 1343). **(K3)**

CO 3 - Design compression and tension members **(K3)**

CO 4 - Analyze and design of composite beams and continuous beams. **(K4)**

CO 5 - Choose the right pre-stressed bridge type suitable for construction process **(K5)**

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

UNIT I INTRODUCTION

(9 Hrs)

Basic concepts – Advantages and disadvantages - Materials of pre-stressing - Loss in pre-stress - Analysis of sections – Stress concept – Strength concept – Load balancing concept -Deflection of Pre-stressed Concrete members – Beam Deflection (Using C Programming)

UNIT II DESIGN OF SHEAR AND FLEXURAL MEMBERS

(9 Hrs)

Basic assumptions of flexural design – Permissible stresses in steel and concrete as per I.S.1343 Code – Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams – Check for flexural capacity based on I.S. 1343 Code – Influence of Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams - Design for shear based on I.S. 1343 Code.

UNIT III DESIGN OF COMPRESSION AND TENSION MEMBERS

(9 Hrs)

Design of compression members and tension members. Circular pre-stressing - Water tanks - Pipes - Analysis and design - IS Codal provisions.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS

(9 Hrs)

Composite beams - Analysis and design. Partial pre-stressing - non-pre-stressed reinforcements. Analysis of Continuous beams - Cable layout - Linear transformation - Concordant cables.

UNIT V PRE-STRESSED CONCRETE BRIDGES

(9 Hrs)

General aspects - Pretension pre-stressed bridge decks - Post tensioned pre-stressed bridge decks - Advantages over R.C. bridges

Text Books

1. Krishna Raju N., Pre-stressed concrete, Tata McGraw Hill Company, New Delhi 2012
2. Lin T.Y. and Ned.H.Burns, "Design of pre-stressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013
3. Dr. Y.R.M. Rao, J. P. Annie, P. Easwari, Pre-stressed Concrete Analysis and Design, G S Enterprises, 2017.



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Reference Books

1. Ramaswamy G.S., Modern pre-stressed concrete design, Arnold Heinimen, New Delhi, 2012
2. David A. Sheppard, William R. and Philips, Plant Cast precast and pre-stressed concrete - A design guide, McGraw Hill, New Delhi 2011.
3. Praveen Nagaraja, Pre-stressed Concrete Design, Kindersley India, 2013
4. Dayaratnam.P., "Pre-stressed Concrete Structures", Oxford and IBH, 2013
5. IS1343:1980, Code of Practice for Pre-stressed Concrete, Bureau of Indian Standards, New Delhi, 2012

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1. <https://nptel.ac.in/courses/105/106/105106118/>
2. <https://www.youtube.com/watch?v=PZi50Miapc8>
3. <https://nptel.ac.in/courses/105/106/105106117>

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	3	-	-	2	-	-	1	1	-	1	-	-	-
CO2	3	2	3	-	-	1	-	-	1	1	-	1	1	1	1
CO3	3	2	3	-	-	1	-	-	1	1	-	1	1	-	2
CO4	2	2	3	-	-	1	-	-	1	1	-	1	-	1	-
CO5	2	2	3	-	-	1	-	-	1	1	-	1	-	2	2

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



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OPEN ELECTIVES**Open Elective – I (Offered in Semester IV)**

U20EEO401	SOLAR PHOTOVOLTAIC FUNDAMENTALS AND APPLICATIONS				Hrs
	L	T	P	C	
	3	0	0	3	45

(Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE)

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



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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.

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.

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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


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U20EEO402	ELECTRICAL SAFETY (Common to ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT)	L	T	P	C	Hrs
		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



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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.

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


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U20ECO401	ENGINEERING COMPUTATION WITH MATLAB	L	T	P	C	Hrs
	(Common to EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics)	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



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in Higher Dimensions- Practical Issues. Differentiation & Integration using MATLAB, 1D & 2D Data Interpolation.

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.Herniter, "Programming in MATLAB", Thomson Learning, 2001
2. John OkyereAltla, "Electronics and circuit analysis using MATLAB", CRC press, 1999
3. K.K.Sharma, "MATLAB Demustified", Vikas Publishing House Pvt Ltd. 2004

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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
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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


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	CONSUMER ELECTRONICS	L	T	P	C	Hrs
U20ECO402	(Common to EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT)	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



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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)		
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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


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U20CSO401	WEB DEVELOPMENT (Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	L	T	P	C	Hrs
		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.



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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.
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.

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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://Oriell.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


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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.


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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", 3rd Edition, 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.

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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

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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


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	SENSORS AND TRANSDUCERS	L	T	P	C	Hrs
U20ICO401	(Common to ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT)	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



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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

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, Oxford 2nd edition Jacob Fraden - 2010
4. Doebelin E.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.

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2. <https://nptel.ac.in/courses/108108147/>
3. <https://www.youtube.com/watch?v=1uPTyJxZzyo>

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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


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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,


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software for making medical models, medical materials, other applications - Case study.

Text Books

1. Rafiq I. Noorani, Rapid Prototyping – Principles and Applications, Wiley & Sons, 2006.
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.

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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 Prototyping”, 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 Verlag 2001.
5. Liou W.Liou, Frank W.Liou, “Rapid Prototyping and Engineering applications : A tool box for prototype development”, CRC Press, 2007.

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3. <https://nptel.ac.in/courses/112/107/112107078/>
4. <https://www.youtube.com/watch?v=oDdOqLblmVQ>
5. <https://www.youtube.com/watch?v=OhNnKTaciVI>

COs/POs/PSOs Mapping

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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


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U20MEO402**MATERIAL HANDLING SYSTEM**
(Common to EEE, ICE, CIVIL, Mechatronics)**L T P C Hrs**
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 and 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.



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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

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.

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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=WXmldbVDJqE>
5. <https://www.youtube.com/watch?v=BBWPIByOEfi>

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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


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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.



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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.

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1. Silberschatz, Korth.H and Sudarshan.S, "Database System Concepts", 6th Edition, McGraw-Hill International, 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.

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2. <http://dev.mysql.com/doc/>
3. <http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf>
4. <http://www.w3schools.com/>
5. <https://www.codecademy.com/learn/learn->

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CO4	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1
CO5	3	1	1	-	1	-	-	-	-	-	1	1	-	-	1

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


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	INTRODUCTION TO COMMUNICATION SYSTEMS	L	T	P	C	Hrs
U20CCO402	(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.



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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

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


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U20ADO401	KNOWLEDGE REPRESENTATIONS AND REASONING	L	T	P	C	Hrs
	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	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.



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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.

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>

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	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


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U20ADO402	INTRODUCTION TO DATA SCIENCE (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 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.



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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.
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 /](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


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Open Elective – II (Offered in Semester V)

U19HSO51	PRODUCT DEVELOPMENT AND DESIGN	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To provide the basic concepts of product design, product features and its architecture.
- To have a basic knowledge in the common features a product has and how to incorporate them suitably in product.
- To enhance team working skills.
- To design some products for the given set of applications.
- To compete with a set of tools and methods for product design and development.

Course Outcomes

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

CO1 - Apply the concept for new product development. **(K3)**

CO2 - Validate knowledge on the concepts of product specification. **(K5)**

CO3 - Describe the principles of industrial design and prototyping. **(K2)**

CO4 - Apply knowledge on product architecture. **(K3)**

CO5 - Review the concept of product development and customer needs. **(K5)**

UNIT I: INTRODUCTION TO PRODUCT DEVELOPMENT (9 Hrs)

Product development versus design, product development process, product cost analysis, cost models, reverse engineering and redesign product development process, new product development, tear down method.

UNIT II: PRODUCT SPECIFICATIONS (9 Hrs)

Establishing the product specifications– Target specifications – Refining specifications, concept generation–Clarify the problem – Search internally – Search externally – Explore systematically - Reflect on the Results and the Process.

UNIT III: PRODUCT CONCEPTS (9 Hrs)

A: Concept generation, product configuration, concept evaluation and selection, product embodiments.
B: Quality function deployment, product design specification, physical prototypes-types and technique, dimensional analysis, design of experiments.

UNIT IV: PRODUCT ARCHITECTURE (9 Hrs)

Concept selection- Screening – scoring, Product architecture – Implication of architecture - Establishing the architecture – Related system level design issues.

UNIT V: PROTOTYPING (9 Hrs)

Reliability, failure identification techniques, Poka-Yoke, Design for the environment, design for maintainability, product safety, liability and design, design for packaging.



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Text Books

1. Kari T. Ulrich and Steven D. Eppinger, "Product Design and Development", McGraw-Hill International Edns.
2. Stephen Rosenthal, "Effective Product Design and Development", Business One Orwin, Homewood,
3. Otto, K. N. Product design: techniques in reverse engineering and new product development.

Reference Books

1. Ashby, M. F., & Johnson, K... Materials and design: the art and science of material selection in product design. Butterworth-Heinemann.
2. Kevin Otto and Kristin Wood, "Techniques in Reverse Engineering and New Product Development", Pearson Education, Chennai, Edition III.
3. Chitale A.V. and Gupta R.C., "Product Design and Manufacturing", 6th Edition, PHI.
4. Taurt Pugh, "Tool Design – Integrated Methods for Successful Product Engineering", Addison Wesley Publishing, New York, NY
5. Kumar, A., Jain, P. K., & Pathak, P. M. Reverse engineering in product manufacturing: an overview. DAAAM international scientific book,

Web References

1. <http://www.worldcat.org/title/product-design-and-development/oclc/904505863>
2. <https://www.pdfdrive.com/product-design-and-development-e38289913.html>
3. <https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/>
4. <https://www.smashingmagazine.com/2018/01/comprehensive-guide-product-design/>
5. https://ocw.mit.edu/courses/sloan-school-of-management/15-783j-product-design-and-development-spring-2006/lecture-notes/clas1_int_crse_6.pdf
6. https://swayam.gov.in/nd1_noc20_de05/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
1	3	-	3	-	3	-	-	-	-	-	-	2	-	-	-
2	1	-	2	-	3	-	-	-	-	-	-	3	-	-	-
3	1	-	3	-	2	-	-	-	-	-	-	2	-	-	-
4	3	-	1	-	3	-	-	-	-	-	-	1	-	-	-
5	1	-	3	-	3	-	-	-	-	-	-	2	-	-	-

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


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U19HSO52	INTELLECTUAL PROPERTY AND RIGHTS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To introduce fundamental aspects of Intellectual Property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- Awareness about current trends in IPR and Government steps in fostering IPR

Course Outcomes

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

CO1: Complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works **(K2)**

CO2: Presenting useful insight on novelty of their idea from state-of-the art search during their project work period. **(K3)**

CO3: Posting Intellectual Property as a career option like R&D IP Counsel, Government Jobs – Patent Examiner, Private Jobs, Patent agent and/or Trademark agent and Entrepreneur **(K5)**

CO4: To disseminate knowledge on Design, Geographical Indication, Plant Variety and Layout Design Protection and their registration aspects **(K1)**

CO5: Organizing their idea or innovations and analyse ethical and professional issues which arise in the intellectual property law context. **(K4)**

UNIT I OVERVIEW OF INTELLECTUAL PROPERTY (9 Hrs)

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

UNIT II PATENTS (9 Hrs)

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


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UNIT III COPYRIGHTS**(9 Hrs)**

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

UNIT IV TRADEMARKS**(9 Hrs)**

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

UNIT V OTHER FORMS OF IP**(9 Hrs)**

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection Geographical Indication (GI) Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection.

Text Books

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

Reference Books

1. Ahuja, V K. Law relating to Intellectual Property Rights. India, IN: Lexis Nexis, 2017.
2. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition, 2012.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.
4. Prabuddha Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, McGraw Hill Education, 2011.
5. S.V. Satakar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
6. V. Scope Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012.

Web References

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>



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2. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
3. Cell for IPR Promotion and Management (<http://cipam.gov.in/>)
4. World Intellectual Property Organisation (<https://www.wipo.int/about-ip/en/>)
5. Office of the Controller General of Patents, Designs & Trademarks (<http://www.ipindia.nic.in/>)
6. Journal of Intellectual Property Rights (JIPR): NISCAIR

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
1	1	-	3	-	2	-	1	2	-	-	-	2	-	-	-
2	1	-	3	-	2	-	2	2	-	-	-	2	-	-	-
3	-	-	2	-	1	-	3	3	-	-	-	2	-	-	-
4	2	-	3	-	2	-	2	2	-	-	-	2	-	-	-
5	1	-	1	-	2	-	1	2	-	-	-	2	-	-	-

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


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U19HSO53	MARKETING MANAGEMENT AND RESEARCH	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To facilitate understanding of the conceptual framework of marketing in engineering.
- To understand the concepts of product and market segmentation for engineering services and technological products.
- Analyzing the various pricing concepts and promotional strategies for engineering and technology markets.
- Learn to focus on a research problem using scientific methods in engineering and technological enterprises.
- To be able to design and execute a basic survey research reports in in engineering and technological enterprises

Course Outcomes

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

CO1 - Analyze the fundamental principles involved in managing engineering and technological markets **(K3)**

CO2 - Understand and develop product, and Market Segmentation for engineering services and technological

Products **(K4)**

CO3 - Develop pricing and promotional strategies for engineering and technology markets **(K6)**

CO4 - Analyze market problems and be capable of applying relevant models to generate appropriate solutions

to meet challenges in engineering and technological enterprises **(K3)**

CO5 - Identify the interrelationships between market trends, innovation, sustainability and communication in engineering and technological enterprises **(K5)**

UNIT I MARKETING – AN OVERVIEW (9 Hrs)

Definition, Marketing Process, Dynamics, Needs, Wants and Demands, Marketing Concepts, Environment, Mix, Types, Philosophies, Selling vs Marketing, Consumer Goods, Industrial Goods.

UNIT II PRODUCT AND MARKET SEGMENTATION (9 Hrs)

Product, Classifications of product, Product Life Cycle, New product development, Branding, Segmentation factors, Demographic, Psycho graphic and Geographic Segmentation, Process, Patterns. Services marketing and Industrial marketing.

UNIT III PRICING AND PROMOTIONAL STRATEGIES (9 Hrs)

Price: Objectives, Pricing Decisions and Pricing Methods, Pricing Management. Advertising- Characteristics, Impact, Goals, Types, Sales Promotion – Point of purchase, Unique Selling Propositions, Characteristics, Wholesaling, Retailing, Channel Design, Logistics.

UNIT IV RESEARCH AND ITS FUNDAMENTALS (9 Hrs)

Research: Meaning, Objectives of Research, Types of Research, Significance of Research - Methods Vs Methodology - Research Process – Components of Research Problem, Literature Survey – Primary Data and Secondary Data, Questionnaire design, Measurement and Scaling Techniques.



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UNIT V BASIC STATISTICAL ANALYSIS AND REPORT WRITING**(9 Hrs)**

Fundamentals of Statistical Analysis and Inference- Measures of Central Tendency -Measures of Dispersion -Measures of Asymmetry - Report Writing: Types of research reports, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Report Writing, Layout of Research Report, Mechanics of Writing Research Report, Ethics in Research

Text Books

1. Philip Kotler & Keller, "Marketing Management", Prentice Hall of India, 14th edition, 2012.
2. Lilien, Gary I., and Arvind Rangaswamy. "Marketing managers make ongoing decisions about product features, prices, distribution options", The Handbook of Marketing Research: Uses, Misuses, and Future Advances (2006).

Reference Books

1. Chandrasekar. K.S., "Marketing Management Text and Cases", 1st Edition, Tata McGraw Hill - Vijaynicole, 2010.
2. Kothari, C. "Research Methodology Methods and Techniques", New Age International (P) Ltd., 2017
3. RajanSexena. Marketing Management: Text cases in Indian Context.(3rd edition) New Delhi, Tata McGraw hill, 2006
4. Moisander J, Valtonen A, "Qualitative marketing research: A cultural approach", Sage Publisher, 2006.
5. Malhotra NK, Satyabhushan Dash, "Marketing Research: An Applied Orientation", 7th ed, Pearson Education, 2019

Web References

1. https://swayam.gov.in/nd1_noc20_mg26/preview
2. https://swayam.gov.in/nd1_noc20_mg26/preview
3. <https://www.entrepreneur.com/encyclopedia/market-research>

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1	-	-	1	-	-	-	2	-	-	1	-	1	-	-	-
2	-	1	2	-	1	-	3	-	-	2	-	1	-	-	-
3	-	-	1	-	1	-	-	-	2	1	-	1	-	-	-
4	-	3	2	2	-	1	-	1	1	2	-	1	-	-	-
5	-	2	2	1	2	2	-	2	2	2	-	1	-	-	-

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


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U19HSO54	PROJECT MANAGEMENT FOR ENGINEERS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the various concepts and steps in project management.
- To familiarize the students with the project feasibility studies and project life cycle
- To enable the students to prepare a project schedule
- To understand the risk management and project Control process.
- To learn about the closure of a project and strategies to be an effective project manager.

Course Outcomes

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

CO1 - Interpret the different concepts and the various steps in defining a project. **(K2)**

CO2 - Examining the feasibility of a project. **(K3)**

CO3 - Build a schedule for a Project. **(K6)**

CO4 - Predict the risk associated with a project and demonstrate the project audit. **(K2)**

CO5 - Analyse the project team and outline the Project closure. **(K4)**

UNIT I PROJECT MANAGEMENT CONCEPTS (9 Hrs)

Project: Meaning, Attributes of a project, Project Life cycle, Project Stakeholders, Classification, Importance of project management, Project Portfolio Management System, Different Project Management Structure, Steps in Defining the Project, Project Rollup – Process breakdown structure – Responsibility Matrices – External causes of delay and internal constraints

UNIT II PROJECT FEASIBILITY ANALYSIS (9 Hrs)

Opportunity Studies, Pre-Feasibility studies, and Feasibility Study: Market Feasibility, Technical Feasibility, Financial Feasibility and Economic Feasibility. Financial and Economic Appraisal of a project, Social Cost Benefit Analysis in India and Project Life Cycle.

UNIT III PROJECT SCHEDULING & NETWORK TECHNIQUES (9 Hrs)

Scheduling Resources and reducing Project duration: Types of project constraints, classification of scheduling problem, Resources allocation methods, Splitting, Multitasking, Benefits of scheduling resources, Rationale for reducing project duration, Options for accelerating Project completion Developing and Constructing the Project Network (Problems), PERT, CPM; Crashing of Project Network,

UNIT IV PROJECT RISK MANAGEMENT AND PROJECT CONTROL (9 Hrs)

Project Risk management; Risk concept, Risk identification, Risk assessment, Risk response development, Contingency planning, Contingency funding and time buffers, Risk response control, and Change control management

Budgeting and Project Control Process, Control issues, Tendering and Contract Administration. Steps in Project Appraisal Process and Project Audits

UNIT V PROJECT CLOSURE AND MANAGING PROJECT (9 Hrs)

Project Closure: Team, Team Member and Project Manager Evaluations. Managing versus Leading a Project: Qualities of an Effective Project Manager, Managing Project Stakeholders, Managing Project



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Teams: Five Stage Team Development Model, Situational factors affecting team development and project team pitfalls.

Text Books

1. Erik Larson and Clifford Gray. "Project Management: The Managerial Process". 6th Edn. McGraw Hill Education; 2017.
2. Harold Kerzner. "Project Management: A systems approach to Planning, Scheduling and Controlling". 12th Edn. John Wiley & Sons; 2017

Reference Books

1. Meredith, J.R. & Mantel, S. J. "Project Management- A Managerial Approach". John Wiley.:2017
2. Prasanna Chandra. "Projects: Planning, Analysis, Selection, Financing, Implementation, and Review". 9th Edn. McGraw Hill Education; 2019.
3. B C Punmia by K K Khandelwal. "Project Planning and Control with PERT and CPM". 4th Edn. Laxmi Publications Private Limited; 2016.
4. Hira N Ahuja, S.P.Dozzi, S.M.Abourizk. "Project Management". 2nd Edn. Wiley India Pvt Ltd; 2013.
5. "A guide to Project Management Body of Knowledge". 6th Edn. Project Management Institute; 2017

Web Resources

1. www.pmi.org
2. www.projectmanagement.com
3. <https://www.sciencedirect.com/journal/international-journal-of-project-management>
4. <https://nptel.ac.in/courses/110/107/110107081/>
5. <https://nptel.ac.in/courses/110/104/110104073/>

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
1	2	-	1	-	-	-	-	-	2	-	2	2	-	-	-
2	-	2	1	-	-	1	-	-	1	1	1	1	-	-	-
3	-	1	3	-	-	-	-	-	-	-	1	-	-	-	-
4	3	1	1	-	-	1	1	-	-	1	1	3	-	-	-
5	3	-	3	-	-	-	-	3	3	2	3	2	-	-	-

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


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U19HSO55**FINANCE FOR ENGINEERS**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To develop a deeper understanding of the fundamentals of Accounting and Finance
- To learn how to apply mathematical principles in Finance and the concepts of Risk and Return
- To understand the need and procedure for conducting Financial Analysis for better decision-making
- To be familiar with the modes of generating funds for business and their implications
- To understand the scientific ways to determine deployment of funds in business

Course Outcomes

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

CO1: Understand basic concepts in accounting and finance and their importance for engineers **(K2)**

CO2: Demonstrate knowledge and understanding of the applications of mathematics in finance **(K3)**

CO3: Conduct Financial Analysis and use the outcome in making informed decisions in investing **(K4)**

CO4: Identify and Appreciate various sources of procurement of funds in business and their critical evaluation **(K2)**

CO5: Know how to scientifically determine the investing in long-term and short-term assets in business **(K3)**

UNIT I: UNDERSTANDING THE FUNDAMENTALS**(9 hrs)**

Assets – Need and Functions of Assets – Types of Assets – Factors determining Investments in Assets. Liabilities – Meaning and Functions of Liabilities – Types of Liabilities – Capital as a Liability: Why and How — Concept and Meaning of Finance – Distinction between Accounting and Finance – Significance of Accounting and Finance for Engineers.

UNIT II: MATHEMATICS OF FINANCE**(9 hrs)**

Time Value of Money – Computation of Present Value and Future Value – Implications of TVM in Financial Decisions – Concept of Risk and Return – Measuring Risk and Return – Concept of Required Rate of Return and its significance in Investment Decisions.

UNIT III: FINANCIAL ANALYSIS**(9 hrs)**

Meaning and Objectives of Financial Analysis – Annual Report As an Input for Analysis – Basic Understanding of Annual Reports - Tools of Financial Analysis – Horizontal Analysis – Vertical Analysis – Trend Analysis – Accounting Ratios – Significance of Ratio Analysis in Decision-making – Snap-shot of the Past to predict the Future – Computation of Key Ratios – Liquidity Ratios – Profitability Ratios – Performance Ratios – Ratios that are helpful for Potential Investors.

UNIT IV: FUNDS PROCUREMENT**(9 hrs)**

Meaning of Funds – Sources of Funds – Long-Term Sources – Short-Term Sources – Financing Decisions in Business – Capital Structure – Need and Importance of Capital Structure – Determining Optimum Capital Structure – Concept and Computation of Earnings Before Interest and Tax (EBIT), Earnings Before Tax (EBT), and Earnings After Tax (EAT)(Simple Problems) - Leverage in Finance – Types and Computation of Leverages – Operating Leverage, Financial Leverage, and Combined Leverage.

UNIT V: FUNDS DEPLOYMENT**(9 hrs)**

Investment Decisions – Types of Investment Decisions: Long-Term Investment Decisions. Significance – Methods: Pay-Back Period Method, Net Present Value Method and Benefit-Cost Ratio Method. Short-



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Term Investment Decisions – Concept of Working Capital – Need and Importance of Working Capital in Business – Determinants of Working Capital in a Business. Components of Working Capital. Dividends: Concept and Meaning – Implications of Dividend Decisions on Liquidity Management.

Text Books

1. R. Narayanaswamy, Financial Accounting – A managerial perspective, PHI Learning, New Delhi. (2015 or later edition)
2. C. Paramasivan and T. Subramanian. Financial Management. New Age International, New Delhi. (2015 or later edition)

Reference Books

1. S.N. Maheswari, Sharad K. Maheswari & Suneel K. Maheswari. Accounting For Management. Vikas Publishing (2017 or later edition)
2. Varun Dawar & Narendar L. Ahuja. Financial Accounting and Analysis. Taxmann Publications. (2018 or later edition)
3. Athma. P. Financial Accounting and Analysis. Himalaya Publishing House. (2017 or later edition)
4. Prasanna Chandra. Financial Management. Tata-McGraw Hill Publishers, New Delhi. (2019 or later edition)
5. S.C. Kuchhal. Financial Management. Chaitanya Publishing House, Allahabad. (2014 or later edition)

Web Resources

1. <http://www.annualreports.com/>
2. <http://www.mmachennai.org/>
3. <https://finance.yahoo.com/>
4. <https://icmai.in/icmai/>
5. <https://nptel.ac.in/courses/110/107/110107144/>
6. https://web.utk.edu/~jwachowi/wacho_world.html
7. <https://www.icaai.org/indexbkbp.html>
8. <https://www.icsi.edu/home/>
9. <https://www.investopedia.com/>
10. <https://www.moneycontrol.com/>
11. <https://www.rbi.org.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
1	-	-	1	-	-	-	2	-	-	1	2	1	-	-	-
2	-	1	2	-	1	-	3	-	-	2	2	1	-	-	-
3	-	-	1	-	1	-	-	-	2	1	2	1	-	-	-
4	-	3	2	2	-	1	-	1	1	2	2	1	-	-	-
5	-	2	2	1	2	2	-	2	2	2	2	1	-	-	-

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


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Open Elective – III (Offered in Semester VI)

U20EEO603	CONVENTIONAL AND NON-CONVENTIONAL ENERGY SOURCES	L	T	P	C	Hrs
	(Common to ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To get knowledge on the status of conventional and non-conventional energy resources in world.
- To have a clear idea about the operation of conventional power plant and its associated equipment's.
- To learn about the concept of energy harvesting of solar through thermal and PV module
- To understand the technological basis for harnessing wind energy.
- To get a clear knowledge on power generation using Ocean, Tidal Energy and Bio-Energy

Course Outcomes

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

CO1 – Identify the world and Indian energy scenario and the necessity of renewable energy sources **(K1)**

CO2 – Gain knowledge for the generation of electrical power from various power plants **(K1)**

CO3 – Analyze and compare the various solar harvesting techniques **(K3)**

CO4 – Describe the aerodynamics of wind turbines and calculate their power, energy production **(K1)**

CO5 – Describe the construction and working principle of various equipment's used in Ocean, Tidal Energy and Bio-Energy power plants **(K2)**

UNIT I ENERGY RESOURCES**(9 Hrs)**

Perspective of energy resources – Forms of Energy – Conventional and non-conventional sources of energy– World's energy status - Energy reserves in India. Limitations of Conventional sources of energy efficiency – Renewable Energy Sources – Energy parameters – Energy Intensity - Gross Domestic product.

UNIT II POWER PLANTS**(9 Hrs)**

Thermal power plant – layout, working principle. Gas turbine power plant – layout, working principle. Nuclear power plants: fuels, nuclear fuel cycle, reactors and nuclear waste management. Hydro Electric plants – Types, energy conversion schemes, environmental aspects.

UNIT III SOLAR ENERGY SYSTEMS**(9 Hrs)**

Solar radiation - Principles of solar energy collection –Types of collector – working principles - Characteristics - efficiency - Solar Energy applications – water heaters, air heaters, solar cooling; solar drying and power generation – solar tower concept – solar pump. Photovoltaic (PV) technology – photovoltaic effect – modelling - Characteristics – efficiency of solar cells.

UNIT IV WIND ENERGY SYSTEMS**(9 Hrs)**

General theory of wind mills – Types of wind mills – performance of wind machines–wind power – efficiency. Merits and Limitations of Wind energy system – Modes of wind power generation.

UNIT V ALTERNATE ENERGY SYSTEMS**(9 Hrs)**

Ocean and Tidal energy conversion - working principle of OTEC – Anderson closed cycle OTEC System. Tidal power – tides - tidal range - types of tidal power plants, single basin and double basins schemes. Bio-mass Energy – Biogas plants.

Text Books

1. S. Rao and Dr. B. B. Parulekar, "Energy Technology", Khanna Publication, 3rd Edition, 1999.
2. B. H. Khan, "Non-Conventional Energy Resources", Tata McGraw Hill Education, 2nd Edition, 2009.
3. D. P. Kothari, K. C. Singal, Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", PHI, 2011

Reference Books

1. G. D. Rai, "Non-conventional energy sources", Khanna Publication. 4th Edition, 2002.
2. Pulfrey, David. L, "Photo voltaic Power Generation", Van Nostrand reinhold Company, 1983.


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3. Abbasik, "Renewable Energy Sources and their Environment", PHI, 2008.
4. Steve Doty, Wayne C. Turner, "Energy Management Handbook", Fairmont Press, 8th Edition, 2012.
5. S.A.Abbasi and N. Abbasi, "Renewable Energy Sources and Their Environmental Impact", PHI, 2001.

Web References

1. https://www.tutorialspoint.com/renewable_energy/index.htm
2. <https://nptel.ac.in/courses/112/107/112107291/>
3. <https://byjus.com/physics/conventional-and-nonconventional-sources-of-energy/>
4. <https://www.jagranjosh.com/general-knowledge/nonconventional-sources-of-energy-1448698715-1>
5. <https://wb.gov.in/departments-power-and-non-conventional-energy-sources.aspx>

COs / POs and PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2	PSO3
1	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
2	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
3	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
4	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-
5	3	1	1	2	-	1	2	-	-	-	-	1	-	-	-

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


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	GRAPHICS DESIGNING	L	T	P	C	Hrs
U20CSO604	(Common to EEE, ECE, ICE, CIVIL & BME)	3	0	0	3	45

Course Objectives

- To develop basic skills using graphics and theory used in design process.
- Create computer-based projects using Adobe Photoshop.
- Understand, develop and employ visual hierarchy using images and text
- Use a computer to create and manipulate images and layers for use in various print and digital mediums.
- To acquire the knowledge of Animation

Course Outcomes

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

CO1 – Develop the basic design elements of graphics. **(K3)**

CO2 – Apply the various photoshop tools. **(K3)**

CO3 – Modify the image size, selection and grids using tools. **(k3)**

CO4 – Create and Work with colored layers. **(K4)**

CO5 – Apply different methods for Animation & Panoramic Picture creation. **(K5)**

UNIT I BASIC CONCEPTS

(9 Hrs)

Basic Concepts of Designing - Design Principles – Basics of design elements – Typography – Color theory - Introduction to Graphics - Introduction to Photoshop - Bitmap and Vector Images - Understanding Image Size and Resolution

UNIT II INTRODUCTION TO PHOTOSHOP

(9 Hrs)

Introduction to Tools - Environment - layout of Photoshop - Design layout setup - color - resolution setting - using basic marquee - selection tools Usage of lasso tools - Using brushes - using and filling colors - layers Using text tool - free transform tool - Exercise: Designing Greeting card / Advertisement

UNIT III IMAGE SIZE, SELECTION, GRID AND GUIDES

(9 Hrs)

Modifying Image Size - Resolution, Marquee - Lasso - Magic Wand - Selection Tools – Selecting – Saving - Crop tool - Coping Selection And Image - Grid and Guide Options – Masks – Channel - Painting and editing - Working with quick masks - Painting (Brush, and its effects) - Blending Modes, Color palettes – Editing - Background - Color - Touchup - Cleanup - Gradient tools - layer blending modes - all types of text tools - shape tools Exercise : Designing Magazine cover - Poster - Brochure

UNIT IV LAYERS

(9 Hrs)

The layer Palette - Changing and controlling layer order - Editing layers - Adjustment layers - Layer Effects Filters - Actions - Automation - Extract - Filter Gallery - Liquefy , Pattern making - Vanishing point - Built in Bitmap Filters - 3rd party Plug-ins - Using predefined Actions - Creating and Recording Actions - Using built in automation - Learning Filter effects - managing the files with layers and layer effects - plugins Manipulation tools - Image control options – HUE - Levels - brightness control Using image – modifying - changing color Exercise : Converting black and white photo to color - designing a photo album


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UNIT V ANIMATION & PANORAMIC PICTURE CREATION**(9Hrs)**

Creating product Packaging designs - CD cover - Book and magazine front cover - Envelope - Visiting card - Color correction and color channel management - Design automation theory and Practical's Samples and demos - guidelines for freelance work - website links - resource sharing - Preparing Image For Print and Web - Calculating Image size and Resolution, Changing Image Dimensions - Layout Preview - Color Separation - Optimizing Images for Web - File Formats - Creating Webpages - web photo galleries

Text Books

1. Adobe Creative Team, "Adobe Photoshop – Classroom in a Book", Adobe system incorporation, Adobe Press, 2010.
2. Katherine A. Hughes, "Graphic Design", Learn It, Do It, CRC Press 2019.
3. Ken Pender, "Digital color in Graphics Design", CRC Press 2012.

Reference Books

1. Mike Wooldridge, "Teach Yourself Visually Adobe Photoshop CS 5", Wiley Publishing, 2010
2. Lesa Snider, "Photoshop the missing Manual", O'Reilly Media, Inc, 2010.
3. Poppy Evans, Aaris Sherin, Irina Lee, "The Graphic Design", Rockport, 2013.
4. Peter Bauer, "Photoshop CC for Dummies", Wiley, 2013.
5. Scott Onstott, "Enhancing CAD Drawings with Photoshop", Wiley, 2006

Web Resources

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes/MIT6_831S11_lec18.pdf<http://www.moshplant.com/direct-or/bezier/>
2. <https://www.cs.montana.edu/courses/spring2004/352/lectures/CS351-GUIDesign.pdf>
3. <https://www.university.youth4work.com/study-material/graphic-design-lecture>
4. <https://kmayeunhia.wordpress.com/lecture-notes/>
5. <https://nptel.ac.in/courses/106/106/106106090/>

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
1	3	2	3	-	-	1	-	-	-	-	-	-	2	1	2
2	3	2	2	1	-	1	-	-	-	-	-	-	1	3	1
3	3	2	-	1	-	2	-	-	-	-	-	-	1	2	1
4	-	2	-	3	-	-	-	-	-	-	-	-	3	3	-
5	3	2	1	-	-	2	-	-	-	-	-	-	2	2	3

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


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U20ITO603

ESSENTIALS OF DATA SCIENCE

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To gain knowledge about the concepts involved in data analytics.
- To discover insights in data using R programming.
- To summarize the operations involved in Hadoop Map Reduce.
- To make use of algorithms related to regression and classification.
- To examine data using time series analysis and text analysis

Course Outcomes

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

CO1 - Experiment with data analytics using R language. **(K3)**

CO2 - Demonstrate clustering algorithms and association rules. **(K3)**

CO3 - Use algorithms related to regression and classification. **(K3)**

CO4 - Explore data using time series analysis and text analysis. **(K2)**

CO5 - Summarize Hadoop platform to solve map reduce problems. **(K2)**

UNIT I DATA ANALYTICS USING R**(9 Hrs)**

Big Data Overview-Examples of Big Data Analytics-Data Analytics Lifecycle overview-Phases in the lifecycle-GINA Case Study-Introduction to R programming-Exploratory Data Analysis-Statistical Methods for Evaluation.

UNIT II CLUSTERING AND ASSOCIATION RULES**(9 Hrs)**

Overview of clustering-Scope of Clustering Techniques- K Means clustering- Additional Algorithms- Clustering in practise: Fake news identification-Overview of Association rules-Apriori Algorithm- Evaluation of Candidate Rules-Applications of Association Rules-An Example: Transactions in a grocery store-Validation and Testing-Diagnosis

UNIT III REGRESSION AND CLASSIFICATION**(9 Hrs)**

Scope of Regression Techniques-Linear Regression-Logistic Regression-Additional Regression models-Scope of Classification Techniques-Decision Trees-Naïve Bayes-Diagnostics of Classifiers- Additional Classification Methods-Applications: Prediction of crop yield

UNIT IV TIME SERIES ANALYSIS AND TEXT ANALYSIS**(9 Hrs)**

Overview of Time Series Analysis-ARIMA Model-Additional Methods-Text Analysis Steps-A Text Analysis Example-Collecting Raw Text-Representing Texts-TFIDF-Categorizing documents by topics- Determining Sentiments-Gaining Insights.

UNIT V HADOOP MAP REDUCE AND DATA ANALYTICS**(9 Hrs)**

Installing and Understanding Hadoop-HDFS and Map Reduce Architecture-Hadoop Map Reduce Example-Hadoop Map Reduce in R-Data Analytics Problems: Exploring web pages categorization - Computing the frequency of stock market change-Real Time Recommender model using Apache Spark.

Text Books

1. David Dietrich, Barry Heller and Beibei Yang, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, Reprint 2015, Wiley, ISBN: 9788126556533.
2. VigneshPrajapathi, "Big Data Analytics with R and Hadoop", Packt Publishing, 2013, Birmingham, Mumbai.


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3. Bill Franks, "Taming the Big Data Tidal Wave: Finding opportunities in Huge DataStreams with Advanced Analytics", John Wiley & sons, 2012.

Reference Books

1. Roger D. Peng, "R Programming for Data Science", LeanPub, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2014.

Web References

1. www.ibm.com/Data Analytics/
2. <https://www.ijser.org/researchpaper/Importance-of-Clustering-in-Data-Mining.pdf>
3. <https://datafloq.com/read/7-innovative-uses-of-clustering-algorithms/6224>
4. <https://publications.waset.org/10011058/improving-fake-news-detection-using-k-means-and-support-vector-machine-approaches>
5. <https://statisticsbyjim.com/regression/when-use-regression-analysis/>

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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3	3	2	1	1	2	-	-	-	-	-	-	-	-	-	-
4	2	1	-	-	2	-	-	-	-	-	-	-	-	-	-
5	2	1	-	-	2	-	-	-	-	-	-	-	-	-	-

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


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U20ITO604

MOBILE APP DEVELOPMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the basic concepts of mobile computing
- To be familiar with the network protocol stack
- To learn the basics of mobile telecommunication system
- To be exposed to Ad-Hoc networks
- To gain knowledge about different mobile platforms and application development

Course Outcomes

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

CO1 - Explain the basics of mobile telecommunication system **(K2)**

CO2 - Articulate the required functionality at each layer for given application **(K2)**

CO3 - Identify solution for all functionality at each layer. **(K2)**

CO4 - Use simulator tools and design Ad hoc networks **(K3)**

CO5 - Develop a mobile application **(K3)**

UNIT I INTRODUCTION**(9 Hrs)**

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

UNIT II MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER**(9 Hrs)**

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance.

UNIT III MOBILE TELECOMMUNICATION SYSTEM**(9 Hrs)**

Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

UNIT III MOBILE AD-HOC NETWORKS**(9 Hrs)**

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

UNIT V MOBILE PLATFORMS AND APPLICATIONS**(9 Hrs)**

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

Text Books

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2012.
2. Jochen H. Schiller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007
3. C.K.Toth, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.


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1. Dharma Prakash Agarwal, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. William.C.Y.Lee, "Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition, TataMcGraw Hill Edition, 2006.
3. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.

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2. Apple Developer : <https://developer.apple.com/>
3. <http://developer.windowsphone.com>
4. BlackBerry Developer : <http://developer.blackberry.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
1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2	1	-	-	1	-	-	-	-	-	-	-	-	-	-
4	3	2	1	1	-	1	-	-	-	-	-	-	-	-	-
5	3	2	1	1	2	1	-	-	-	-	-	-	-	-	-

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


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U20ICO603

FUZZY LOGIC AND NEURAL NETWORKS

(Common to CSE, IT, CIVIL, BME)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To expose the students to learn different architecture of neural network.
- To provide adequate knowledge about different training algorithm of neural network. -
- To provide adequate knowledge about properties and operations of fuzzy sets.
- To provide comprehensive knowledge of fuzzy logic control to real time systems.
- To provide adequate knowledge of Neuro-fuzzy logic controllers.

Course Outcomes

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

CO1 - Understand properties of fuzzy set, fuzzy relations, fuzzy rule base and algorithm **(K2)**

CO2 - Understand fuzzy logic controllers and its applications. **(K2)**

CO3 - Understand neural network architecture. **(K2)**

CO4 - Learn various training algorithm of neural network and its application. **(K2)**

CO5 - Understand Neuro-fuzzy logic controllers. **(K2)**

UNIT I INTRODUCTION TO FUZZY LOGIC**(9 Hrs)**

Fuzzy sets – properties of fuzzy sets – operations on fuzzy sets. Fuzzy relations linguistic variables – Linguistic approximation. Fuzzy statements: Assignments, Conditional and unconditional statements fuzzy rule base – fuzzy algorithm

UNIT II FUZZY LOGIC CONTROL SYSTEM**(9 Hrs)**

Fuzzy logic controller – Fuzzification, Membership functions. Triangular, Trapezoidal, Grassian – Membership value assignments using neural networks, intention, inference – knowledge base – Inference Mechanism –Defuzzification case study: Fuzzy logic controller for a temperature process – inverted pendulum control problem.

UNIT III INTRODUCTION TO NEURAL NETWORK**(9 Hrs)**

Motivation for the development of neural networks – artificial Neural networks –biological neural networks – Typical architecture – Training common Activation functions. McCulloh Pitts neuron: Architecture, algorithm and applications – Back propagation neural net – standard architecture – Algorithm – derivation of learning rules – number of hidden layers – Hopfield net architecture algorithm and applications Adaptive Resonance Theory: Architecture and operation

UNIT IV NEURAL NETWORKS BASED ON COMPETITION**(9 Hrs)**

Kohinoor's Self Organizing map- Counter propagation Networks – Neural networks for control: Schemes of neuro control –Inverse dynamics. Case study: Neuro controller for a temperature process and Inverted Pendulum problem

UNIT V NEURO FUZZY LOGIC CONTROL**(9 Hrs)**

Adaptive fuzzy controller – self timing and self organizing controllers – stability of FLC – Non linear Fuzzy control – Fuzzy neuron.


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Text Books

1. LaureneFausett, "Fundamentals of Neural Networks", Pearson Education, 2008
2. Timothy J. Ross , "Fuzzy Logic with Engineering Applications", McGraw- Hill International Editions,2010
3. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA .2015

Reference Books

1. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 2019
2. Rajasekaran. S, Pai. G.A.V. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice-Hall of India, 2003
3. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and soft computing", Pearson Education 2007
4. W.T.Miller, R.S.Sutton and P.J.Webrose, Neural Networks for Control, MIT Press, 1996.
5. C.Cortes and V.Vapnik, Support-Vector Networks, Machine Learning, 1995.

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1. <https://lecturenotes.in/subject/922>.
2. <https://www.ifi.uzh.ch/dam/jcr:00000000-2826-155d-0000-00005e4763e3/fuzzylogicscript.pdf>.
3. <https://nptel.ac.in/courses/106/105/106105173/>.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	3	3	2	3	3	2	-	-	-	2	-	2	1	-	1
4	3	3	3	3	3	2	-	-	-	2	-	2	1	-	1
5	3	3	3	2	2	2	-	-	-	2	-	2	1	-	1

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


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U20MEO604	HEATING VENTILATION AND AIR CONDITIONING SYSTEM (HVAC)				L	T	P	C	Hrs
	(Common to EEE, ECE, ICE, CIVIL)				3	0	0	3	45

Course Objectives

- To understand the principles of heating ventilation and air conditioning, refrigerant properties, selection
- To learn about the heating and cooling load estimation
- To understand about air distribution systems, industrial ventilation
- To impart knowledge of the psychrometric properties, processes and air-conditioning systems
- To provide knowledge on different components and parameters involved in design of air conditioning systems using cooling load calculations

Course Outcomes

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

CO1 - Describe the principles of heating ventilation and refrigerant properties. **(K1)**

CO2 - Analyse the factors affecting the load estimate. **(K4)**

CO3 - Explain the air distribution classification, types of air flow and types of cross section. **(K1)**

CO4 - Appraise the psychrometric processes and air conditioning system performance. **(K5)**

CO5 - Design the Air-conditioning systems with available resources as cost effective. **(K5)**

UNIT I INTRODUCTION TO HVAC**(9 Hrs)**

Definition – Principles of HVAC – Scope of HVAC Industry with overview of consulting & construction Industry-market size – Growth – Penetration – opportunities- challenges – Energy usage and saving of HVAC - Terminologies – Heat and its types – Psychrometric chart – Properties of Air – Codes & Standards used in HVAC-Refrigerants - Desirable properties – classification – refrigerants used – nomenclature – Selection of refrigerants - ozone depletion – global warming–ASHRAE – Recent substitute for refrigerants.

UNIT II VENTILATION, HEATING AND COOLING LOAD**(9 Hrs)**

Basics of Heat transfer in a building envelop – Understanding of Outdoor & Indoor condition – Factors affecting the loads estimate Sources of Heat gain – External: Sun gain through Glass/Window/Roof/Wall – Partition gain – Internal: People/Lights/Electrical Equipments/motors/Kitchen Appliances – Heat gain through Infiltration air – Ventilation, air quantity and loads –Need, threshold limits of contaminants, estimation of ventilation rate, decay equation, air flow around buildings – Methods of Ventilation – Infiltration load calculation – Heating and cooling load estimation – Calculating ESHF, GTH, ADP, Dehumidified CFM – Cold storage design

UNIT III DESIGN OF AIR DISTRIBUTION SYSTEM**(9 Hrs)**

Air Distribution – Classification – Types of Air flow – Types of Cross section – Types of Velocity & pressure duct – Types of material – Types of Insulations – Duct Accessories – SMACNA standard – Duct designing methods: Velocity reduction method, Equal friction method, Static regain method - Duct designing Software – Duct sheet metal calculation: GI sheet, Gauge of duct & thickness of Gauge, Hanger spacing, Hanger Rod Diameter and Angle support Size –Air terminal selection – Industrial ventilation: Steel plants, car parks, plant rooms and mines

UNIT IV INTRODUCTION TO PSYCHROMETRIC AND HUMAN COMFORT**(9 Hrs)**

Principle and psychrometric properties of air – Psychrometric Chart – Psychrometric relations; Dalton's law of partial pressures –Wet bulb temperature and measurement – Adiabatic saturation temperature – Psychrometric processes – mixing of air stream - sensible heat factor – HVAC systems: Unitary, Semi-central, Central, Air-cooled systems, Water cooled systems–Human Comfort – Heat transfer from body, convection, radiation, conduction, evaporation, clothing resistance, activity level - Concept of human comfort – Thermal response – comfort factors– Environmental indices - Indoor air quality(IQA) - Effective temperature and comfort chart – Heat production and regulation of human body.


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UNIT V DESIGN OF AIR CONDITIONING SYSTEMS COMPONENTS**(9 Hrs)**

Air conditioning loads - Sources of heat load – Sensible load – Latent load - Conduction load – Sun load – Load from occupants – Equipment load – Infiltration air load- Load from moisture gain – Fresh air load- ASHARE standards - concepts of RSHF, GSHF- problems, concept of ESHF and ADP temperature - Requirements of industrial air conditioning – Calculation of load on air-conditioning system – Design of space cooling load - Air-conditioning devices and components: Air filters, types, efficiency – Humidifiers and Dehumidifiers – selection of humidifier and design – Fans, types & selection - Coil, Characteristics, types & Coil Accessories - condensate control-blowers – Cooling towers and spray ponds – Air distribution system – precision air conditioning - Automotive air conditioning - Heat pump – heat sources – different heat pump circuits – Commissioning and Maintenance.

Text Books

1. Arora, C.P., "Refrigeration and Air conditioning", TataMcGraw-Hill, New Delhi, Third edition, 2017.
2. McQuiston, F.C., Parker, J.D and Spiliter, J.D., "Heating Ventilating and Air Conditioning", John Wiley & Sons Inc., 2001.
3. Stocker W.F and Jones J.W, "Refrigeration and Air Conditioning ", McGraw-Hill, 1995.

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1. Manohar Prasad, "Refrigeration and Air Conditioning", New Age International Publisher, New Delhi, 2015.
2. Arora.S.C and Domkundwar.S, "A course in refrigeration and Air conditioning", DhanpatRai(P) Ltd, New Delhi, 2016.
3. Legg, R.C., "Air Conditioning System - Design, Commissioning and maintenance", Batsford Ltd, London 1991.
4. Haines, W.R, and Wilso, C.L, "HVAC systems Design Handbook", Mcgraw Hill, 2nd Edition, New Delhi, 1994
5. Sapali S.N, "Refrigeration and air Conditioning", PHI, second edition, 2014.

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2. [Http://ocw.mit.edu/courses/mechanical engineering/](Http://ocw.mit.edu/courses/mechanical%20engineering/)
3. <http://www.nptelvideos.in/2012/12/refrigeration-and-airconditioning.html>
4. <https://www.youtube.com/watch?v=ScVBPAitibQ>
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COs/POs/PSOs Mapping

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4	3	1	2	2	-	-	-	-	-	-	-	-	2	-	-
5	3	1	2	2	-	-	-	-	-	-	-	-	2	-	-

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


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U20MEO605	CREATIVITY INNOVATION AND NEW PRODUCT DEVELOPMENT				Hrs
	L	T	P	C	
	3	0	0	3	45

(Common to EEE, ECE, ICE, CIVIL, BME, Mechatronics)

Course Objectives

- To understand the need for creativity and innovation
- To learn about the project selection and evaluation
- To learn about the Patent and IPR
- To understand the quality standards and new product planning
- To learn model preparation and evaluation

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

- CO1** - Describe the creativity and problem solving. **(K1)**
CO2 - Analyse the methods for project selection and evaluation. **(K4)**
CO3 - Analyse the patent laws and IPR. **(K4)**
CO4 - Describe the new product planning. **(K1)**
CO5 - Acquire knowledge about the patent applications. **(K1)**

UNIT I INTRODUCTION**(9 Hrs)**

The process of technological innovation - factors contributing to successful technological innovation - the need for creativity and innovation - creativity and problem solving -brainstorming - different techniques

UNIT II PROJECT SELECTION AND EVALUATION**(9 Hrs)**

Collection of ideas and purpose of project - Selection criteria - screening ideas for new products evaluation techniques

UNIT III NEW PRODUCT DEVELOPMENT**(9 Hrs)**

Research and new product development - Patents - Patent search - Patent laws-International code for patents - Intellectual property rights (IPR)

UNIT IV NEW PRODUCT PLANNING**(9 Hrs)**

Design of proto type - testing - quality standards - marketing research introducing new Products

UNIT V MODEL PREPARATION & EVALUATION**(9 Hrs)**

Creative design - Model Preparation - Testing - Cost evaluation – Patent application

Text books

1. Twiss, Brian. "Managing Technological Innovation", Pitman Publishing Ltd., 1992.
2. Watton, Harry B. "New Product Planning", Prentice Hall Inc., 1992.
3. Lawrence Sanders G, Saylor foundation Publishing Ltd., 2012.

Reference books

1. Nystrom, Harry "Creativity and Innovation", John Wiley & Sons, 1979.
2. Dr Paul Trott, Innovation Management and New Product Development, 6th Edition, Pearson Publication, 2017
3. Khandwalla, N – "Fourth Eye (Excellence through Creativity) - Wheeler Publishing", 1992.
4. Bulletins I.P.R, TIFAC, New Delhi, 1997.
5. Jacob Goldenberg, Creativity in Product Innovation, Cambridge University Press, 2002.


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Web References

1. <https://nptel.ac.in/courses/107/103/107103082/>
2. <https://nptel.ac.in/courses/107/101/107101086/>
3. <https://nptel.ac.in/courses/110/107/110107094/>
4. <https://www.youtube.com/watch?v=H6OlyjLJf6k>
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COs/POs/PSOs Mapping

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3	3	2	1	1	-	-	-	-	-	-	-	-	1	1	3
4	3	2	1	1	-	-	-	-	-	-	-	-	1	1	3
5	3	2	1	1	-	-	-	-	-	-	-	-	1	1	3

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


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U20BMO604

MEDICAL ROBOTICS

(Common to EEE, ECE, ICE, CIVIL)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives:

- To understand the basics of Robotics
- To gain knowledge in Kinematics
- To know about the robot vision
- To describe various motion planning solutions
- To explain various applications of Robots in Medicine

Course Outcomes:

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

CO1 - Understand the basics of robotic systems. **(K2)**

CO2 - Explore workspace and related motion of the Robots **(K3)**

CO3 - Analyse and extract information from the image using Robots **(K3)**

CO4 - Design of task planning and simulating the task. **(K4)**

CO5 – Construct Robots for Medical applications **(K4)**.

UNIT I INTRODUCTION**(9 Hrs)**

Introduction- Automation and Robots – Classification - Applications- Specifications – Direct Kinematics Dot and cross products – Coordinate frames – Rotations – Homogeneous coordinates Link coordination arm equation – Four-axis robot -Five-axis robot - Six-axis robot.

UNIT II KINEMATICS**(9 Hrs)**

Inverse Kinematics – General properties of solutions tool configuration – Workspace analysis and trajectory planning work envelope - examples- workspace fixtures – Pick and place operations – Continuous path motion – Interpolated motion – Straight-line motion.

UNIT III ROBOT VISION**(9 Hrs)**

Robot Vision- Image representation – Template matching – Polyhedral objects – Shape analysis – Segmentation – Thresholding – region labelling – Shrink operators – Swell operators – Euler numbers – Perspective transformation – Structured illumination – Camera calibration.

UNIT IV PLANNING**(9 Hrs)**

Task Planning – Task level programming – Uncertainty – Configuration – Space, Gross motion – Planning – Grasp Planning – Fine-motion planning – Simulation of planar motion – Source and Goal scenes – Task Planner simulation.

UNIT V MEDICAL APPLICATIONS**(9 Hrs)**

Applications in Biomedical Engineering – Biologically Inspired Robots – Application in Rehabilitation – Interactive Therapy – Bionic Arm – Clinical and Surgical – Gynaecology – Orthopaedics – Neurosurgery.

Text Books

1. Robert Schilling, "Fundamentals of Robotics-Analysis and control", Prentice Hall, 2003.
2. Paula Gomes, "Biomedical Instrument and Robotic Surgery System: Design and Development for Biomedical Applications", Woodhead Publishing, 2012
3. Klafter, Chmielewski and Negin, "Robotic Engineering - An Integrated approach", PHI, first edition, 2009


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Reference Books

1. J.J.Craig, "Introduction to Robotics", Pearson Education, 2005.
2. Fu, Lee and Gonzalez., "Robotics, control vision and intelligence", McGraw Hill International, 2nd edition, 2007
- 3 John J. Craig, "Introduction to Robotics", Addison Wesley Publishing, 3rd edition, 2010.
4. Saeed B. Niku, "Introduction to Robotics: Analysis, Systems, Applications", Prentice Hall, 2001.
5. K. S. Fu, R. C. Gonzales and C. S. G. Lee, "Robotics", McGraw Hill, 2008.

Web Resources

- 1.<https://nptel.ac.in/courses/112/105/112105249/>
- 2.https://www.intechopen.com/books/medical_robotics/motion_tracking_for_minimally_invasive_robotic_surgery
- 3.https://www.intechopen.com/books/medical_robotics/robotic_applications_in_neurosurgery
- 4.https://www.intechopen.com/books/medical_robotics/medical_robotics_in_cardiac_surgery
- 5.<https://www.worldscientific.com/worldscinet/jmrr>

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5	3	1	1	-	1	1	-	-	-	-	-	1	-	-	-

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


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	NETWORK ESSENTIALS	L	T	P	C	Hrs
U20CCO603	(Common to EEMECH, CIVIL, ICE MECHATRONICS, BME)	3	0	0	3	45

Course Objectives

- To understand the fundamental concepts of computer communication and data networks
- To gain the necessary knowledge and skills to work effectively with network engineering and administrators
- To learn how to research ,communicated network and IT issuing by reading relevant industry information
- To understanding the basic technologies and step required for setting up managing small LAN
- To understand the various technologies of security to protect the information in network

Course Outcomes

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

CO1- Understand the basic knowledge and skills to implement defined network architecture

CO2- Explain the performances of data link control and their access medium

CO3- Describe about internet Protocol and their working processes in IPV.

CO4- Explain the basic concepts of Transport Protocols and working of TCP layer

CO5- Design and study the operations of Security and their different algorithm

UNIT I NETWORK MODELS

(9 Hrs)

Data communications- Networks-PAN,LAN, MAN and WAN- Internet, Intranet and Extranets- Protocols and standards- OSI/ISO reference model- TCP/IP protocol suite-Broadband ISDN- ATM protocol reference model-- SONET/SDH architecture-Bluetooth and UWB –WiFi-WiMax Cognitive Radios- Adhoc and Sensor Networks-Green communications.

UNIT II DATA LINK CONTROL AND MEDIUM ACCESS

(9 Hrs)

Types of errors- Error detection and correction- Checksum- Framing-Flow control-Stop and wait protocol- Go-back N- Selective repeat protocols HDLC-Random access protocols- Controlled access- Wired LANs- IEEE standards, IEEE 802.3, 802.4, 802.5 and 802.6- - Fast Ethernet- Gigabit Ethernet –Wireless LANs- IEEE 802.11.

UNIT III NETWORK ROUTING

(9 Hrs)

Logical addressing- IPv4 addresses- IPv6- Internet protocol- Transition from IPv4 to IPv6- Mapping logical to physical address- Mapping physical to logical address- ICMP-Direct Vs indirect delivery- Forwarding-Unicast and Multicast routing protocols- Different Routing Algorithms- Internetworking-Routers and gateways.

UNIT IV TRANSPORT AND CONGESTION

(9 Hrs)

Elements of Transport Protocols: addressing, Connection Establishment, Connection Release, Error Control and Flow Control – Congestion control: Desirable Bandwidth Allocation, Regulating the Sending Rate, Wireless Issues- UDP, RPC -TCP Protocol, TCP connection management, TCP sliding window and congestion control.


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UNIT V SECURITY**(9 Hrs)**

Introduction to Cryptography, Cipher text, symmetric key cryptography – AES and DES, RSA public key and private keys- Digital signature .Security in the Internet: IPSec, PGP, VPN and Firewalls. Authentication Protocols: Shared Secret Key, The Diffie-Hellman Key Exchange, Authentication Using Kerberos. Wireless Security- issues and challenge

Text Books

1. William Stallings, "Data and computer communications", Ninth Edition, Pearson Education, New Delhi, 2014.
2. Behrouz. A. Forouzan, "Data Communication and Networking", Fifth Edition, McGraw Hill, New Delhi, 2013.
3. Pallapa Venkatram and Sathish Babu.B, "Wireless & Mobile Network security ", Tata McGraw Hill, New Delhi, 2010

Reference Books

1. Douglas E. Comer, "Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecture", 6th Edition, Pearson Education, 2013.
2. Nader F. Mir, "Computer and Communication Networks", 2nd Edition, Prentice Hall, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
4. Behrouz A. Forouzan and Firouz Mosharraf, "Computer Networks a Top Down Approach", Tata McGraw-Hill, 2017.
5. Rich Seifert, James Edwards, "The All New Switch Book: The Complete Guide to LAN Switching Technology", 2nd Edition, Wiley Publishing Inc, 2011

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2. <https://tinyurl.com/yapn9ac7>
3. <https://tinyurl.com/ydf33ye6>
4. <https://nptel.ac.in/courses/106/105/106105081/>
5. <https://nptel.ac.in/courses/106/105/106105183/>

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5	2	1	1	1	1	1	-	-	-	-	-	1	-	-	-

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


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	WEB PROGRAMMING	L	T	P	C	Hrs
U20CCO604	(Common to EEE,ECE, MECH, CIVIL, ICE MECHATRONICS, BME)	3	0	0	3	45

Course Objectives

- To Learn the fundamentals of web application development
- To understand the design components and tools using CSS
- To Learn the concepts of JavaScript and programming fundamentals.
- To understand the working procedure of XML
- To study about advance scripting and Ajax applications

Course Outcomes

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

CO1 - Comprehend basic web applications using HTML(**K2**)

CO2 - Use CSS to design web applications (**K3**)

CO3 - Use java scripts functions for the web page creation (**K3**)

CO4 - Explain XML structure(**K2**)

CO5 - Demonstrate the web 2.0 application to advance scripts(**K2**)

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.

UNIT – II STYLE SHEETS**(9 Hrs)**

CSS: 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 JAVA SCRIPTS**(9 Hrs)**

Client side scripting, JavaScript, develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

UNIT –IV XML**(9 Hrs)**

XML: 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 to XSL, XML transformed simple example, XSL elements, transforming with XSLT.

UNIT –V 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.

Text Books

1. Ralph Moseley, M.T. Savaliya, "Developing Web Applications", BPB Publications, 2017.
2. Hirdesh Bhardwaj,, "Web Designing", Pothi.com, 2016
3. P.J. Deitel and H.M. Deitel, Internet and World Wide Web - How to Program, Pearson Education, 2009.


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Reference Books

1. Ralph Moseley, "Developing Web Applications", Wiley India Pvt. Ltd, 2013
2. Joel Sklar, "Principles of Web Design", 6th edition, Cengage Learning, Inc, 2014
3. B. M. Harwani, "Developing Web Applications in PHP and AJAX", Tata McGraw-Hill Education, 2010
4. UttamK.Roy, Web Technologies, Oxford University Press, 2010.
5. Rajkamal, Web Technology, Tata McGraw-Hill, 2009.

Web References

1. <https://nptel.ac.in/courses/106/106/106106156/>
2. <https://www.coursera.org/learn/html-css-javascript-for-web-developers>
3. <https://code.tutsplus.com/courses/how-to-become-a-web-developer>
4. <https://webdesignerwall.com/>
5. <https://www.smashingmagazine.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
1	2	1	1	1	2	1	-	-	-	-	-	1	-	-	-
2	2	1	2	1	2	1	-	-	-	-	-	1	-	-	-
3	2	1	2	1	2	1	-	-	-	-	-	1	-	-	-
4	2	1	1	1	2	1	-	-	-	-	-	1	-	-	-
5	2	1	1	1	2	1	-	-	-	-	-	1	-	-	-

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


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PRINCIPLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING		L	T	P	C	Hrs
U20ADO603	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE)	3	0	0	3	45

Course Objectives

- To understand basic principles of Artificial Intelligence
- To learn and design Knowledge representation
- To understand the concept of reasoning
- To master the fundamentals of machine learning, mathematical framework and learning algorithms
- To understand the reinforcement and statistical learning.

Course Outcomes

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

CO1 - Understand foundational principles of artificial intelligence. **(K2)**

CO2 - Understand formal methods of knowledge representation. **(K2)**

CO3 - Understand the fundamental issues and challenges of Reasoning. **(K2)**

CO4 - Analyze the underlying mathematical relationships with Machine Learning algorithms. **(K3)**

CO5 - Apply various models for Artificial Intelligence programming techniques. **(K4)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to Artificial Intelligence - Artificial Intelligence Problems - Timelines of Artificial Intelligence - Production Systems - State Space Representation - Branches of Artificial Intelligence - Application of Artificial Intelligence.

UNIT II KNOWLEDGE REPRESENTATION**(9 Hrs)**

Knowledge Management - Types of Knowledge - Knowledge representation - Approaches to Knowledge representation - Issues in Knowledge representation - Knowledge base. First order Logic – Frames — Conceptual Dependency.

UNIT III REASONING**(9 Hrs)**

Types of reasoning - reasoning with Fuzzy Logic - Rule based Reasoning - Diagnosis Reasoning.

UNIT IV LEARNING**(9 Hrs)**

Types of Learning - Machine Learning - Intelligent agents - Association Learning: Apriori Algorithm - Case Study: Customer Sequence and SCADA Application – k-Means Clustering - Fuzzy Clustering - Cluster Similarity

UNIT V REINFORCEMENT AND STATISTICAL LEARNING**(9 Hrs)**

Markov Decision Problem - Hidden Markov Model - Linear Classifier - decision Trees: Random forest - Bayesian Network – ANN - ANN Learning process - Types of Network – Perceptron - RBF Network - Case studies: Character recognition.

Text Books

1. Anand Hareendran S., Anand Hareendran, And Vinod Chandra S.S. "Artificial Intelligence and Machine Learning" PHI Publication, 2014.
2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Science, 1997.
3. Peter Harrington, "Machine Learning in action", Manning Publication, 2012.

Reference Books

1. Charu C. Aggarwal "Data Classification Algorithms and Applications", Chapman & Hall/CRC Data Mining and Knowledge Discovery Series.
2. Andreas C. Mueller and Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly Media, Inc. First Edition, 2016.
3. Ermy Watt, Reza Borhani, and Aggelos K. Katsaggelos "Machine Learning Refined Foundations, Algorithms, and Applications", Cambridge University Press, 2016.


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4. Shai Shalev-Shwartz and Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

Web Resources

1. <https://www.coursera.org/learn/machine-learning>
2. https://ml-cheatsheet.readthedocs.io/en/latest/regression_algos.html
3. <https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms>

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	—	1	-	-	-	-	-	-	-	2	2	2
2	1	2	2	—	—	-	-	-	-	-	-	-	1	1	-
3	2	2	1	2	—	-	-	-	-	-	-	-	-	1	1
4	3	2	2	2	1	-	-	-	-	-	-	-	1	-	1
5	2	2	2	2	1	-	-	-	-	-	-	-	1	1	2

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


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U20ADO604	DATA SCIENCE APPLICATION OF VISION	L	T	P	C	Hrs
	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To understand the capability of a machine to get and analyze visual information and make decisions
- To learn methods and algorithms for Vision
- To learn how to use deep learning for Vision tasks
- To understand the neural network concepts
- To study the real world applications using computer vision

Course Outcomes

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

CO1 - Understand the methods and algorithms for image processing. **(K2)**

CO2 - Apply object detection and segmentation concepts for image processing. **(K4)**

CO3 - Apply scalable algorithms for large datasets in vision. **(K4)**

CO4 - Analyze deep learning and neural network architectures for image and video processing. **(K3)**

CO5 - Apply vision-based solutions for specific real-world applications. **(K4)**

UNIT I IMAGE FUNDAMENTALS**(9 Hrs)**

Pixels - The Building Blocks of Images - The Image Coordinate System - RGB and BGR Ordering - Scaling and Aspect Ratios. Image filters - Gaussian blur - Median filter - Dilation and erosion - Custom filters - Image thresholding - Edge detection - Sobel edge detector - Canny edge detector.

UNIT II OBJECT DETECTION AND SEGMENTATION**(9 Hrs)**

Image Features - Harris corner detection - Local Binary Patterns - Image stitching - Segmentation: Contour detection - The Watershed algorithm - Super pixels - Normalized graph cut.

UNIT III MACHINE LEARNING WITH COMPUTER VISION**(9 Hrs)**

Data pre-processing - Image translation through random cropping - Image rotation and scaling - Applications of machine learning for computer vision - Logistic regression - Support vector machines - K-means clustering.

(9 Hrs)**UNIT IV IMAGE CLASSIFICATION USING NEURAL NETWORKS**

Image Classification Basics Types of Learning - The Deep Learning Classification Pipeline - Introduction to Neural Networks - The Perceptron Algorithm - Backpropagation and Multi-layer Networks - The Four Ingredients in a Neural Network Recipe - Weight Initialization - Constant Initialization - Uniform and Normal Distributions - LeCun Uniform and Normal - Understanding Convolutions - CNN Building Blocks - Common Architectures and Training Patterns.

(9 Hrs)**UNIT V COMPUTER VISION AS A SERVICE**

Computer vision as a service – architecture - Developing a server-client model - Computer vision engine.

Text Books

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2009.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, Cengage Learning, 2007.
3. Gary Bradski, "Learning OpenCV", First Edition, 2008.


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Reference Books

1. Alok Kumar Singh Kushwaha, Rajeev Srivastava, "Recognition of Humans and Their Activities for Video Surveillance", IGI Global, 2014.
2. Ying-li Tian, Arun Hampapur, Lisa Brown, Rogerio Feris, Max Lu, Andrew Senior, "Event Detection, Query, and Retrieval for Video Surveillance", IGI Global, 2009.
3. Matthew Turk, Gang Hua, "Vision-based Interaction", First Edition, Morgan Claypool, 2013.
4. Ian Goodfellow, Yoshuo Bengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series)", MIT Press, 2017.
5. Fan Jiang, "Anomalous Event Detection from Surveillance Video", ProQuest, 2012.

Web Resources

1. <https://www.kaggle.com/learn/computer-vision>
2. <https://machinelearningmastery.com/what-is-computer-vision/>
3. <https://www.udemy.com/course/pythoncv/>
4. <https://www.analyticsvidhya.com/blog/2019/03/opencv-functions-computer-vision-python/>
5. https://www.youtube.com/watch?v=N81PCpADwKQ&ab_channel=ProgrammingKnowledge

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	2	1	-	-	-	-	-	-	-	2	2	-
2	2	1	1	2	—	-	-	-	-	-	-	-	1	1	1
3	2	2	2	1	—	-	-	-	-	-	-	-	-	-	1
4	1	2	2	2	1	-	-	-	-	-	-	-	1	2	-
5	2	1	2	2	1	-	-	-	-	-	-	-	1	1	1

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


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Open Elective – IV (Offered in Semester VII)

U20EE0706	ELECTRICAL ENERGY CONSERVATION AND AUDITING	L	T	P	C	Hrs
		3	0	0	3	45

(Common to ECE, ICE, MECH, CIVIL, BME, Mechatronics)

Course Objectives

- To know the necessity of conservation of energy.
- To understand the energy management schemes in motors.
- To understand the energy management methods in lighting schemes.
- To illustrate the metering schemes for energy management.
- To learn economic analysis and management techniques.

Course Outcomes*After completion of the course, the students will be able to***CO1** - Outline about the energy audit process and instruments. **(K2)****CO2** - Apply the energy efficient methods for improving efficiency of electric motors. **(K2)****CO3** - Develop good illumination systems and analyze the power factor. **(K3)****CO4** - Acquire knowledge on various meters used for energy management. **(K2)****CO5** - Analyze and evaluate cost effective model in electrical equipments. **(K5)****UNIT I INTRODUCTION****(9 Hrs)**

Basics of energy – need for energy management – energy accounting – energy monitoring – targeting and reporting – energy audit – definitions – types of energy audit – audit instruments – audit of process industry – Case studies.

UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION**(9 Hrs)**

Energy management for electric motors: energy efficient controls and starting efficiency – motor efficiency and load analysis – selection of motors – energy efficient motors. Energy management by cogeneration: forms of cogeneration – electrical interconnection.

UNIT III LIGHTING SYSTEMS**(9 Hrs)**

Energy management in lighting systems: task and the working space – light sources – ballasts – lighting controls – optimizing lighting energy – reactive power management – capacitor sizing – degree of compensation – capacitor losses – effect of harmonics – lighting and energy standards.

UNIT IV METERING FOR ENERGY MANAGEMENT**(9 Hrs)**

Metering for energy management: units of measure – utility meters – demand meters – paralleling of current transformers – instrument transformer burdens – multi tasking solid state meters – metering location vs requirements – power analyzer – metering techniques and practical examples.

UNIT V ECONOMIC ANALYSIS AND MODELS**(9 Hrs)**

Power system tariffs – Economic analysis: cash flow model – Time value of money – pay-back method – utility rate structures – cost of electricity – loss evaluation – load management – demand control techniques – utility monitoring and control system – economic analysis of HVAC systems.


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Text Books

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, "Guide to Energy Management", The Fairmont Press, Inc., 5th Edition, 2006.
2. Frank Kreith, D. Yogi Goswami, "Energy Management and Conservation Handbook", CRC Press, 2nd Edition, 2016.
3. Wayne C. Turner, "Energy Management Handbook", The Fairmont Press, 4th Edition, 2001.

References Books

1. P. Venkateshaiah K.V. Sharma, "Energy Management and Conservation", Dreamtech Press, 1st Edition, 2020.
2. Amit K. Tyagi, "Handbook on Energy Audits and Management", TERI, 1st Edition, 2003.
3. ICAI, "Electricity in buildings good practice guide", McGraw-Hill Education, 1st Edition, 2017.

Web References

1. <https://nptel.ac.in/courses/108/106/108106022/>
2. <https://www.youtube.com/watch?v=onlhwmbl8CA>
3. <https://www.youtube.com/watch?v=CTt4y8bokWs>
4. <https://ieeexplore.ieee.org/document/7977655>
5. <https://ieeexplore.ieee.org/document/993185>
6. <https://ieeexplore.ieee.org/document/6450335>

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2	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-
3	3	2	3	-	-	-	-	-	-	-	-	1	-	-	-
4	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-
5	2	2	3	-	-	-	-	-	-	-	-	1	-	-	-

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


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U20ECO705

IOT AND ITS APPLICATIONS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

Course Outcomes

After completion of the course, students will be able to

CO1-Understand internet of Things and its hardware and software components.(K2)

CO2-Demonstrate the Interfacing of I/O devices, sensors & communication modules.(K3)

CO3-Understand the concepts of remotely monitor data and control devices.(K2)

CO4-Build and deploy an various architecture with their elements.(K3)

CO5-Can develop real time IoT based projects.(K3)

UNIT – I INTRODUCTION TO INTERNET OF THINGS**(9 Hrs)**

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

UNIT -II ARCHITECTURE OF IoT**(9 Hrs)**

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT - III ELEMENTS OF IoT**(9 Hrs)**

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT - IV IoT APPLICATION DEVELOPMENT**(9 Hrs)**

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices

UNIT -V IoT APPLICATIONS**(9 Hrs)**

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in Business to Master IoT, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.


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Text Books

1. Vijay Madiseti, Arshdeep Bahga, "Internet of Things, A Hands on Approach", University Press, 3rd/e, Aug 2018.
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill ISBN: 9789352605224, 2nd edition, May 2017
3. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs 2014

Reference Books

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2012
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2007
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
4. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2015
5. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
- 6.

Web Resources

1. <https://www.i-scoop.eu/internet-of-things-guide/>
2. <https://www.theinternetofthings.eu/>
3. <https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>
4. <https://www.coursera.org/learn/iot>
5. https://onlinecourses.nptel.ac.in/noc21_ee85/preview

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	-	3	2	-	-	-	-	-	-	-	-	-	-	-
3	2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
4	2	2	2	-	-	-	-	-	-	-	3	-	-	-	-
5	2	3	2	-	3	-	-	-	-	-	3	-	-	-	-

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


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U20ECO706

SENSORS FOR INDUSTRIAL APPLICATIONS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To study principles of sensor and calibration
- To understand different types of motion sensors
- To demonstrate force, magnetic and heading sensors with its application to the learners
- To enhance students to understand the concept of optical, pressure and temperature sensor
- To select suitable sensor for industrial application

Course Outcomes

After completion of the course, students will be able to

- CO1** - Explain principles of sensor and illustrate the calibration (K2)
CO2 - Demonstrate different types of range and sensors (K3)
CO3 - Determine the principles of Force, magnetic and heading sensors (K3)
CO4 - Describe different optical and thermal sensors (K2)
CO5 - Select suitable sensor for real time applications (K3)

UNIT I INTRODUCTION**(9 Hrs)**

Principles of Physical and Chemical Sensors: Sensor classification, Sensing mechanism of Mechanical, Electrical, Thermal, Magnetic, Optical, Chemical and Biological Sensors.

Sensor Characterization and Calibration: Study of Static and Dynamic Characteristics, Sensor reliability, aging test, failure mechanisms and their evaluation and stability study.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS**(9 Hrs)**

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS**(9 Hrs)**

Strain Gage, Load Cell and Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS**(9 Hrs)**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement. Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V APPLICATIONS OF SENSORS**(9 Hrs)**

Applications of Sensors for Industry Automation - Design of smart Industry using Temperature, Humidity and Pressure sensors - Applications of Flow sensors in Industries-Applications of Gyro sensor. Applications of Position sensors.

Text Books

1. Patranabis D., "Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., second edition


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2005(revised).

2. Renganathan S., "Transducer Engineering", Allied Publishers (P) Ltd., 2005(revised).
3. Ernest O. Doebelin, "Measurement systems Application and Design", International Student Edition, VIEdition, Tata McGraw-Hill Book Company, 2012.

Reference Books

1. Kr.Iniewski, "Smart Sensors for Industrial Applications", CRC Press, 2017
2. Bolton W, "Mechatronics", Thomson Press, third edition, 2004.
3. Ian R Sinclair, —Sensors and TransducersI, Third Edition, Newnes publishers, 2001.
4. Robert B. Northrop, "Introduction to Instrumentation and Measurement", 3rd Edition", CRC – Press, Taylor and Francis Group, 2005
5. Curtis D. Johnson, "Process Control Instrumentation Technology", Prentice Hall International Edition, 2015.

Web References

1. <https://www.first-sensor.com/en/applications/industrial/>
2. <https://www.finoit.com/blog/top-15-sensor-types-used-iiot/>
3. <https://www.iaasiaonline.com/smart-sensors-for-industrial-applications-2/>
4. <https://www.plantautomation-technology.com/articles/types-of-sensors-used-in-industrial-automation>
5. <https://www.thomasnet.com/articles/instruments-controls/sensors/>

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3	2	2	3	-	-	-	1	-	-	-	-	1	-	-	-
4	2	2	3	-	-	-	1	-	-	-	-	1	-	-	-
5	2	2	3	-	-	-	1	-	-	-	-	1	-	-	-

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


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U20CS0705

ARTIFICIAL INTELLIGENCE
(Common to EEE, ICE, CIVIL, MECH, CCE, FT)

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To cover fundamentals of Artificial Intelligence,
- To understand various knowledge representation techniques.
- To provide knowledge of AI systems and its variants
- To understand the planning and different learning.
- To understand the communication process of language translator.

course outcomes

On successful completion of this course students will be able to

CO1 - Understand the basics of Artificial Intelligence. **(K1)**

CO2 - Apply AI problem solving techniques, knowledge representation, and reasoning methods in

Knowledge based systems **(K3)**

CO3 - Develop simple intelligent / expert system using available tools and techniques of AI to analyze and interpret domain knowledge. **(K3)**

CO4 - Become familiar with planning and different learning methods. **(K3)**

CO5 - Understanding the human language to Machine language and Robotics. **(K1)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction - Foundations of AI – History of AI –Structure of AI agents, Problem solving - Informed and uninformed search techniques.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING**(9 Hrs)**

Logical Agents –Propositional logic - First-Order Logic - Forward and backward chaining - Knowledge Representation

UNIT III UNCERTAIN KNOWLEDGE AND REASONING**(9 Hrs)**

Basic probability notations - Bayes rule – Wumpus world revisited - Bayesian network.

UNIT IV PLANNING AND LEARNING**(9 Hrs)**

Introduction to planning, Planning in situational calculus - Representation for planning – Partial order planning algorithm- Learning from examples- Knowledge in Learning - Statistical Learning Methods - Reinforcement Learning.

UNIT V COMMUNICATING, PERCEIVING AND ACTING**(9 Hrs)**

Natural Language Processing – Natural Language for communication – Perception - Robotics.

Text Books

1. Kevin Night, Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill 2008.
2. Stuart Russel, Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, Books Third edition, 2000.


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Reference Books

1. George F Luger, Artificial Intelligence, Pearson Education, 6th edition, 2009.
2. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
3. EngeneCharniak and Drew Mc Dermott," Introduction to Artificial intelligence, Addison Wesley 2000.
4. Patrick Henry Winston," Artificial Intelligence", Addison Wesley, Books Third edition, 2000.
5. Nils J. Nilsson,"Principles of Artificial Intelligence", Narosa Publishing House, 2000.

Web Resources

- https://www.tutorialspoint.com/artificial_intelligence/index.htm
- <https://www.javatpoint.com/artificial-intelligence-tutorial>
- <https://www.w3schools.com/ai/>
- <https://www.mygreatlearning.com/blog/artificial-intelligence-tutorial/>
- <https://nptel.ac.in/courses/112/103/112103280/>

COs/POs/PSOs Mapping

CO'S	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	3	3	3	3	3	3	-	-	3	-	3	3	3
2	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	-	-	3	-	3	3	3
4	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-
5	2	2	2	2	-	2	-	2	-	2	-	2	2	2	-

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


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CLOUD TECHNOLOGY AND ITS APPLICATIONS

U20CSO706

(Common to EEE, ICE, MECH, CIVIL,
BME, CCE, Mechatronics)

L T P C Hrs
3 0 0 3 45

Course Objectives

- To define the fundamental ideas behind Cloud Computing.
- To classify the basic ideas and principles in cloud information system.
- To relate cloud storage technologies and relevant distributed file systems.
- To explain the Cloud Applications.
- To define the Future of Cloud.

Course Outcomes

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

CO1 - Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. **(K1)**

CO2 - Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacentres to build and deploy cloud applications that are resilient, elastic and cost-efficient. **(K3)**

CO3 - Illustrate the fundamental concepts of Cloud Applications. **(K4)**

CO4 - Explain the Applications of cloud. **(K3)**

CO5 - Advancing towards a Cloud. **(K3)**

UNIT I INTRODUCTION

(9 Hrs)

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network.

UNIT II CLOUD INFORMATION SYSTEMS

(9 Hrs)

Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing.

UNIT III CLOUD INFRASTRUCTURE

(9 Hrs)

Introduction– Evolving IT infrastructure – Evolving Software Applications –Service Oriented architecture – Interoperability Standards for Data Center Management - Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment.

UNIT IV CLOUD APPLICATIONS

(9 Hrs)

Software Utility Application Architecture - Characteristics of a SaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework - Common Enablers – Conceptual


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view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture - Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.

UNIT V FUTURE OF CLOUD

(9 Hrs)

Other Design Considerations - Design of a Web Services Metering Interface - Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

Text Books

1. Sandeep Bhowmik, 'Cloud Computing', Cambridge University Press; First edition, 2017.
2. Erl, 'Cloud Computing: Concepts, Technology & Architecture', Pearson Education India, 1st edition, 1 January 2014.
3. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

Reference Books

1. Sanjiva Shankar Dubey, 'Cloud Computing and Beyond', Dreamtech Press 2nd edition, 2019.
2. John W. Rittinghouse and James F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
3. George Reese, "Cloud Application Architectures", O'Reilly Publications, 2009.
4. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
5. Bunker and Darren Thomson, "Delivering Utility Computing", John Wiley & Sons Ltd. 2006.

Web Resources

1. www.coltdatacentres.net/Cloud Technology.
2. www.zdnet.com.
3. <https://www.cloudbakers.com/blog/what-is-a-cloud-application>
4. <https://www.cloudbakers.com/blog/what-is-a-cloud-application>
5. <https://blog.servermania.com/what-is-a-cloud-application/>

COs/POs/PSOs Mapping

CO'S	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	1	1	-	1	1	-	2	1	3	1	2	3	2
2	1	1	2	1	1	3	1	-	2	1	3	1	3	3	2
3	2	2	1	1	-	3	1	1	2	1	3	1	3	3	3
4	1	1	1	1	2	2	1	-	2	1	3	1	2	2	2
5	2	1	1	1	1	3	1	-	2	1	3	1	2	3	2

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


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U20ITO705	AUTOMATION TECHNIQUES & TOOLS - DEVOPS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- The Background and mindset of Devops
- To enable students appreciate the agile led development environment.
- To give the students a perspective to grasp the need for Minimum viable product led development using Sprints.
- To enable students acquire fundamental knowledge of CI/CD and CAMS.
- To enable learners realize various aspects of DevOps Ecosystem.

Course Outcomes

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

CO1 - Explain traditional software development methodologies like waterfall. **(K2)**

CO2 - Apply the Agile Methodology and comparing various other software development models with agile. **(K3)**

CO3 - Explain implementing Continuous Integration and Continuous Delivery. **(K2)**

CO4 - Explain CAMS for DevOps (Culture, Automation, Measurement and Sharing). **(K2)**

CO5 - Create quick MVP prototypes for modules and functionalities. **(K3)**

UNIT I TRADITIONAL SOFTWARE DEVELOPMENT (9 Hrs)

The Advent of Software Engineering - Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation - Developers vs IT Operations conflict.

UNIT II RISE OF AGILE METHODOLOGIES (9 Hrs)

Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools - Working software over comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan

UNIT III INTRODUCTION DEVOPS (9 Hrs)

Introduction to DevOps - Version control - Automated testing - Continuous integration - Continuous delivery - Deployment pipeline - Infrastructure management – Databases

UNIT IV PURPOSE OF DEVOPS (9 Hrs)

Minimum Viable Product- Application Deployment- Continuous Integration- Continuous Delivery

UNIT V CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING) (9 Hrs)

CAMS – Culture, CAMS – Automation, CAMS – Measurement, CAMS – Sharing, Test-Driven Development, Configuration Management-Infrastructure Automation- Root Cause Analysis- Blamelessness- Organizational Learning

Text Books

1. Dev Ops – Volume 1 , Pearson and Xebia Press
2. Grig Gheorghiu, Alfredo Deza, Kennedy Behrman, Noah Gift, Python for DevOps,2019

Reference Books

1. The DevOps Handbook - Book by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis
2. What is DevOps? - by Mike Loukides
3. Joakim Verona, Practical DevOps ,2016.


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COs/POs/PSOs Mapping

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1	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
2	3	2	1	1	2	-	-	-	-	-	-	-	3	2	3
3	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
4	2	1	-	-	2	-	-	-	-	-	-	-	3	2	3
5	3	2	1	1	2	-	-	-	-	-	-	-	3	2	3

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


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U20ITO706	AUGMENTED AND VIRTUAL REALITY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn basics of VR and AR systems
- To know about basic Augment reality functions
- To know about basic Virtual reality functions
- To know about Virtual reality environment and steps to work on it
- To learn various application on AR and VR

Course Outcomes

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

CO1 - Understand the concepts of VR **(K2)**

CO2 - Summarize different VR modelling Process **(K2)**

CO3 - Identify applications of virtual reality environment **(K2)**

CO4 - Explore and work on Augmented Reality environment **(K2)**

CO5 - Illustrate applications related to VR and AR **(K3)**

UNIT I VIRTUAL REALITY AND 3D COMPUTER GRAPHICS (9Hrs)

Introduction - Benefits of virtual reality - The Virtual world space – Positioning the virtual observer – Stereo perspective projection – 3D clipping – Color Theory – Simple 3D modeling – Illumination models – Reflection models – Shading algorithms

UNIT II VR MODELLING PROCESS (9Hrs)

Geometric modeling – kinematics modeling- physical modeling – behaviour modeling – model Management.

UNIT III CONTENT CREATION CONSIDERATIONS FOR VR (9Hrs)

Methodology and terminology - user performance studies - VR health and safety issues – Usability of virtual reality system - cyber sickness -side effects of exposures to virtual reality environment

UNIT IV AUGMENTED REALITY (AR) (9Hrs)

Introduction – Benefits of AR – Key players of AR technology - Understanding Augmented reality - Working with AR and System structure

UNIT -V APPLICATIONS ON VR (9Hrs)

Medical applications- robotics applications- Advanced Real time Tracking-other applications- games, movies, simulations

Text Books

1. Kelly S. Hale , Kay M. Stanney," Handbook of Virtual Environments: Design, Implementation, and Applications", Human Factors and Ergonomics ,Second Edition , 2014.
2. C. Burdea and Philippe Coiffet, "Virtual Reality Technology", Gregory, John Wiley and Sons, Inc., Second Edition, 2008.
3. Jason Jerald, "The VR Book: Human-Centred Design for Virtual Reality". Association for Computing Machinery and Morgan and Claypool, New York, 2015.


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Reference Books

1. Dieter Schmalstieg and Tobias Hollerer, "Augmented Reality: Principles and Practice (Usability)", Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016.
2. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability)", Addison-Wesley Professional; 1 edition, 2016.
3. Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile", O'Reilly Media, 1st edition, 2015.
4. Tony Parisi, "Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages", O'Reilly Media, 1st edition, 2014.

Web References

1. <https://www.coursera.org/courses?query=augmented%20reality>
2. <https://nptel.ac.in/courses/106/106/106106138/>
3. <http://www.vrmedia.it/en/xvr.html>
4. <http://www.hitl.washington.edu/artoolkit/>

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	2	1	-	-	2	-	-	-	-	2	-	2	1	2	3
4	2	1	-	-	2	-	-	-	-	2	-	2	1	2	3
5	2	1	-	-	2	-	-	-	-	2	-	2	2	2	3

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


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U20ICO705

INDUSTRIAL AUTOMATION

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To know about the design of a system using PLC.
- To study about PLC Programming
- To study knowledge on application of PLC
- To have an exposure SCADA architecture
- To know about the fundamentals of DCS.

Course Outcomes

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

CO1- Know the fundamentals of data networks and Understand working of PLC,I/O modules of PLC, automation and applications in industry. (K1)

CO2- Know about the design of systems using PLC and PLC programming. (K1, K2, K3)

CO3- Acquire knowledge on application of PLC. (K1, K3)

CO4- Know about the SCADA architecture, communication in SCADA, develop any application based on SCADA along with GUI using SCADA software. (K1, K2, K3)

CO5- Know the fundamentals of DCS. (K1)

UNIT I PLC ARCHITECTURE**(9 Hrs)**

Introduction and overview of Industrial automation – Block diagram of PLC – different types of PLC – Type of input and output – Introduction to relay logic- Application of PLC.

UNIT II PLC PROGRAMMING**(9 Hrs)**

Introduction to Ladder logic programming – Basic instructions – Timer and Counter instruction Arithmetic and logical instruction – MCR, PID controller and other essential instruction sets - Case studies and examples for each instruction set.

UNIT III APPLICATION OF PLC**(9 Hrs)**

Introduction to high level PLC language – Programming of PLC using simulation software – Real time interface and control of process rig/switches using PLC.

UNIT IV INTRODUCTION OF SCADA**(9 Hrs)**

Introduction to DCS and SCADA - Block diagram – function of each component – Security objective – Operation and engineering station interface – Communication requirements.

UNIT V DISTRIBUTED CONTROL SYSTEM**(9 Hrs)**

Development of different control block using DCS simulation software – Real time control of test rigs using DCS. Introduction to HART, Field bus and PROFIBUS – Application and case studies of large scale process control using DCS.

Text Books

1. John W. Webb and Ronald A Reis, Programmable Logic Controllers - Principles and Applications, Prentice Hall Inc., New Jersey, 5th Edition, 2002.
2. Lukcas M.P, Distributed Control Systems, Van Nostrand Reinhold Co., New York, 1986.
3. Frank D. Petruzella, Programmable Logic Controllers, McGraw Hill, New York, 4th Edition, 2010.


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Reference Books

1. Deshpande P.B and Ash R.H, Elements of Process Control Applications, ISA Press, New York, 1995.
2. Curtis D. Johnson, Process Control Instrumentation Technology, Prentice Hall, New Delhi, 8th Edition, 2005.
3. Krishna Kant, Computer-based Industrial Control, Prentice Hall, New Delhi, 2 nd Edition, 2011.

Web Resources

1. <https://nptel.ac.in/courses/108105063/>
2. <https://www.google.com/amp/s/controlstation.com/what-is-a-distributed-control-system/amp/>
3. <https://nptel.ac.in/courses/108/105/108105088/>
4. https://onlinecourses.nptel.ac.in/noc20_me39/preview
5. https://nptel.ac.in/content/syllabus_pdf/108105088.pdf.

COs/POs/PSOs Mapping

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3	3	2	1	-	-	1	-	-	-	1	1	2	1	1	-
4	2	3	1	-	-	1	-	-	-	1	1	2	1	1	-
5	3	2	1	-	-	1	-	-	-	1	1	3	1	1	-

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


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U20MEO706	PRINCIPLES OF HYDRAULICS AND PNEUMATICS SYSTEM	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.
- To provide students with an understanding of Hydraulic system design and industrial applications.
- To provide fundamental knowledge of components forming pneumatic systems.
- To design pneumatic circuits.
- To understand the PLC programming and its applications in Hydro mechanical servo systems.

Course Outcomes

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

CO1 - Identify the components of a typical hydraulic systems. **(K2)**

CO2 - Design and predict simple pressure and direction flow circuits. **(K3)**

CO3 - Understand the pneumatic components (Cylinders, valves, etc.), their use, symbols, and their constructional details. **(K2)**

CO4 - Design Industrial Pneumatics automatic control circuits. **(K3)**

CO5 - Develop circuits for controlling hydraulic and pneumatic system using PLC. **(K3)**

UNIT I ELEMENTS OF HYDRAULIC SYSTEMS (9 Hrs)

Introduction to fluid power, Power unit and accessories, Types of power units –elements. Design properties - Hydraulic fluids, Selection of hydraulic fluid, comparison of hydraulics and pneumatics. Types of cylinders, cylinder cushioning, Pipes- material, pipe fittings. Seals and packing. Filter arrangement, maintenance of hydraulic systems. Selection criteria for cylinders, pipes, Heat generation in hydraulic system.

UNIT II HYDRAULIC SYSTEM DESIGN AND INDUSTRIAL APPLICATIONS (9 Hrs)

Pressure, flow and direction control valves – types & constructional details, circuit symbols. Flow, Pressure and direction control circuits. Regenerative circuits, differential circuits, feed circuits, sequencing circuits, synchronizing circuits, fail-safe circuits. Design of hydraulic circuits.

UNIT III ELEMENTS OF PNEUMATIC SYSTEMS (9 Hrs)

Compressors- types, selection. Symbols of pneumatic elements. Cylinders - types, typical construction details. Valves – Types, typical construction details.

UNIT IV PNEUMATIC SYSTEMS DESIGN AND INDUSTRIAL APPLICATIONS (9 Hrs)

General approach, travel step diagram. Types - sequence control, cascade, step counter method. K..Mapping for minimization of logic equation. Metal working, handling, clamping, application with counters. Design of pneumatic circuits.


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UNIT V ADVANCES IN HYDRAULICS AND PNEUMATICS**(9 Hrs)**

Electro pneumatics, ladder diagram. Servo and Proportional valves - types, operation, application. Hydro-Mechanical servo systems. PLC-construction, types, operation, programming.

Text Books

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2005.
2. Srinivasan R. "Hydraulic and Pneumatic Controls", Vijay Nicole Imprints Private Ltd, 2005.
3. Yeaple F.D, "Hydraulic and Pneumatic Power and Control: Design", McGraw-Hill, USA, 2007.
4. S.Sameer, "Hydraulic And Pneumatic", R.K.Publications, 2010.
5. Turner I C, "Engineering Applications Of Pneumatics And Hydraulics", Taylor & Francis, 2020.

Reference Books

1. Majumdar, S.R, "Oil Hydraulic Systems: Principles and Maintenance", Tata McGraw- Hill, New Delhi, 2003.
2. Sundaram K.Shanmuga, "Hydraulic and Pneumatic Controls", S. Chand, 2006.
3. Pippenger J.J Tyler G Hicks, "Industrial Hydraulics", McGraw-Hill, USA, 2007.
4. Jarosław Stryczek, "Advances in Hydraulic and Pneumatic Drives and Controls", Springer, 2020.
5. Joji Parambath, "Hydraulics Accumulators and Circuits" 2020.

Web References

1. <https://nptel.ac.in/courses/112/106/112106300/>
2. <https://nptel.ac.in/courses/112/105/112105046/>
3. <https://nptel.ac.in/courses/112/102/112102011/>
4. <https://nptel.ac.in/courses/112/106/112106175/>
5. <https://www.hydraulicspneumatics.com/>

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3	3	1	2	-	1	-	-	1	-	1	-	1	2	2	1
4	3	2	2	2	1	1	-	1	-	1	-	3	2	1	2
5	3	1	2	1	2	1	-	1	1	1	-	3	2	2	2

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


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U20MEO707

SUPPLY CHAIN MANAGEMENT

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To develop a deeper understanding of the fundamentals of Accounting and Finance
- To learn how to apply mathematical principles in Finance and the concepts of Risk and Return
- To understand the need and procedure for conducting Financial Analysis for better decision-making
- To be familiar with the modes of generating funds for business and their implications
- To understand the scientific ways to determine deployment of funds in business

Course Outcomes

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

CO1 - Examine the process and strategy of supply chain management **(K2)**

CO2 - Enumerate the inventory in supply chain management **(K2)**

CO3 - Identify the importance of logistics and information technology in supply chain management **(K3)**

CO4 - Discuss the importance of integrated systems in supply chain management **(K2)**

CO5 - Demonstrate how agile and lean method will help to optimise resources in supply chain management **(K2)**

UNIT I INTRODUCTION TO SUPPLY CHAIN MANAGEMENT**(9 Hrs)**

Generic Types of supply chain, Various Definitions and Implications, Major Drivers of Supply chain. Strategic Decisions- in Supply Chain Management-Introduction, Business Strategy, Core Competencies in Supply Chain, Strategic SC Decisions

UNIT II SOURCE OF MANAGEMENT AND INVENTORY IN SUPPLY CHAIN MANAGEMENT**(9 Hrs)**

Elements of Strategic Sourcing, - Collaborative Perspective, Development of Partnership, Types of Inventory, Supply/ Demand Uncertainties, Inventory costs, Selective Inventory Control, Vendor Manage Inventory system, Inventory Performance Measure

UNIT III LOGISTICS AND INFORMATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT**(9 Hrs)**

Strategy, Transportation Selection, Trade-off, Third Party Logistics,, Overview of Indian Infrastructure for Transportation- Types of IT Solutions like Electronic Data Interchange (EDI), Data Mining/ Data Warehousing, E-Commerce, E- Procurement, Bar Coding Technology- Computer Based Information Systems- ERP, ERP & SCM.

UNIT IV REVERSE AND COLLABORATIVE SUPPLY CHAIN MANAGEMENT**(9 Hrs)**

Reverse Supply Chain v/s Forward Supply Chain, Types and, Issues, Reverse Supply Chain for Food items, Reverse Logistic and Environment Impact. Evolution of collaborative SCM, Efficient Customer response,


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UNIT V AGILE AND LEAN SUPPLY CHAIN MANAGEMENT**(9 Hrs)**

Source of Variability, Characteristics of Agile Supply Chain, Achieving Agility in Supply Chain. Lean supply chain management-Concept and Application, Cases of Supply Chain like, News Paper Supply Chain, Book Publishing, Mumbai Dabbawala, Disaster management, Organic Food, Fast Food.

Text books

1. Chopra, Sunil, Peter Meindl, and Dharam Vir Kalra. Supply chain management: strategy, planning, and operation. 6/e Edition, MA: Pearson, 2016.
2. Martin Christopher, Logistics and Supply Chain Management, 5th Edition, FT Publishing International, 2016.
3. D K AGRAWAL, A text book of Logistics and supply chain management, MACMILAN, 2015
4. Badenhorst Weiss H Supply Chain Management: A Logistic Approach, Oxford E-Books, 2018
5. Sunil Chopra, Supply Chain Management: Strategy, Planning, and Operation, Pearson, 2017

Reference books

1. Michael H. Hugos, Essentials of Supply Chain Management, 3rd edition, John Wiley & Sons, 2018.
2. Richard B. Chase, Ravi Shankar, F. Robert Jacobs, Operations & Supply Chain Management, 15 edition Mc Graw Hill India, 2018.
3. William C Copacino, Supply chain Management, Basics and Beyond, , CRC press, 2010.
4. William C Copacino, Retail supply chain Management, James B. Ayers, Mary Ann Odegaard, CRC press, 2018.
5. James R Good, The essentials of Supply Chain Management, , Bowling Green state University, 2019

Web References

1. <https://www.edx.org/learn/supply-chain-management>
2. <http://library.jgu.edu.in/content/logistics-and-supply-chain-management>
3. <https://onlinelibrary.wiley.com/Journal of Supply Chain Management>
4. [https://www.emerald.com/insight/ An International Journal of Operations and Logistics Management](https://www.emerald.com/insight/An International Journal of Operations and Logistics Management)
5. <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mg22/>

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
1	1	2	-	-	-	-	2	1	-	-	3	1	3	2	3
2	2	2	-	-	-	-	3	-	-	-	1	-	2	2	2
3	1	2	-	-	-	-	3	-	-	-	2	1	1	2	2
4	2	-	-	-	-	-	2	-	-	-	-	-	2	1	-
5	2	1	-	-	-	-	1	1	-	-	-	1	2	1	2

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


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U20MCO702**BUILDING AUTOMATION**

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- Gain knowledge on Building Management System (BMS) and Automation.
- Be familiarized with various transducers and sensors in BMS.
- Be exposed on Control panel and Communication.
- Learn Fire Alarm System (FAS) and security system such as CCTV.
- Gain knowledge on Energy Management in Building Automation.

Course Outcomes

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

CO1 - Remembering current philosophy, technology, terminology, and practices used in building automation(K1)

CO2 - Understand different fire standards, FAS Components, FAS loops, Architectures.(K2)

CO3 - Apply hardware and software for HVAC system (K3)

CO4 - Evaluate energy management system(K3)

CO5 - Design the new concepts materials of building automation(K3)

(9 Hrs)**UNIT I INTRODUCTION TO BMS AND AUTOMATION**

Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system, architecture and components of BMS.

(9 Hrs)**UNIT II FAS AND SECURITY SYSTEMS**

Fire, Fire modes – Fire Alarm Systems components: Field components, panel components – FAS Architectures – Access Components, Access control system Design - CCTV camera types and operation –camera selection criteria – CCTV Applications.

Security Systems Fundamentals: Introduction to Security Systems, Concepts. Perimeter Intrusion: Concept, Components, Technology. Security Design: Concept of automation in access control system for safety, Physical security system with components, RFID enabled access control with components, Computer system access control – DAC, MAC, RBAC.

(9 Hrs)**UNIT III HVAC SYSTEM**

Fundamentals: HVAC Fundamentals, Basic Processes (Heating, Cooling etc) Basic Science: Air Properties, Psychrometric Chart, Heat Transfer mechanisms. Human Comfort: Human comfort zones, Effect of Heat, Humidity, Heatloss. Processes: Heating Processes (Boiler, Heater), Cooling Process (Chiller), Ventilation Process (Central Fan System, AHU, Exhaust Fans), Unitary Systems (VAV, FCU). Control Theory: Instrumentation Basics, Field components & use, DDC & applications. Control Panel: HVAC Control Panel, MCC Basics, Panel Components.

(9 Hrs)**UNIT IV ENERGY MANAGEMENT SYSTEM**

ASHRAE Symbols Energy Management: Energy Savings concept & methods, lighting control, Building Efficiency improvement, Green Building (LEED) Concept & Examples

(9 Hrs)**UNIT V BUILDING MANAGEMENT SYSTEM**

IBMS (HVAC, Fire & Security) project cycle, Project steps BMS. Verticals: Advantages & Applications of BMS, Examples Integration: IBMS Architecture, Normal & Emergency operation. Advantages of BMS

Text Books

1. Gerardus Blokdyk "Intelligent Building Automation Systems The Ultimate Step-By-Step Guide "5STARCook's,


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2018.

2. Phil Zito "Building Automation Systems a to Z: How to Survive in a World Full of Bas "CreateSpace Independent Publishing Platform, 2016

Reference Books

1. Jim Sinopoli "Smart Buildings", Butterworth-Heinemann imprint of Elsevier, 2nd ed., 2010.
2. Albert Ting-Pat So, WaiLok Chan, Kluwer "Intelligent Building Systems" Academic publisher, 3rd ed., 2012.
3. James Sinopoli "Advanced Technology for Smart Buildings" Artech House. – 2016
4. Sibanjan Das, Umit Mert Cakmak "Hands-On Automated Machine Learning: A beginner's guide to building" Packt Publishing Ltd. – 2018
5. Gerard Blokdyk "Building Automation: Quickstart Administration" CreateSpace Independent Publishing Platform, 2017

Web Resources

1. <https://www.youtube.com/watch?v=wNeYPfNV8QI>
2. <https://nptel.ac.in/courses/108/105/108105063/>
3. https://swayam.gov.in/nd1_noc20_me39/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
1	3	2	1	-	-	-	-	-	-	-	3	2	-	-	-
2	3	2	1	-	-	-	-	-	-	-	3	2	-	-	-
3	3	2	1	-	-	-	-	-	-	-	3	2	-	-	-
4	3	2	1	-	-	-	-	-	-	-	3	2	-	-	-
5	3	2	1	-	-	-	-	-	-	-	3	2	-	-	-

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


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U20MCO703	AUTOMATION IN MANUFACTURING SYSTEMS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To impart knowledge in the field of Automated Manufacturing system.
- To illustrate the basic concepts of automation in production lines.
- To understand the fundamentals of automation in multi station assembly machines
- Describe the importance of automated material handling and storage systems.
- To understand automated inspection principles and strategies in manufacturing.

Course Outcomes

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

CO1 - Understand the basic types, levels, strategies of automation. **(K1)**

CO2 - Understand basic components and their functions of automated production line system. **(K2)**

CO3 - Apply the quantitative analysis and assembly systems. **(K2)**

CO4 – Examine various storage system and transportation requirements of automated systems. **(K2)**

CO5 - Evaluate the process control strategy to an automated system. **(K3)**

(9 Hrs)

UNIT I INTRODUCTION

Facilities - Manual work systems, worker - machine systems and automated systems. Manufacturing support systems, Automation in Production systems - Automated Manufacturing systems, Computerized manufacturing support systems, Manual labour in Production systems, Automation principles and strategies.

(9 Hrs)

UNIT II AUTOMATED PRODUCTION LINES

Fundamentals - System configurations, work part transfer mechanisms, Storage buffers, and Control of the production line. Applications - Machining systems and System Design Considerations. Analysis of Transfer lines - Transfer lines with No internal parts storage, Transfer lines with internal storage buffers.

(9 Hrs)

UNIT III AUTOMATED ASSEMBLY SYSTEMS

System configurations, Parts delivery at workstations and applications, quantitative analysis of assembly systems - Parts Delivery System at Workstations, Multi - Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

(9 Hrs)

UNIT IV AUTOMATED MATERIAL TRANSPORT & STORAGE SYSTEMS

Automated Material Transport & Storage systems: Automated Guided Vehicle (AGV) Systems, Types and applications, Vehicle Guidance Technology, Vehicle Management and Vehicle safety. Automated Storage and Retrieval Systems (ASRS) and Carousel Storage Systems.

(9 Hrs)

UNIT V AUTOMATED INSPECTION SYSTEMS

Quality in Design and manufacturing, inspection principles and strategies, automated inspection, contact Vision-contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

Text Books

1. Beno Benhabib Manufacturing: Design, Production, Automation, and Integration, CRC Press, 2009.
2. R. Thomas Wright, Mich+ael Berkeihiser, 'Manufacturing and Automation Technology', 2011.
3. Mikell P. Groover, 'Automation, Production Systems and Computer-Integrated Manufacturing', Pearson Publisher, Fourth Edition, 2016.


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Reference Books

1. P. Radhakrishnan, S. Subramanyan and V. Raju, 'CAD/CAM/CIM', New Age International (P) Ltd., New Delhi, 2009.
2. S.R. Deband Sankha Deb, 'Robotics Technology and Flexible Automation', Tata McGraw Hill, Second Edition, New Delhi, 2010.
3. Peter Corke, 'Robotics, Vision and Control: Fundamental Algorithms in MATLAB', Springer, 2011.
4. Nicholas Odrey, Mikell P Groover, Roger Nagel, Ashish Dutta, 'Industrial Robotics (SIE): Technology, Programming and Applications', McGraw Hill, 2012.
5. Caustic Kumar (Editor), Divya Zindani (Editor), J. Paulo Davim, 'Digital Manufacturing and Assembly Systems in Industry 4.0', CRC Press, 2021

Web Resources

1. <https://nptel.ac.in/courses/108/105/108105063/>
2. <https://www.automationmag.com/>
3. <https://www.springer.com/gp/book/9783319771786>.
4. <https://library.automationdirect.com/industrial-automation-top-10-trends/>
5. <https://nptel.ac.in/courses/112/102/112102011/>

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
1	3	2	1	-	-	-	-	-	-	-	3	2	3	2	3
2	3	2	1	-	-	-	-	-	-	-	3	2	3	2	3
3	3	2	1	-	-	-	-	-	-	-	3	2	3	1	3
4	3	2	1	-	-	-	-	-	-	-	3	2	3	2	3
5	3	2	1	-	-	-	-	-	-	-	3	2	3	2	3

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


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U20CCO705	DATA SCIENCE USING PYTHON	L	T	P	C	Hrs
	(Common to EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME)	3	0	0	3	45

Course Objectives

- To understand the concepts of Real world data science and Python.
- To learn the OOPs concepts with data science.
- To understand the NumPy operations with data science.
- To learn the data manipulation with Pandas.
- To clean, prepare and visualize with real data science.

Course outcomes

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

- CO1** – Infer the Real world data science and solve basic problems using Python. **(K2)**
CO2 – Design an application with user-defined modules and packages using OOP concept **(K2)**
CO3 – Employ efficient storage and data operations using NumPy arrays. **(K2)**
CO4 – Apply powerful data manipulations using Pandas. **(K3)**
CO5 – Do data preprocessing using Pandas. **(K2)**

UNIT I: INTRODUCTION TO DATA SCIENCE AND PYTHON (9Hrs)

Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators.

Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.

UNIT II FILE, EXCEPTION HANDLING AND OOP (9 Hrs)

User defined Modules and Packages in Python- Files: File manipulations, File and Directory related methods- Python Exception Handling.

OOPs Concepts -Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance.

UNIT III INTRODUCTION TO NUMPY (9Hrs)

NumPy Basics: Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing- Transposing Arrays and Swapping Axes.

Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods- Sorting Unique and Other Set Logic.

UNIT IV DATA MANIPULATION WITH PANDAS (9Hrs)

Introduction to pandas Data Structures: Series, DataFrame, Essential Functionality: Dropping Entries Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking.

UNIT V DATA CLEANING AND PREPARATION (9Hrs)

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String.

Manipulation: Vectorized String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.


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Text Books

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition, 2018.
3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

Reference Books

1. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.
3. Steven S. Skiena, "Data Science Design Manual", Springer International Publication, 2017.
4. Rajendra Akerkar, Priti Srinivas Sajja, "Intelligence Techniques for Data Science", Springer International Publication, 2016.
5. Longbing Cao "Data Science Thinking: The Next Scientific, Technological and Economic Revolution", Springer International Publication, 2018.

Web References

1. <https://www.programmer-books.com/introducing-data-science-pdf/>
2. <https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf>
3. [http://math.ecnu.edu.cn/~lfzhou/seminar/\[Joel_Grus\]_Data_Science_from_Scratch_First_Princ.pdf](http://math.ecnu.edu.cn/~lfzhou/seminar/[Joel_Grus]_Data_Science_from_Scratch_First_Princ.pdf)
4. <https://www.edx.org/course/python-basics-for-data-science>
5. <https://www.edx.org/course/analyzing-data-with-python>

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
1	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
2	2	2	2	2	2	-	-	-	-	-	-	-	-	-	-
3	2	2	2	2	2	-	-	-	-	-	-	-	-	-	-
4	3	3	3	3	3	-	-	-	-	-	-	-	-	-	-
5	3	2	2	2	2	-	-	-	-	-	-	-	-	-	-

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


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U20CCO706

MOBILE APPLICATION DEVELOPMENT USING ANDROID

L	T	P	C	Hrs
3	0	0	3	45

(Common to EEE, ECE, MECH, CIVIL,
ICE, Mechatronics, BME)

Course Objectives

- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design
- Implement the design using specific mobile development frameworks
- Deploy the mobile applications in marketplace for distribution

Course Outcomes

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

- CO1-** Describe the requirements for mobile applications **(K2)**
CO2- Explain the challenges in mobile application design and development **(K3)**
CO3- Develop design for mobile applications for specific requirements **(K3)**
CO4- Implement the design using Android SDK. **(K2)**
CO5- Implement the design using Objective C and iOS. **(K2)**

UNIT- I INTRODUCTION

(9 Hrs)

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT – II BASIC DESIGN

(9 Hrs)

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT – III ADVANCED DESIGN

(9 Hrs)

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT – IV ANDROID

(9Hrs)

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V IOS

(9 Hrs)

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.


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Text Books

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd edition 2011.
2. Charlie Collins, Michael D. Galpin, Matthias K  ppler, "Android in Practise", Manning Publications Co., 1st edition, 2012.
3. Jeff McWherter, Scott Gowell, "Professional Mobile Application Development", John Wiley & Sons, Inc., 2012.

Reference Books

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
4. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.
5. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd.

Web Reference

1. <http://developer.android.com/develop/index.html>
2. <http://developer.android.com/reference/>
3. <https://www.udacity.com/course/developing-android-appsfundamentals--ud853-nd>

COs/POs/PSOs Mapping

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	2	2	3	-	-	-	3	2	2	-	-	-
2	3	2	3	2	2	3	-	-	-	3	2	2	-	-	-
3	3	2	3	2	2	3	-	-	-	3	2	2	-	-	-
4	3	2	3	2	2	3	-	-	-	3	2	2	-	-	-
5	3	2	3	2	2	3	-	-	-	3	2	2	-	-	-

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


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	DATA SCIENCE APPLICATION OF NLP	L	T	P	C	Hrs
U20ADO705	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics)	3	0	0	3	45

Course Objectives

- To introduce the fundamental concepts and techniques of Natural language Processing(NLP)
- To analyzing words based on Text processing.
- To analyzing words based on Morphology.
- To examine the syntax and language modeling
- To get acquainted with syntax and semantics

Course Outcomes

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

CO1 - Understand the principles and process the Human Languages such as English using computers. **(K2)**

CO2 - Creating CORPUS linguistics based on digestive approach (Text Corpus method). **(K2)**

CO3 - Demonstrate the techniques for text-based Processing of NLP with respect to morphology. **(K4)**

CO4 - Perform POS tagging for a given natural language. **(K3)**

CO5 - Check the syntactic and semantic correctness of sentences using grammars and labelling. **(K3)**

UNIT I INTRODUCTION TO NLP**(9 Hrs)**

Introduction to various levels of natural language processing, Ambiguities and computational challenges in processing various natural languages. Introduction to Real life applications of NLP such as spell and grammar checkers, information extraction, and machine translation.

UNIT II TEXT PROCESSING**(9 Hrs)**

Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis.

UNIT III MORPHOLOGY**(9 Hrs)**

Inflectional and Derivation Morphology, Morphological Analysis and Generation using finite state transducers.

UNIT IV LEXICAL SYNTAX AND LANGUAGE MODELING**(9 Hrs)**

Introduction to word types, POS Tagging, Maximum Entropy Models for POS tagging, Multi-word Expressions- The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

UNIT V SYNTAX AND SEMANTICS**(9 Hrs)**

Introduction to phrases, clauses and sentence structure, Shallow Parsing and Chunking, Shallow Parsing with Conditional Random Fields (CRF), Lexical Semantics, Word Sense. Disambiguation, WordNet, Thematic Roles, Semantic Role Labelling with CRFs. Applications of NLP.

Text Books

1. Dan Jurafsky, James H. Martin, "Speech and Language Processing", Third Edition, Prentice Hall, 2018.
2. Emily Bender, "Linguistics Fundamentals for NLP", Morgan Claypool Publishers, 2013.
3. Jacob Eisenstein, "Introduction to Natural Language Processing", MIT Press, 2019.

Reference Books

1. Chris Manning, Hinrich Schuetze, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.


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Academic Curriculum and Syllabi R-2020

2. Cole Howard, Hobson Lane, Hannes Hapke, "Natural Language Processing in Action" Manning Publication 2019.
3. Li Deng, Yang Liu "Deep Learning in Natural Language Processing" Springer, 2018.
4. Tom Hoobyar, Tom Dotz, Susan Sanders, "NLP The Essential Guide to Neuro-Linguistic Programming", William Morrow Paperbacks, 2013.
5. Kate Burton, "Coaching With NLP For Dummies", Wiley, 2011.

Web Resources

1. <https://machinelearningmastery.com/natural-language-processing/>
2. <https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1>
3. <https://www.nlp.com/what-is-nlp/>

COs/POs/PSOs Mapping

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3	2	2	1	2	—	-	-	-	-	-	-	-	-	1	1
4	1	2	2	2	1	-	-	-	-	-	-	-	1	-	2
5	2	1	2	2	1	-	-	-	-	-	-	-	1	1	1

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


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	ARTIFICIAL INTELLIGENCE APPLICATIONS	L	T	P	C	Hrs
U20ADO706	(Common to EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME)	3	0	0	3	45

Course Objectives

- To study the basic design concept of AI.
- To understand the Machine learning concepts.
- To learn the concept of Deep learning and its applications
- To learn the concept of RPA.
- To acquire the skill to design a chatbot using NLP.

Course Outcomes

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

CO1 - Apply the concept of data science. **(K4)**

CO2 - Understand the concept of Machine learning. **(K2)**

CO3 - Understand the concept of Deep Learning. **(K2)**

CO4 - Apply the design ideas in RPA. **(K4)**

CO5 - Make use of NLP concepts to create chatbot. **(K3)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction – Alan Turing and Turing test - The rise and fall of expert system - technological drivers of modern AI -Structure of AI - Data: types of Data - Big Data - Database and other tools - Data Process - Ethics and Governance - Data terms.

UNIT II MACHINE LEARNING**(9 Hrs)**

Machine learning - Standard deviation - the normal distribution - Naive Bayes Classifier - K-Nearest Neighbor - Linear regression - K-Means Clustering.

UNIT III DEEP LEARNING**(9 Hrs)**

Deep Learning - Difference between Deep Learning and Machine learning – ANN – Backpropagation – RNN – CNN – GAN - Deep Learning Applications - Use Case: detecting Alzheimer's Disease - Deep Learning Hardware - When to use Deep Learning? - Drawbacks of deep learning.

UNIT IV ROBOTIC PROCESS AUTOMATION**(9 Hrs)**

RPA - pros and cons of RPA - Determine the right function to automate - assess the processes - RAP and AI - RPA in the real world.

UNIT V NATURAL LANGUAGE PROCESSING**(9 Hrs)**

Challenges of NLP - Understanding How AI translated Language - NLP in real World - Voice Commerce - Virtual assistants – Chatbot - Future of NLP - The Future of AI.

Text Books

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing" Third Edition. 2000.
2. S. Kanimozhi Suguna, M. Dhivya, Sara Paiva, "Artificial Intelligence (AI) Recent Trends and Applications" CRC Press, 2021.
3. Navin Sabharwal; Amit Agrawal, "Cognitive Virtual Assistants Using Google Dialogflow" Apress, 2020.

Reference Books

1. Durkin, J., "Expert systems Design and Development", Macmillan, 1994.
2. Peter Jackson, "Introduction to Expert Systems", Addison Wesley Longman, 1999.
3. Amir Shevat, "Designing Bots: Creating Conversational Experiences" O'Reilly, 2017.
4. Anik Das and Rashid Khan, "Build Better Chatbots: A Complete Guide to Getting Started with Chatbots" Apress, 2017.
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Web Resources

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2. https://pytorch.org/tutorials/beginner/chatbot_tutorial.html
3. <https://www.mygreatlearning.com/blog/basics-of-building-an-artificial-intelligence-chatbot/>
4. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-3-reasoning-goal-trees-and-rule-based-expert-systems/>
5. <http://www.umsl.edu/~joshik/msis480/chapt11.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
1	2	1	2	1	1	-	-	-	-	-	-	-	-	1	2
2	2	1	1	1	2	-	-	-	-	-	-	-	1	1	1
3	2	2	1	2	2	-	-	-	-	-	-	-	-	1	1
4	1	2	2	2	1	-	-	-	-	-	-	-	2	-	1
5	2	2	2	2	1	-	-	-	-	-	-	-	1	1	-

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


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