



NARAYANA ENGINEERING COLLEGE::NELLORE



AUTONOMOUS

B.Tech-Civil Engineering Course Structure & SYLLABUS

(2020-21 academic year)

(NECR B.Tech 20)

(w.e.f AY: 2020-21)



**NARAYANA
ENGINEERING COLLEGE**
(AUTONOMOUS)



NARAYANA ENGINEERING COLLEGE::NELLORE



AUTONOMOUS

INSTITUTE VISION & MISSION

VISION

- To be one of the nation's premier Institutions for Technical and Management Education and a key contributor for Technological and Socio-economic Development of the Nation.

MISSION

- To produce technically competent Engineers and Managers by maintaining high academic standards, world class infrastructure and core instructions.
- To enhance innovative skills and multi disciplinary approach of students through well experienced faculty and industry interactions.
- To inculcate global perspective and attitude of students to face real world challenges by developing leadership qualities, lifelong learning abilities and ethical values.

DEPARTMENT OF CIVIL ENGINEERING

DEPARTMENT VISION & MISSION

VISION OF THE DEPARTMENT

To entrust civil engineers to society for creating a sustainable world and enhance the global quality of life.

MISSION OF THE DEPARTMENT

1. To adopt practical oriented teaching - learning practices for mastery of fundamentals, versatility of mind, motivation for learning among each student.
2. To impart leadership quality, professional ethics, environmental consciousness and social responsibilities through co-curricular and extra-curricular activities.
3. To have extensive interactions with industry for sharing knowledge and practices through collaborations and extension activities.

PEOs, POs, PSOs

POs

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. 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.

11. 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.

12: 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.

PEOs

PEO 1: Apply knowledge in emerging areas of Civil Engineering to handle the realistic problems.

PEO 2: Relate engineering issues to broader social and human context, in which their engineering contributions will be utilized.

PEO 3: Graduates will exhibit managerial skills and social responsibility in their profession and adapt to current trends.

PSOs

PSO_1: Domain Specific Knowledge: Apply the relevant techniques to plan, analyze and design Civil Structures.

PSO_2: Product Development: Design and deployment of principles to create a new technology for the success of business.

DEPARTMENT OF CIVIL ENGINEERING

Course Structure for B.Tech CIVIL w.e.f AY: 2020-21

SEMESTER I

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20MA1001	BS	Algebra and Calculus	3	1	0	4	4	40	60	100
20CH1002	BS	Chemistry for Civil	3	0	0	3	3	40	60	100
20ES1001	ES	Problem Solving and Programming	3	0	0	3	3	40	60	100
20EN1001	HS	English	2	0	0	2	2	40	60	100
20CH1502	BS	Chemistry for Civil Engineering Lab	0	0	3	3	1.5	40	60	100
20ES1504	ES	Engineering Graphics Lab	0	1	4	5	3	40	60	100
20ES1506	ES	Problem Solving and Programming Lab	0	0	3	3	1.5	40	60	100
20EN1501	HS	English Language Lab	0	0	3	3	1.5	40	60	100
20MC8001	MC	Mandatory course I :Induction Program	Induction Program							
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	11	2	16	29	19.5	320	480	800



SEMESTER II

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20PH1002	BS	Physics for Civil Engineering	3	0	0	3	3	40	60	100
20MA1003	BS	Vector Calculus Complex Variables and Transforms	3	1	0	4	4	40	60	100
20ES1010	ES	Principles of Electrical and Electronics Engineering	3	0	0	3	3	40	60	100
20ES1005	ES	Building Material Science	2	0	0	2	2	40	60	100
20ES1006	ES	Engineering Mechanics	3	0	0	3	3	40	60	100
20PH1502	BS	Physics for Civil Engineering lab	0	0	3	3	1.5	40	60	100
20ES1505	ES	Engineering and IT workshop	0	0	4	4	2	40	60	100
20EN1502	HS	Oral Communication skills lab	0	0	2	2	1	40	60	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	14	1	12	27	19.5	320	480	800



SEMESTER III

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20MA1006	BS	Probability Statistics and Numerical Methods	2	1	0	3	3	40	60	100
20ES1014	ES	Fluid Mechanics	3	0	0	3	3	40	60	100
20CE2001	PC	Building Construction and Planning	3	0	0	3	3	40	60	100
20CE2002	PC	Strength of Materials	3	0	0	3	3	40	60	100
20CE2003	PC	Surveying	3	0	0	3	3	40	60	100
20CE2501	PC	Building drawing	0	0	3	3	1.5	40	60	100
20CE2502	PC	Strength of Materials lab	0	0	3	3	1.5	40	60	100
20CE2503	PC	Surveying Lab	0	0	3	3	1.5	40	60	100
20CD6001	SC	Career competency Development I	0	0	2	2	1	40	60	100
20CC6001	SC	Value added course/Certificate course I	0	1	0	1	1	40	60	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	14	2	14	30	21.5	400	600	1000

**SEMESTER IV**

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE2004	PC	Geotechnical Engineering-I	3	0	0	3	3	40	60	100
20CE2005	PC	Hydraulics engineering	3	0	0	3	3	40	60	100
20CE2006	PC	Structural Analysis	2	1	0	3	3	40	60	100
20CE2007	PC	Surveying&Geomatics	3	0	0	3	3	40	60	100
	OE	Open elective I	3	0	0	3	3	40	60	100
20CE2504	PC	Hydraulics Engineering lab	0	0	3	3	1.5	40	60	100
20CE2505	PC	Structural Analysis practice	0	0	3	3	1.5	40	60	100
20CE2506	PC	Surveying & Geomatics Lab	0	0	3	3	1.5	40	60	100
20CD6002	SC	Career competency Development II	0	0	2	2	1	40	60	100
20CC6002	SC	Value added course/Certificate course II	0	1	0	1	1	40	60	100
20MC8002-12	MC	Mandatory course II	2	0	0	2	0	--	--	--
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	16	2	14	32	21.5	400	600	1000

**SEMESTER V**

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE2008	PC	Design of Reinforced Concrete Structures	3	0	0	3	3	40	60	100
20CE2009	PC	Geotechnical Engineering-II	3	0	0	3	3	40	60	100
20CE2010	PC	Water Resources Engineering	3	0	0	3	3	40	60	100
	OE	Open elective II	3	0	0	3	3	40	60	100
20CE4001-05	PE	Professional Elective I	3	0	0	3	3	40	60	100
20CE2507	PC	Computer Aided Drafting of Buildings	0	0	3	3	1.5	40	60	100
20CE2508	PC	Geotechnical Engineering Lab	0	0	3	3	1.5	40	60	100
20CD6003	SC	Career competency Development III	0	0	2	2	1	40	60	100
20CC6003	SC	Value added course/Certificate Course III	0	1	0	1	1	40	60	100
20CE7501	PR	Internship I/on job training/Com Ser Project	0	0	0	0	1.5	00	100	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	15	1	11	27	21.5	360	640	1000



Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE2011	PC	Concrete technology	3	0	0	3	3	40	60	100
20CE2012	PC	Environmental Engineering	3	0	0	3	3	40	60	100
20CE2013	PC	Highway Engineering	2	0	0	2	2	40	60	100
	OE	Open Elective III	3	0	3	3	3	40	60	100
20CE4006-10	PE	Professional Elective II	3	0	0	3	3	40	60	100
20CE4011-15	PE	Professional elective III	3	0	0	3	3	40	60	100
20CE2509	PC	Concrete Tech and Highway Engineering lab	0	0	3	3	1.5	40	60	100
20CE2510	PC	Environmental Engineering Lab	0	0	2	2	1	40	60	100
20CD6004	SC	Career competency Development IV	0	0	2	2	1	40	60	100
20CC6004	SC	Value added course/Certificate course IV	0	1	0	1	1	40	60	100
20MC8002-12	MC	Mandatory course III	2	0	0	2	0	00	00	00
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	17	1	13	30	21.5	400	600	1000

**SEMESTER VII**

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20HS5001-8	HE	Humanities and Social Science Elective	2	0	0	2	2	40	60	100
20CE2014	PC	Design of steel structures	3	0	0	3	3	40	60	100
20CE2015	PC	Estimation and quantity surveying	3	0	0	3	3	40	60	100
	OE	Open Elective IV	2	0	2	4	3	40	60	100
20CE4016-20	PE	Professional elective IV	3	0	0	3	3	40	60	100
20CE4021-25	PE	Professional elective V	3	0	0	3	3	40	60	100
20CE2511	PC	CAD Lab	0	0	2	2	1	40	60	100
20CE2512	PC	Estimation and quantity surveying Practice	0	0	3	3	1.5	40	60	100
20CD6005	SC	Career competency Development V	0	0	2	2	1	40	60	100
20CC6501	SC	Skill development Training	0	0	2	2	1	40	60	100
20CE7502	PR	Internship II/on job training/Com Ser Project	0	0	3	3	1.5	00	100	100
20MC8002-12	MC	Mandatory course IV	2	0	0	2	0	00	00	00
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	18	0	17	35	23	400	700	1100

**SEMESTER VIII**

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE7503	PR	Project work, seminar and internship	0	0	0	0	12	60	140	200
		Activity Point Programme	During the Semester					20 points		
			0	0	0	0	12	60	140	200

**OPEN ELECTIVES (OE) Offered by CIVIL Department**

Department	Course Code	Open Elective
Civil Engineering	20CE3001	Disaster Management And Mitigation
	20CE3002	Green buildings
	20CE3003	Air and Noise Pollution
	20CE3004	Water shed management
	20CE3005	Environmental Impact Assessment
	20CE3006	Solid Waste Management
	20CE3007	Waste water engineering
	20CE3008	Water supply Engineering
	20CE3009	Cost Effective Housing Techniques



PROFESSIONAL ELECTIVES (PE)

Elective Track/Group	Professional Elective-1	Professional Elective-2	Professional Elective-3	Professional Elective-4	Professional Elective-5
Structural Engineering	Green Buildings (20CE4001)	Advanced Concrete Technology (20CE4006)	Pre Stressed Concrete (20CE4011)	Bridge Engineering (20CE4016)	Finite Element Methods In Civil Engineering (20CE4021)
Transportation Engineering	Pavement Materials (20CE4002)	Air Port And Harbor Engineering (20CE4007)	Railway Engineering (20CE4012)	Advanced Transportation Engineering (20CE4017)	Urban Transportation Planning (20CE4022)
Environmental Engineering	Ecological Engineering (20CE4003)	Air And Noise Pollution (20CE4008)	Solid Waste management (20CE4013)	Industrial Waste water Treatment (20CE4018)	Environmental Impact Assessment (20CE4023)
Water Resources Engineering	River Engineering (20CE4004)	Irrigation Engineering (20CE4009)	Hydraulic Structures (20CE4014)	Ground Water Engineering (20CE4019)	Water Shed Management (20CE4024)
Geotechnical Engineering	Geotechnical Explorations (20CE4005)	Earthquake Engineering (20CE4010)	Ground Improvement Techniques (20CE4015)	Advanced Foundation Engineering (20CE4020)	Instrumentation & Sensor Technologies For Civil Engineering Applications (20CE4025)



LIST OF HONOR SUBJECTS

S.NO	Course Name	Course Code	L-T-P	Credits
POOL-1				
1	Stability Of Structures	20CEH001	3-1-0	4
2	Experimental Methods In Structural Engineering	20CEH002	3-1-0	4
3	Non Linear Structural Analysis	20CEH003	3-1-0	4
4	Advanced Design Of Steel Structures	20CEH004	3-1-0	4
POOL-2				
1	Advanced Geotechnical Engineering	20CEH005	3-1-0	4
2	Geotechnical Measurements And Explorations	20CEH006	3-1-0	4
3	Geotechnical Earthquake Engineering	20CEH007	3-1-0	4
4	Rock Mechanics	20CEH008	3-1-0	4
POOL-3				
1	Intelligent Transportation Systems	20CEH009	3-1-0	4
2	Transportation Safety Systems	20CEH010	3-1-0	4
3	Advanced Geometric Design Of Highways	20CEH011	3-1-0	4
4	Computer Simulation In Traffic Engineering	20CEH012	3-1-0	4
POOL-4				
1	Global Navigation Satellite System	20CEH013	3-1-0	4
2	Machine Processing Of Remotely Sensed Data	20CEH014	3-1-0	4
3	Geospatial Data Processing	20CEH015	3-1-0	4
4	Introduction to Geodesy	20CEH016	3-1-0	4
POOL-5				
1	Water Resources System Planning and Management	20CEH017	3-1-0	4
2	Design and Drawing of Irrigation Structures	20CEH018	3-1-0	4
3	Advanced Hydrology	20CEH019	3-1-0	4
4	Advanced Irrigation Engineering Design	20CEH020	3-1-0	4

**LIST OF MINOR SUBJECTS**

S.NO.	Course Name	Course Code	L-T-P	Credits
1	Strength of Materials	20CEM001	3-1-0	4
2	Fluid Mechanics	20CEM002	3-1-0	4
3	Water Resources Engineering	20CEM003	3-1-0	4
4	Surveying	20CEM004	3-1-0	4
5	Structural Analysis	20CEM005	3-1-0	4
6	Geology/Soil Mechanics	20CEM006	3-1-0	4
7	Environmental Engineering	20CEM007	3-1-0	4
8	Highway Engineering	20CEM008	3-1-0	4



PROFESSIONAL ELECTIVES (PE)

SEMESTER	SUBJECT	COURSE CODE	CREDITS
V Sem	Professional Elective I	20CE4001-05	3
VI Sem	Professional Elective II	20CE4006-10	3
	Professional Elective III	20CE4011-15	3
VII Sem	Professional Elective IV	20CE4016-20	3
	Professional Elective V	20CE4020-25	3
	TOTAL		15

OPEN ELECTIVES (OE)

SEMESTER	SUBJECT	CREDITS
IV Sem	Open Elective I	3
V Sem	Open Elective II	3
VI Sem	Open Elective III	3
VII Sem	Open Elective IV	3
	TOTAL	12

SKILL ORIENTED COURSE (SC)

SEMESTER	SUBJECT	COURSE CODE	CREDITS
III Sem	Career Competency Development I	20CD6001	1
	Value Added Course/Certificate Course I	20CC6001	1
IV Sem	Career Competency Development II	20CD6002	1
	Value Added Course/Certificate Course II	20CC6002	1
V Sem	Career Competency Development III	20CD6003	1
	Value Added Course/Certificate Course III	20CC6003	1
VI Sem	Career Competency Development IV	20CD6004	1
	Value Added Course/Certificate Course IV	20CC6004	1
VII Sem	Career Competency Development V	20CD6005	1
	Skill Development Training	20CC6501	1
	TOTAL		10

PROJECT (PR)

SEMESTER	SUBJECT	COURSE CODE	CREDITS
V Sem	Internship I/on job training/Com Ser Project	20CE7501	1.5
VII Sem	Internship II/on job training/Com Ser Project	20CE7502	1.5
VIII Sem	Project work, seminar and internship	20CE7503	12



	TOTAL	15
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HUMANITIES AND SOCIAL SCIENCES (HS)

SEMESTER	Course Code	SUBJECT	CREDITS
I	20EN1001	English	2
	20EN1501	English Language Lab	1.5
II	20EN1502	Oral Communication skills lab	1
VII	20HS5001-8	Humanities and social Science Elective	2
		TOTAL	6.5

BASIC SCIENCES (BS)

SEMESTER	Course Code	SUBJECT	CREDITS
I	20MA1001	Algebra and Calculus	4
	20CH1002	Chemistry for Civil Engineering	3
	20CH1502	Chemistry for Civil Engineering Lab	1.5
II	20PH1002	Physics for Civil Engineering	3
	20MA1003	Vector Calculus, Complex Variables and Transforms	4
	20PH1502	Physics for Civil Engineering lab	1.5
III	20MA1006	Probability Statistics and Numerical Methods	3
		TOTAL	20

ENGINEERING SCIENCES (ES)

SEMESTER	Course Code	SUBJECT	CREDITS
I	20ES1001	Problem Solving and Programming	3
	20ES1504	Engineering Graphics Lab	3
	20ES1506	Problem Solving and Programming Lab	1.5
II	20ES1010	Principles of Electrical and Electronics Engineering	3
	20ES1005	Building Material Science	2
	20ES1006	Engineering Mechanics	3
	20ES1505	Engineering and IT workshop	2
III	20ES1014	Fluid Mechanics	3
		Total	20.5

**PROFESSIONAL CORE (PC)**

SEMESTER	Course Code	SUBJECT	CREDITS
III	20CE2001	Building Construction and Planning	3
	20CE2002	Strength of Materials	3
	20CE2003	Surveying	3
	20CE2501	Building drawing	1.5
	20CE2502	Strength of Materials lab	1.5
	20CE2503	Surveying Lab	1.5
		13.5	
IV	20CE2004	Geotechnical Engineering-I	3
	20CE2005	Hydraulics engineering	3
	20CE2006	Structural Analysis	3
	20CE2007	Surveying & Geomatics	3
	20CE2504	Hydraulics Engineering lab	1.5
	20CE2505	Structural Analysis practice	1.5
	20CE2506	Surveying & Geomatics Lab	1.5
		16.5	
V	20CE2008	Design of Reinforced Concrete Structures	3
	20CE2009	Geotechnical Engineering-II	3
	20CE2010	Water Resources Engineering	3
	20CE2507	Computer Aided Drafting of Buildings	1.5
	20CE2508	Geotechnical Engineering Lab	1.5
		12	
VI	20CE2011	Concrete technology	2
	20CE2012	Environmental Engineering	3
	20CE2013	Highway Engineering	3
	20CE2509	Concrete Tech and Highway Engineering lab	1.5
	20CE2510	Environmental Engineering Lab	1
		10.5	
VII	20CE2014	Design of steel structures	3
	20CE2015	Estimation and quantity surveying	3
	20CE2511	CAD Lab	1
	20CE2512	Estimation and quantity surveying Practice	1.5
		8.5	
		TOTAL	55



CREDITS PER SEMESTER

SL NO	SUBJECT AREA	CREDITS PER SEMESTER								CREDITS NECN
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3.5	1					2		6.5
2	BS	8.5	8.5	3						20
3	ES	7.5	10	3						21.5
4	PC			13.5	16.5	12	10.5	8.5		61
5	PE					3	6	6		15
6	OE				3	3	3	3		12
7	SC			2	2	2	2	2		10
8	PR					1.5		1.5	12	15
	TOTAL	19.5	19.5	21.5	21.5	21.5	21.5	23	12	160

DEPARTMENT OF CIVIL ENGINEERING
Course Structure for B.Tech CIVIL w.e.f AY: 2020-21
SEMESTER I

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20MA1001	BS	Algebra and Calculus	3	1	0	4	4	40	60	100
20CH1002	BS	Chemistry for Civil	3	0	0	3	3	40	60	100
20ES1001	ES	Problem Solving and Programming	3	0	0	3	3	40	60	100
20EN1001	HS	English	2	0	0	2	2	40	60	100
20CH1502	BS	Chemistry for Civil Engineering Lab	0	0	3	3	1.5	40	60	100
20ES1504	ES	Engineering Graphics Lab	0	1	4	5	3	40	60	100
20ES1506	ES	Problem Solving and Programming Lab	0	0	3	3	1.5	40	60	100
20EN1501	HS	English Language Lab	0	0	3	3	1.5	40	60	100
20MC8001	MC	Mandatory course I :Induction Program	Induction Program							
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	11	2	16	29	19.5	320	480	800

NARAYANA ENGINEERING COLLEGE: NELLORE														
20MA1001	Algebra &Calculus (CSE, ECE, EEE, CE, ME)							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P			C	CIE	SEE	TOTAL					
I	3	1	0	69	4	40	60	100						
Pre-requisite: Intermediate Mathematics														
Course Objectives: <ol style="list-style-type: none">1. To familiarize the students with the theory of matrices and quadratic forms2. To analyze first order ordinary differential equations.3. To enlighten the learners in the concepts of higher order differential equation an its applications4. To explain the series expansions using mean value theorems and the concepts of multivariable differential calculus.5. To summarize the procedure to solve the partial differential equations.6. To explain the student with mathematical tools needed in evaluating multiple integrals and its applications.														
Course Outcomes: After successful completion of the course, the student will be able to								Blooms taxonomy Level						
CO 1	Solve the system of Linear Equations							(BTL-3)						
CO 2	Solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.							(BTL-3)						
CO 3	Obtain the complete solution of a higher order differential equations							(BTL-2)						
CO 4	Make use of the Taylor’s and Maclaurin’s Series and Maxima, Minima for the given function							(BTL-3)						
CO 5	Apply a range of techniques for solutions of first order Linear and non linear Partial Differential Equations (PDE)							(BTL-3)						
CO 6	Apply the techniques of Multiple integrals for the Area of the region bounded by curves and volume							(BTL-3)						
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2												
CO2	3	3	1											
CO3	3	3	1											
CO4	3	2												
CO5	3	3	1											
CO6	3	2												
1: Low, 2-Medium, 3- High														
COURSE CONTENT														
MODULE – 1				Matrices				Hours: 16 (12L+4T)						
Introduction to matrices, Definition of Rank ,Definition of Echelon form , Problems, Solving System of Non-Homogeneous equations- Definition, Conditions for Consistency, Problems, Solving System of Homogeneous equations- Definition, Problems, Eigen values & Eigen Vectors- Definition, Problems ,properties of Eigen values & Eigen Vectors(Without proof), Cayley – Hamilton Theorem - Statement(Without proof),finding inverse and power of a matrix by Cayley-Hamilton Theorem Diagonalization of a Matrix-Definition, similarity of a matrix ,modal matrix, spectral matrix,powers of a														

matrix, problems on Diagonalization of a matrix, Quadratic Forms- Definition, Finding Matrix from Q.F, Index, signature, rank and nature of the quadratic forms, Reduction of Q.F. into a canonical form by linear transformation , Reduction of Q.F. into a canonical form by orthogonal transformation.

At the end of the Module 1, students will be able to:

1. Solve the system of homogenous and non-homogenous linear equations.(BTL-3)
2. Obtain the Eigen values and Eigen vectors of a matrix.(BTL-2)
3. Identify special properties of matrix and for using this information to study the nature of the linear equations. (BTL-3)
4. Find the inverse and powers of a square matrix.(BTL-1)
5. Obtain the diagonalization form of the matrix.(BTL-2)
6. Apply the techniques of matrices in various engineering problems. (BTL-3)

MODULE -2

First Order Ordinary Differential Equations

Hours: 9 (7L+2T)

Exact Differential equation - Definition, condition for exactness, problems, Non - Exact Differential equations- Integrating factor , Method1: Integrating factor by inspection, problems, Method2: Finding Integrating factor , problems, Method3: Finding Integrating factor , problems, Method4: Finding Integrating factor , problems, Method5: Finding Integrating factor , problems, Linear differential Equation- Definition, Working rule to find general solution, problems, Bernoulli's differential Equation- Definition, Working rule to find general solution, problems, Applications of Differential equation of First order: Newton's law of Cooling- Explanation of the concept, problems, Law of natural growth and Decay- Explanation of the concept, problems and Simple Electric Circuits- Explanation of the concept, problems.

At the end of the Module 2, students will be able to:

1. Identify the first order ordinary differential equations. (BTL-3)
2. Solve the first order ordinary differential equations. (BTL-3)
3. Apply the techniques of first order ordinary differential equations in Newton's law of cooling, Natural growth & Decay problems. (BTL-3)
4. Make Use of the first order ordinary differential equation techniques in simple electric circuits. (BTL-3)

MODULE-3

Higher Order Ordinary Differential Equations

Hours: 11 (8L+3T)

Non-Homogenous Linear Differential equation of second and higher order with constant coefficients- Definition, complete solution, operator D, rules for finding Complimentary function, problems, inverse operator, General method for finding Particular Integral.

Non-homogeneous Linear Differential Equations of Second & Higher order with Constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, Polynomial in x , $e^{ax}v(x)$, $X.V(x)$ -Explanation of the concept & problems, Method of variation of parameters- Explanation of the concept & problems, Euler- Cauchy equation- Definition, problems , Legendre's Linear equation- Definition, problems. Applications to Higher order Differential Equations - L-C-R circuits, problems.

<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 1. Identify the higher order ordinary differential equations. (BTL-3) 2. Solve the linear differential equations with constant coefficients by appropriate methods (BTL-3) 3. Solve the linear differential equations with variable coefficients by appropriate methods (BTL-3) 4. Make Use of the higher order ordinary differential equations techniques in electrical circuits. and in various engineering problems. (BTL-3) 		
MODULE-4	<p>Mean value theorems & Multivariable</p> <p>Calculus</p>	Hours: 9 (7L+2T)
<p>Taylor's and Maclaurin's theorems with remainders-Statements (without proof), problems on Taylor's series , problems on Maclaurin's series, Jacobean-Definition, Properties , problems ,Functional dependence-Definition , problems ,Maxima & Minima of function of two variables - Rules , Maxima & Minima of function of two variables without constraint- problems ,Maxima & Minima of function of two variables with constraint- problems, Lagrange's Method of Undetermined multipliers, problems.</p>		
<p>At the end of the Module 4, students will be able to:</p> <ol style="list-style-type: none"> 1. Demonstrate the given function as a series of Taylor's and maclurin's with remainders.(BTL-2) 2. Illustrate series expansions of functions using mean value theorems. (BTL-2) 3. Apply Jacobean concept to deal with problems in change of variables.(BTL-3) 4. Obtain the maxima and minimum values of the function for two variables.(BTL-2) 5. Apply the mean value theorems to check the continuity of the function in the given interval (BTL-3) 		
MODULE-5	Partial Differential Equations	Hours: 12 (9L+3T)
<p>Definition ,Formation of PDE by the Method of Elimination of arbitrary constants, problems ,Method of Elimination of arbitrary functions, problems, Method of Separation of Variables-Explanation of the concept& problems, First order linear partial differential equations-Definition, Solutions of first order linear PDE-Working rule of Lagrange's Method, problems ,First order non-linear partial differential equations- Definition, Solutions of first order non-linear partial differential equations-Standard form-I, problems , Standard form-II, problems ,Standard form-III, problems, Standard form-IV, problems.</p>		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 1. Identify the basic properties of partial differential equations. (BTL-3) 2. Outline partial differential equations. (BTL-2) 3. Solve the applications of PDE by using the method of separation of variables (BTL-3) 4. Apply the PDE techniques in various engineering fields. (BTL-3) 		
MODULE-6	Multiple Integrals	Hours: 12 (9L+3T)

Double Integrals- Introduction, Evaluation in Cartesian coordinates, problems, Evaluation in Polar coordinates, change of variables – Problems on Cartesian to Polar, Change of Order of Integration-Problems , Area enclosed by plane curves - Problems, Triple integrals- Introduction, Evaluation of Triple Integrals, Volume by Triple Integrals – Problems, Change of variables between Cartesian, cylindrical and spherical polar coordinates- Problems.

At the end of the Module 6, students will be able to:

1. Obtain double integrals in Cartesian and polar co-ordinates. (BTL-2)
2. Obtain the area bounded by a region using double integration techniques.(BTL-2)
3. Solve triple integrals.(BTL-3)
4. Obtain volumes by using triple integrals.(BTL-2)
4. Make Use of multiple integral techniques in engineering problems.(BTL-3)

Total hours:

69 hours (52L+17T)

Content beyond syllabus:

1. Orthogonal Trajectories.
2. Deflection of Beams .
3. Simultaneous Linear equations with constant coefficients
4. Taylor's series for function of two variables.
5. Homogeneous Linear Partial differential equations with constant coefficients.
6. Calculation of mass, centre of gravity, moment of inertia

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Matrices	CO1	https://youtu.be/P2pL5VThrZQ
2	First Order Ordinary Differential Equations	CO2	https://youtu.be/P7gVp333B6M
3	Higher Order Ordinary Differential Equations	CO3	https://youtu.be/btOCUmJkrrg
4	Mean value theorems & Multivariable Calculus:	CO4	https://youtu.be/bJPuy0QZ-tE https://youtu.be/0apMXhWG_W8 https://youtu.be/aqfSOOiO2kl
5	Partial Differential Equations	CO5	https://youtu.be/kZ7Oa7iMiCs
6	Multiple Integrals	CO6	https://youtu.be/mleeVrv447s

Text Book(s):

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
3. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Reference Book(s):

- 1.R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
- 2.George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
- 3.B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education
- 4.H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.

Online Resources/ Web Resources:

- 1 <http://www.macs.hw.ac.uk/~simonm/linalg.pdf>
- 2.<http://www.e-booksdirectory.com/details.php?ebook=7400re>
- 3 http://www.efunda.com/math/math_home/math.cfm
- 4.<http://www.ocw.mit.edu/resources/#Mathematics>
- 5 .<http://www.sosmath.com/>
- 6.<http://www.mathworld.wolfram.com/>

NARAYANA ENGINEERING COLLEGE:NELLORE														
20CH1002	CHEMISTRY FOR CIVIL ENGINEERING							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
I	3	0	0	48	3	40	60	100						
Pre-requisite: Nil														
Course Objectives:														
1. The main objective of the course is to impart knowledge on the fundamental concepts of chemistry involved in application of several important engineering materials that are used in the industry/day-to-day life														
2. understand the chemical concepts involved inWater treatment and Corrosion														
3. To train the students on the principles and applications of polymers														
Course Outcomes: After successful completion of the course, the student will be able to:									BL					
CO 1	Select and employ suitable water treatment technologies for domestic and industrial applications								1					
CO 2	Illustrate various corrosion situations and implement suitable corrosion control measures.								2					
CO 3	Apply basic chemical concepts to analyze chemical processes involved in different environmental problems								3					
CO 4	Acquire required knowledge about engineering materials like cement, refractories and steel.								2					
CO 5	Explain the preparation, properties, and applications of polymers and mechanism of lubrication.								2					
CO 6	Explain the chemistry of soil acidity and amendments of acid soils .								2					
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2				2	1					1		
CO2	3	2				1	1					1		
CO3	2	1				1	2					1		
CO4	1	1				2	2					1		
CO5	2	1				1	1					1		
CO6	2	2				1						1		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	
WATER TECHNOLOGY	8 hrs
Definition of hard and soft water, Sources of water and classification of impurities, Hardness and its types, Units of hardness, Determination of hardness of water by EDTA method. problems on hardness, Boiler problems – Scale and Sludge formation in boiler, Priming & Foaming,. Internal treatment methods. Water softening processes –Zeolite process, Ion- exchange process. Brackish water treatment- Electrodialysis, Reverse osmosis.	
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. List the differences between temporary and permanent hardness of water .(L1) 2. Explain the principles of reverse osmosis and electro dialysis. .(L2) 3. Compare quality of drinking water with BIS and WHO standards. .(L2) 4. Illustrate problems associated with hard water - scale and sludge. .(L2) 5. Explain the working principles of different Industrial water treatment processes .(L2) 	

MODULE -2	
CORROSION AND ITS CONTROL	8 hrs
Corrosion - mechanism of chemical, electrochemical corrosion - Pilling Bed worth rule – Types of Electrochemical corrosion - galvanic corrosion - differential aeration corrosion ,factors influencing corrosion. Corrosion control: Cathodic protection - sacrificial anodic method - Protective coatings: surface preparation for metallic coatings –metal spraying, metal cladding ,hot dipping electro plating (copper plating) and electro less plating (Nickel plating) .	
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> 1. Apply Pilling Bed worth rule for corrosion .(L3) 2. Demonstrate the factors affecting corrosion.(L2) 3. Differentiate between oxidation and electrochemical corrosion .(L2) 4. Apply the principles of electrochemistry to design corrosion control measures .(L3) 5. Explain factors influencing corrosion.(L2) 	
MODULE-3	
ENVIRONMENT CHEMISTRY	8 hrs
Environment and Ecology, Environmental segments, Structure and composition of atmosphere. Atmospheric pollution: Tropospheric Pollution-Gaseous air pollutants-(a) Oxides of Sulphur, (b) Oxides of Nitrogen, (c) Hydrocarbons, Global Warming and Greenhouse Effect, Acid rain. Particulate Pollutants - Smog, Formation of photochemical smog, Effects of photochemical smog. Stratospheric Pollution-Formation and Breakdown of Ozone, the Ozone Hole, Effects of Depletion of the Ozone Layer. Chemical and photochemical reactions of various species in atmosphere. Water pollution- Causes of Water Pollution, Biochemical Oxygen Demand.	
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 1. Demonstrate the green house effect and ozone layer depletion.(L2) 2. Explain the sources of atmospheric pollution.(L2) 3. Discuss and describe of air pollution.(L2) 4. Explain ozone layer depletion.(L2) 5. Describe the causes of water pollution.(L2) 	
MODULE-4	
ADVANCED ENGINEERING MATERIALS	8 hrs
Cement: Portland cement, constituents, Manufacture of Portland Cement, chemistry of setting and hardening of cement (hydration, hydrolysis, equations).	
Refractories: Definition, Classification with Examples, properties of Refractory Material, Causes for the failure of a Refractory Material.	
Steel – Types of Steel, chemical composition – applications of alloy steels, Basic composition of mild steel, High yield deformed steel (Tor), Stainless Steel, High tensile steel and TMT steel.	
At the end of the Module 4, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the commonly used industrial materials.(L2) 2. Explain the manufacturing of port land cement. .(L2) 3. Explain setting and hardening reactions of Portland cement.(L2) 4. Demonstrate the properties of refractories.(L2) 5. Explain the applications of different steels.(L2) 	
MODULE-5	

LUBRICANTS & POLYMERS		8hrs
<p>Lubricants: Functions of lubricant, Mechanism of lubrication, Fluid or Hydrodynamic Lubrication, Thin film or Boundary lubrication & Extreme pressure lubrication. Lubricants for Extreme ambient conditions and for special applications. Properties of lubricants and tests.</p> <p>Polymers: Types of Polymerization. Thermoplastics & thermosetting polymers. Preparation, properties and applications of the Polyethylene, Teflon, PVC, Nylon, Phenol formaldehyde & Urea Formaldehyde, Elastomers: Natural rubber, Vulcanization of rubber & Synthetic rubber-buna-S and buna-N.</p>		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 1. Identify different types of polymers .(L3) 2. Distinguish between thermoplastic and thermo setting resins .(L2) 3. Explain the preparation, properties and applications of some plastic materials.(L2) 4. Demonstrate vulcanisation of natural rubber.(L2) 5. Explain the mechanism of lubrication.(L2) 		
MODULE-6		
SOIL CHEMISTRY		8 hrs
<p>Chemical (elemental) composition of the earth's crust and soils. Types of soils, soil components (inorganic and organic), chemical properties of soil. Soil organic matter, sources of soil organic matter, end products of organic matter decomposition, Chemistry of soil acidity; active and potential acidity; lime potential, sub-soil acidity. Saline and alkaline soils-introduction, sources of soluble salts, Chemistry of salt-affected soils and amendments; soil pH, ECE, ESP, SAR and important relations; soil management and amendments. Chemistry and electrochemistry of water logged soils. Soil pollution-introduction, sources of soil pollution.</p>		
<p>At the end of the Module 6, students will be able to:</p> <ol style="list-style-type: none"> 5. Understand the chemical composition of the constituents of the soil .(L3). 6. Explain the amendments of salt effected soils. .(L2) 7. Demonstrate soil management and amendments. .(L2) 8. Describe chemical properties of soil.(L2) 9. Explain sources of soil pollution.(L2) 		
Total hours:		48 hours

Text Book(s):	
<ol style="list-style-type: none"> 1. P. C. Jain & Monika Jain, <i>Engineering Chemistry</i>, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013. 2. K. N. Jayaveera, G. V. Subba Reddy Demonstrate the green house effect and ozone layer depletion 3. C. Ramachandriah, <i>Engineering Chemistry</i>, Mc.Graw Hill Publishers, New Delhi. Bolt GH & Bruggenweert 4. MGM.1981. soil chemistry. Elsevier 	
Reference Book(s):	
<ol style="list-style-type: none"> 1. Text book of Engineering chemistry by shashi chawla. 2. Text book of Engineering chemistry by A.jayashree, Willey publications, New Delhi 	

3. A Text book of Environmental Chemistry by O.D.Tyagi And M.Mehra.

Online Resources:

1. <https://www.cgaspirants.com/2017/08/engineering-chemistry-by-jain-jain.html>
2. <https://www.scribd.com/doc/278434466/Shashi-Chawla-Engineering-Chemistry-PDF>
3. file:///C:/Users/DELL/Downloads/Ch_2-EnvChemistry.pdf

Web Resources:

1. <https://nptel.ac.in/courses/105/106/105106119/>
2. <https://nptel.ac.in/courses/113/104/113104082/>
3. <https://www.youtube.com/watch?v=YH-00EOnfEE&vl=en>
4. <https://nptel.ac.in/courses/123/105/123105001/>
5. <https://nptel.ac.in/courses/113/105/113105028/>
6. <https://nptel.ac.in/courses/124/105/124105014/>

NARAYANA ENGINEERING COLLEGE:NELLORE								
20ES1001	PROBLEM SOLVING AND PROGRAMMING							R20
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
I	3	0	0	48	3	40	60	100
Pre-requisite: Mathematics Knowledge, Analytical and Logical skills								
Course Objectives: <ol style="list-style-type: none"> 1. To understand various steps in Program development. 2. To understand the basic concepts in C Programming Language. 3. To learn how to write modular and readable C Programs. 4. To learn the syntax and semantics of a C Programming language. 5. To learn structured programming approach for problem solving. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Identify methods to solve a problem through computer programming. (BL - 3)							
CO 2	Understand the use of basic elements of C language. (BL - 2)							
CO 3	Understand the difference and the usage of various control statement. (BL - 2)							
CO 4	Apply the modular approach for solving the problems. (BL - 3)							
CO 5	Apply the Arrays and Pointers for solving problems. (BL - 3)							
CO 6	Explain User-Defined Data Types and Files. (BL - 2)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											1	
CO2	1	2	1										1	
CO3	1	2	1		2								2	2
CO4	2	2	3	2	1							2	3	2
CO5	3	3	2	2								1	2	
CO6	2	2	2	2								1	2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	FUNDAMENTALS OF COMPUTERS AND PROGRAMMING	8h
Fundamentals of computers: History of Computers, Generations of Computer, The Computer System - The Input-Process-Output Concept, Components of Computer System, Operating System - Introduction, Objectives, Functions. Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Structured Programming Concept, Algorithms, Flowcharts, How to Develop a Program. Fundamental Algorithms: Exchanging the values of Two Variables, Counting, Summation of a set of numbers, Factorial computation, Generation of the Fibonacci Sequence, Reversing the digits of an integer.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the working of a Computer. (BL - 2) 2. Solve problems using language independent notations. (BL - 3) 		

3. Understand the compilers and interpreters. (BL - 2) 4. Understand Structured Programming. (BL - 2) 5. Develop algorithms and flowcharts for problems.(BL - 3)		
MODULE -2	BASIC ELEMENTS OF C	7 h
Basics of C: Introduction, Character Set, Structure of a C Program, A Simple C Program, Variables, Data Types and Sizes, Declaration, How does The Computer Store Data in Memory, Identifiers, Keywords, Constants, Assignment, and Initialization. Operators and Expressions: Arithmetic Operators, RelationalOperators, LogicalOperators, BitwiseOperators, Conditional Operator, Comma operator, sizeof operator, Expressions, L values and R values, Expression Evaluation- Precedence and Associativity, Type Conversion.		
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> 1. Understand the basic structure of a program in C. (BL - 2) 2. Understand tokens in C language.(BL - 2) 3. Illustrate the working of expressions.(BL - 2) 4. Understand the precedence and Associativity rules of operators. (BL - 2) 5. Understand the rules of type conversion. (BL - 2) 		
MODULE-3	DATA INPUT / OUTPUT AND CONTROL STATEMENTS	8 h
Input and Output: Basic Screen and Keyboard I/O in C, Formatted Input and Output, Unformatted Input and Output Functions Control Statements: Selection Statements - if, Nested if, if-else, Nested if-else, else-if ladder, switch Looping Statements - while, do-while, for, Nested loops, Unconditional Statements - goto, break, continue, return.		
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 1. Explain the Formatted and Unformatted I/O functions. (BL - 2) 2. Understand Selection Statements. (BL - 2) 3. Understand Looping Statements. (BL - 2) 4. Explain Unconditional Statements. (BL - 2) 		
MODULE-4	FUNCTIONS AND PROGRAM STRUCTURE	8 h
Functions: Introduction, Using Functions, Passing Arguments to a Function, Working with Function, Scope and Extent, Recursion, The C Preprocessor. Program Structure: Storage classes, Automatic variables, External variables, Static variables, Register variables, Multifile programs.		
At the end of the Module 4, students will be able to: <ol style="list-style-type: none"> 1. Understand the basic concept of functions. (BL - 2) 2. Understand concept of Recursion and Preprocessor. (BL - 2) 3. Explain storage specifiers. (BL - 2) 		
MODULE-5	ARRAYS AND POINTERS	9 h
Arrays and Strings: Introduction, One-Dimensional Array, Multidimensional Arrays, Passing Arrays to Function, Strings - Declaration, Initialization, Printing Strings, String Input, Character Manipulation, String Manipulation, Arrays of Strings. Pointers: Fundamentals, Pointer Declarations, Operations on pointers, Passing Pointers to a Function, Pointers and Arrays, Arrays of Pointers, Pointer to Pointer, Pointer to Functions, Command line arguments, Dynamic Memory Management.		
At the end of the Module 5, students will be able to: <ol style="list-style-type: none"> 1. Understand the concept of Arrays. (BL - 2) 2. Understand the concept of pointers. (BL - 2) 3. Explain Dynamic Memory Management. (BL -2) 		

MODULE-6	USER-DEFINED DATA TYPES AND FILES	8 h
Structures and Unions: Basics of Structures, Nesting of Structures, Arrays of Structures, Structures and Pointers, Structures and Functions, Self-Referential Structures, Unions, Bit-fields, Enumerations, typedef. Files: Introduction, Using Files in C, Working with Text Files, Random Accesses to Files of Records.		
At the end of the Module 6, students will be able to: <ol style="list-style-type: none"> 1. Explain user defined data types. (BL - 2) 2. Understand the concept of Self-Referential Structures. (BL - 2) 3. Understand the working of files. (BL - 2) 		
Total hours:		48 Hours

Content Beyond Syllabus: <ol style="list-style-type: none"> 1. Analysis of Algorithms 2. Binary Files 3. Variable Length Argument Lists 		
Self-Study: Contents to promote self-Learning:		
S. No	Module	Reference
1	Fundamentals of Computers and Programming	https://nptel.ac.in/courses/106/106/106106127/ [Lec1] https://nptel.ac.in/courses/106/105/106105214/ [Week 1 - Lec 1 To 2] https://nptel.ac.in/courses/106/105/106105171/ [Week 1 - Lec 1 To 4]
2	Basic Elements of C	https://nptel.ac.in/courses/106/105/106105171/ [Week 1 - Lec5] https://nptel.ac.in/courses/106/105/106105171/ [Week 2 - Lecture 7 To 10] https://nptel.ac.in/courses/106/105/106105171/ [Week 3 - Lec 11 To 14] https://nptel.ac.in/courses/106/106/106106127/ [Lec2] https://nptel.ac.in/courses/106/106/106106127/ [Lec3] https://nptel.ac.in/courses/106/106/106106127/ [Lec4]
3	Data Input / Output and Control Statements	https://nptel.ac.in/courses/106/106/106106127/ [Lec5] https://nptel.ac.in/courses/106/105/106105171/ [Week 3 - Lec15] https://nptel.ac.in/courses/106/105/106105171/ Week 4 - Lec 16 To 20] [Week 5 - Lec 21 To 25] https://nptel.ac.in/courses/106/106/106106127/ [Lec 6 & 7]
4	Functions and Program Structure	https://nptel.ac.in/courses/106/105/106105171/ [Week 7 - Lec35] [Week 8 - Lecture 36 To 40] https://nptel.ac.in/courses/106/105/106105171/ [Week 11 - Lec 53 To 54] https://nptel.ac.in/courses/106/106/106106127/ [Lec 20 To 27]

5	Arrays and Pointers	https://nptel.ac.in/courses/106/105/106105171/ [Week 6 - Lec 26 To 30][Week 7 - Lec 32 To 34,48] [Week 12 - Lec 58, 59, 61] https://nptel.ac.in/courses/106/106/106106127/ [Lec 9 To 19]
6	User-Defined Data Types and Files	https://nptel.ac.in/courses/106/105/106105171/ [Week 11 - Lec 55, 56, 57, 60] https://nptel.ac.in/courses/106/106/106106127/ [Lec 36, 37, 38] https://nptel.ac.in/courses/106/106/106106127/ [Lec60]

Text Book(s):

1. Pradip Dey, and Manas Ghosh, “Programming in C”, 2018, Oxford University Press.
2. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill

Reference Books :

1. Brian W. Kernighan, and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Pearson.
2. Ajay Mittal, Programming in C: A Practical Approach , 3/e, Pearson Publication
3. SCHILDT and HERBERT, C: The Complete Reference, 4th Edition, McGraw Hill, 2020
4. SOMASHEKARA, M. T., GURU, D. S., MANJUNATHA, K. S., Problem Solving with C, 2nd Edition, PHI Learning, 2018
5. Paul Deitel, Deitel & Harvey Deitel, C How to Program, 6th Edition, Pearson Education
6. Jeri R. Hanly, Elliot B. Koffman, Ashok Kamthane and A. Ananda Rao, Programming in C and Data Structures, 1st Edition, Pearson Education, 2010.
7. H. Cheng, C for Engineers and Scientists, Mc.Graw-Hill International Edition Education / PHI, 2009
8. Yashavant P. Kanetkar, Let us C, 16th Edition, BPB Publications, Delhi, 2017.
9. R.G. Dromey, “How to Solve it by Computer”. Pearson, 2014.
10. Anita Goel, Computer Fundamentals, Pearson Publication, 2010.

Online Resources / Web Resources:

1. <https://nptel.ac.in/courses/106/105/106105171/>
2. <https://nptel.ac.in/courses/106/106/106106127/>
3. https://www.youtube.com/playlist?list=PLVlQHNRLfIP8IGz6OXwIV_lgHgc72aXlh
4. <https://www.youtube.com/watch?v=8PopR3x-VMY>
5. <https://www.youtube.com/watch?v=vl794HKeXug>
6. <https://books.goalkicker.com/CBook/>
7. <https://www.tutorialspoint.com/cprogramming/index.htm>
8. <https://www.programiz.com/c-programming>
9. <https://www.javatpoint.com/c-programming-language-tutorial>
10. <https://www.edureka.co/blog/c-programming-tutorial/>
11. <https://data-flair.training/blogs/c-tutorial/>
12. <https://www.programmingsimplified.com/c-program-examples>
13. <https://www.w3schools.in/category/c-tutorial/>
14. C Programming Notes for Professionals book : <https://books.goalkicker.com/CBook/>

NARAYANA ENGINEERING COLLEGE :: NELLORE								
20EN1001	ENGLISH							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I	2	0	0	32	2	40	60	100
Pre-requisite: Knowledge of fundamentals of English Language & Grammar								
Course Objectives: <ol style="list-style-type: none"> 1. To enhance the linguistic and communicative competence. 2. To improve the Language proficiency of students in English with an emphasis on Vocabulary, Reading and Writing skills. 3. To provide knowledge of grammatical structures & rules and encourage their appropriate use. 4. To expose the students to Reading skills and apply the skill & strategies of a successful reader 5. To acquaint the students with effective strategies of paragraphs, note making, text editing, review writing and formal correspondence such as letter writing, e mail, and memos. 6. To aid the students acquire appropriate and adequate knowledge on writing Technical Reports. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Acquire in depth knowledge on formulating appropriate sentences with grammatical accuracy and vocabulary building. (B.L:2)							
CO 2	Understand the factors that influence in use of grammar and learn to use sentences unambiguously. (B.L:2)							
CO 3	Impart effective strategies for professional written communication using devices of coherence & cohesion with adequate support & detail. (B.L:3)							
CO 4	Provide knowledge of use of phrases & clauses and improve effective writing Note making & Paraphrasing. (B.L:2)							
CO 5	Understanding the grammar rules for synthesis of sentences and use prewriting strategies to plan to write dialogues, reviews and edit the text effectively. (B.L:2)							
CO 6	Master the skills and sub skills of reading and use strategies for reading effectively and provide knowledge on the structure and format of technical writing. (B.L:3)							

1: Low, 2-Medium, 3- High

COURSE CONTENT		
Module – I		Hours :06
<p>Grammar : Parts of speech: Noun (Countables & Uncountables, Singulars & Plurals, Kinds of Nouns), Pronoun, Verb, Adverb, Adjective - Kinds of Sentences & Sentence Structures – Question forms – Word order in Sentence</p> <p>Vocabulary Building : Concept of word formation – Synonyms & Antonyms – Homonyms & Homophones – Prefixes & suffixes – Commonly confused Words – One word substitutes – Idioms & Phrasal Verbs</p> <p>At the end of the Module 1, students will be able to:</p> <ul style="list-style-type: none"> • Acquire in depth knowledge on basic grammar concepts. • Understand the meaning of suffixes & Prefixes, idioms and phrasal verbs. • Learn meaning and usage of Vocabulary. 		
Module – II		Hours :08
<p>Grammar : Subject Verb agreement – Pronoun-antecedent agreement – Verbs: auxiliary verbs (Primary & Modal)- Tenses</p> <p>Writing : Principles of writing: clarity, simplicity, brevity, single focus, organization of thoughts - Sentence Structure – Joining the sentences - sequencing the ideas - introduction and conclusion – Punctuation.</p> <p>At the end of the Module II, students will be able to:</p> <ul style="list-style-type: none"> • Learn to use sentences clearly. • Understand the usage of grammar. • Learn the importance of use of Auxiliary verbs. 		
Module – III		Hours :10
<p>Grammar : Direct & Indirect Speech – Active and Passive Voice – Comparison of Adjectives – Articles – Prepositions</p> <p>Writing : Paragraph Writing - Phrases & Clauses – Conditionals - Business letters and Emails and Memos - Structure/ template of common business letters and emails: inquiry/ complaint/ placing an order</p> <p>At the end of the Module III, students will be able to:</p> <ul style="list-style-type: none"> • Understand and learn the nuance of writing business letters, e-mails, memos and effective paragraphs • Learn to use devices of coherence & cohesion with adequate support & detail • Learn the use of prepositions and active & passive voice in engineering and scientific contexts. 		
Module – IV		Hours :10
<p>Grammar : Phrasal Verb – Cause and effect – Verb noun Collocations & adjective-noun collocations – correcting common errors in grammar and usage - Misplaced modifiers, idiomatic expressions</p> <p>Writing : Note Making- organizing techniques: providing a suitable title, headings and sub headings; methods of sequencing - Paraphrasing -techniques of paraphrasing: Replacement of words and phrases, change of sentence structures.</p> <p>At the end of the Module IV, students will be able to:</p> <ul style="list-style-type: none"> • Understand the usage of phrases and clauses in sentences • Learn grammatical rules to encourage their appropriate use in writing • Learn to write effective note making and paraphrase 		
Module – V		Hours :08

Grammar : Question formation (Wh- questions, Yes or No questions, Tag questions)-If Clauses— Simple, Compound, Complex Sentences - Correcting common errors in grammar and usage

Writing : Editing short texts - Dialogue writing - Writing Definitions (short and long) – compare and contrast paragraphs- Writing of Reviews : Book / Play / Movie - focus on appropriate vocabulary and structure - language items like special vocabulary and idioms used

At the end of the Module V, students will be able to:

- Acquire the knowledge of applying the grammatical rules for synthesis of sentences
- Learn to write dialogues for various contexts
- Learn to edit the text and writing reviews

Module – VI

Hours :06

Reading Skills : Types of reading: Skimming, Scanning, Intensive & Extensive Reading - Effective Reading-Tips

Reading Comprehension

Scramble Sentences

Complete the passage using contextual clues

Identifying Main Ideas using Scanning Technique

Identifying Specific Ideas using Skimming Technique

Writing : Describing – Report Writing: definition - purpose – types – structure - formal and informal reports - stages in developing report- proposal, progress and final reports –examples

At the end of the Module VI, students will be able to:

- Master the skills and sub skills of reading
- Learn the structure and format of technical reports
- Learn to write description of things, process, places and persons

Content beyond syllabus:

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Vocabulary for Aptitude & Recruitment Tests Campus Jobs	CO1	https://youtu.be/uzvZa2qEuWo
2	Tips to Improve Verbal and Written Communication Skills	CO2	https://youtu.be/6Y3NY0ERBxY
3	How to write professional emails in English	CO3	https://youtu.be/3Tu1jN65slw
4	Introduction to Collocation	CO4	https://youtu.be/-ouWOpo2Uh8
5	Error Spotting Questions in Campus Recruitment Tests	CO5	https://youtu.be/Rz6-qjNrZCU
6	Reading Skills: How To Skim, Scan and Read for Detail Effectively	CO6	https://youtu.be/SRHNKzXxu6o

Text Books:

- Green, David *Contemporary English Grammar –Structures and Composition*, MacMillan India, 2014
- Raymond Murphy's *English Grammar with CD*, Murphy, Cambridge University Press, 2012
- Michael Swan, (2017) *Practical English Usage (Practical English Usage)*, 4th edition, UK: Oxford University Press.
- Ashraf, M Rizvi. *Effective Technical Communication*. Tata McGraw-Hill, 2006.

Reference Books

- *English Conversation Practice* –Grant Taylor, Tata McGraw Hill, 2009.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012
- Meenakshi Raman and Sangeeta Sharma, *Professional Communication, Second Edition*, Oxford University Press, India, 2017
- Michael McCarthy, Felicity O'Dell, (2015) *English Vocabulary in Use Advanced (South Asian Edition)*, UK: Cambridge University Press
- *Spoken English*, R.K. Bansal & JB Harrison, Orient Longman, 2013, 4Th edition.

WEB RESOURCES:

- Grammar/Listening/Writing 1-language.com
- <http://www.5minuteenglish.com/>
- <https://www.englishpractice.com/>

Grammar/Vocabulary

- English Language Learning Online
- <http://www.bbc.co.uk/learningenglish/>
- <http://www.better-english.com/>
- <http://www.nonstopenglish.com/>
- <https://www.vocabulary.com/>
- BBC Vocabulary Games
- Free Rice Vocabulary Game

Reading

- <https://www.usingenglish.com/comprehension/>
- <https://www.englishclub.com/reading/short-stories.htm>
- <https://www.english-online.at/>

Listening

- <https://learningenglish.voanews.com/z/3613>
- <http://www.englishmedialab.com/listening.html>

Speaking

- <https://www.talkenglish.com/>
- BBC Learning English – Pronunciation tips
- Merriam-Webster – Perfect pronunciation Exercises

Online Dictionaries

- Cambridge dictionary online : <https://dictionary.cambridge.org/>
- MacMillan dictionary : <https://www.macmillandictionary.com/>
- Oxford learner's dictionaries : <https://www.oxfordlearnersdictionaries.com/>

NARAYANA ENGINEERING COLLEGE:NELLORE								
20CH1502	CHEMISTRY FOR CIVIL ENGINEERING LAB							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1.To provide the learners hands-on-training on the practical applications of the concepts learnt in the theoretical sessions on water treatment, electrochemistry, lubricants, using simple chemical methods. 2.The course will also train the learner to observe good lab practices, record readings and graphically represent the results, as well as analyze and interpret the influence of reaction conditions on the results. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Analyze quality parameters of water samples from different sources							
CO 2	Perform quantitative analysis using instrumental methods .							
CO 3	utilize the fundamental laboratory techniques for analyses such as titrations, separation/purification/ and Spectroscopy							
CO 4	To be able to analyze and gain experimental skill.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3											1		
CO2	3											1		
CO3	3											1		
CO4	3											1		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	CO
Task-1 : Determination of Hardness of a water sample	
Objective <ol style="list-style-type: none"> 1. Determine the total hardness (total calcium and magnesium ion concentration). 2. Learn how to titrate with EDTA solution. 3.Determine permanent hardness and the temporary hardness 	CO1
Task-2 : Estimation of DO	
Objective: <ol style="list-style-type: none"> 1. To Determine the level of dissolved oxygen in a sample of water using Winkler's method. 2. Analyze the effects of various factors on the level of dissolved oxygen in a water sample (e.g., salt content, temperature, degree of mixing, and the presence of reducing compounds). 	CO 1
Task-3- Determination of chloride content of water	
Objective: define precipitation titrations,	CO 1

1. state and explain the principle of precipitation titrations with reference to the determination of silver ions in an aqueous solution, 2. explain different basis of end point determination in the argentometric titrations, 3. prepare a standard solution of sodium chloride and use it for the standardisation of silver nitrate, 4. Titrate the given solution of chloride ions with silver nitrate by using Mohr's and Fajan's methods and Determine chloride ion concentration in a water sample.	
Task-4: pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base	
Objective: 1. To perform a potentiometric titration of an acidic solution of known molarity. 2. To graph the volume of base added vs the pH and to determine the equivalence point 3. To calculate the molarity of the basic solution	CO 1
Task-5 : Potentiometry - determination of redox potentials and emfs	
Objective: 1. Determine the concentration of an unknown iron(II) solution. By using potentiometer 2. Discuss how the potential changes with relative concentration of oxidised/reduced form, 3. perform a redox titration of ammonium iron (II) sulphate using potassium dichromate as oxidizing agent, 4. determine the equivalence point of the redox titration by plotting titration curve using potential change values and amount of oxidizing agent added during titration,	CO 1
Task-6 : Determination of Strength of an acid in Pb-Acid battery	
Objective: 1. To determine the half –reactions involved in spontaneous oxidation –reduction reactions. 2. Explain the function of the lead storage and dry cell batteries ...electrolysis involving two lead strips immersed in sulfuric acid.	CO 3
Task-7 : Preparation of a polymer	
Objective: To prepare phenol formaldehyde resin. (Bakelite) 1. Understand the differences between linear and cross linked polymers. 2. Compare and contrast the recycling properties of linear and cross linked polymers. 3. Compare the combustion properties of various types of material. 4. Define the following terms: polymer, monomer, repeat unit, cross linking, biopolymer	CO 1
Task-8: Determination of percentage of Iron in Cement sample by colorimeter	
Objective: 1. To provide practical knowledge of instrumental for developing experimental skill in building colorimetric estimation of iron in cement. 2. understand Beer's –Lambert's law principle	CO 2
Task-9: Estimation of Calcium in port land Cement	
Objective: 1. To estimate calcium cement by EDTA method. 2. To understand the strength of the port land cement.	CO 2
Task-10: Determination of Viscosity of lubricating oil by Red Viscometer	
Objective: 1. Measuring viscosity of fluids. 2. Describe a fluid as having "high "or "low" viscosity	CO 4

Additional Experiments:	
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Task-11: Estimation of Ferrous Iron by Dichrometry.				
Objective: 1. determine the percentage of ferrous iron in an unknown sample by redox titration with potassium dichromate solution . 2. The student will pre-treat the sample to obtain the iron in the reduced(+2 oxidation) state. 3.The student will use a solution of primary standard as the titrant				CO 3
Task-12: Determination of cell constant and conductance of solutions				
Objective: 1. To determine conductivity of the given water sample. by using conductivity meter 2. To understand the specific conductance.				CO 1
Virtual Labs: 1. http://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1 2. http://vlab.amrita.edu/?sub=2&brch=190&sim=339&cnt=1 3. http://vlab.amrita.edu/?sub=2&brch=190&sim=606&cnt=1				
Self-Study: Contents to promote self-Learning:				
SNO	Topic	CO	Reference	
1	Estimation of hardness of water	CO 1	https://www.youtube.com/watch?v=Sa0WfA9UGG0	
2	Potentiometric redox titration	CO 1	https://www.youtube.com/watch?v=wVJ8WQax0rQ	
3	Preparation of polymer	CO 4	https://www.youtube.com/watch?v=PSSK5VGcC0	

Text Book(s): 1. A Textbook of Quantitative Analysis, Arthur J. Vogel. 2. Jaya Shree Anireddy, Textbook of Engineering Chemistry, Wiley Precise Textbook Series, 20 3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company
Reference Book(s): 1. S.K. Bhasin and Sudha Rani, “Laboratory Manual on Engineering Chemistry”, Dhanpat Rai Publishing Company, New Delhi, 2 nd edition. 2.Sunitha Rattan, “Experiments in Applied Chemistry”, S.K. Kataria & Sons, New Delhi, 2 nd edition.
Web References: 1. https://nptel.ac.in/courses/122101001/23 2. https://nptel.ac.in/courses/104103071/39

NARAYANA ENGINEERING COLLEGE:NELLORE								
20ES1504	ENGINEERING GRAPHICS LAB							R2020
Semester	Hours / Week			Total hrs	Credits C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
I	0	1	4	75	3	40	60	100
Pre-Requisite: Basic Mathematics (Geometry)								
Course Objectives: <ol style="list-style-type: none"> 1. To impart skills on using drawing instruments 2. To convey exact and complete information of any physical object. 3. To Construct Engineering Curves. 4. To Learn and practice basic AutoCAD commands. 5. To Instruct the utility of drafting & modeling packages in orthographic and isometric drawings 6. To understand the applications of AUTOCAD for modeling physical objects 								
Course Outcomes: At the end of the course, student will be able to:								
CO 1	Define the qualities of precision and accuracy in engineering drawing. (BL-1)							
CO 2	Draw engineering curves with different methods(BL-3).							
CO 3	Develop the orthographic projection of points and straight lines(BL-3)							
CO 4	Construct the planes and simple solids.(BL-3).							
CO 5	Understand and practice basic AUTOCAD commands (BL-2)							
CO 6	Construct Isometric views using AUTOCAD (BL-3).							

CO-PO Mapping														
CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				1							1	1	1
CO2	2	1			1							1	1	2
CO3	2	2			1							2	2	2
CO4	2	2			2	1						2	2	2
CO5	1	1	1		1							1	1	3
CO6	2	2	2		2							1	2	3
1: Low, 2-Medium, 3- High														
COURSE CONTENT Part-A Manual Drawing														
TASK– 1			Introduction and Conic sections									10 H		
Introduction to Engineering graphics: Principles of Engineering Graphics and their significance; various instruments used, drawing sheet sizes and title block, lettering, BIS conventions, types of lines and dimensioning methods. Geometrical constructions: simple constructions, construction of Pentagon, Hexagon by general method only.														
Conic Sections:. Types of conics: Ellipse, Parabola and Hyperbola (Eccentricity method only),														
At the end of the TASK -1, students will be able to: <ol style="list-style-type: none"> Understand of Geometrical Constructions. (BL-2) Draw Conic Sections by using eccentricity method . (BL-3) 														

TASK--2	Orthographic Projections	10 H
Objectives and Principle of projection, Methods of projections, Comparison between first angle and third angle projection. Projections of points: Projection of points placed in different quadrants, Projection of straight lines: Fundamental concepts, Line parallel, perpendicular and inclined to one and two reference planes placed in first quadrant only, Projections of planes: Projection of planes (Triangle, Square, Pentagon, Circle) parallel, perpendicular and inclined to one and two reference planes placed in first quadrant only		
At the end of the TASK- 2 , students will be able to: <ol style="list-style-type: none"> 1. Understand Orthographic Projection of points. (BL-2) 2. Draw Projection of lines inclined to one and two reference planes. (BL-3) 3. construct the Projection of planes inclined to one and two reference planes.(BL-3) 		
TASK-3	Projections of Solids	12 H
Types of solids ; Polyhedra, Solids of revolution, Projections of regular solids (Prisms, Pyramids, Cylinders and Cone),with its axis perpendicular to one plane and parallel to other plane, Axis inclined to one plane and parallel to other plane.		
At the end of the TASK - 3 , students will be able to: <ol style="list-style-type: none"> 1. Understand Projections of regular Solids. (BL-2) 2. Draw projections of Prisms, Pyramids, Cylinders And Cones(BL-3) 		
TASK-4	Isometric and Orthographic views	10H
Isometric Projections : Principles, Isometric scale, Isometric views ,Conventions, Isometric views of lines, planes, simple solids (Cube, Cylinder, Cone), Conversion of Isometric views to Orthographic views.		
At the end of the TASK - 4 , students will be able to: <ol style="list-style-type: none"> 1.Understand Principles of Isometric Projections and Isometric scale. . (BL-2) 2.Draw isometric views of simple solids (BL-2) 3.Apply the principles in Conversion of Isometric views in to Orthographic views. (BL-3) 		
Part B Computer Aided Drafting		
TASK-5	Introduction to AutoCAD	15 H
Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions. Dimensioning principles and conventional representations.		
At the end of the TASK- 5 , students will be able to: <ol style="list-style-type: none"> 1. Understand the Basic AutoCAD commands. (BL-2) 2. Draw the templates of simple physical objects. (BL-3) 3. Apply the utility of drafting & modelling packages in orthographic and isometric drawings 		
TASK-6	Orthographic and Isometric Projections	18 H
Transformation of Isometric Projections into orthographic projections such as simple solids such as cylinder, cone, square prism, pentagonal pyramid Draw 3D model of mechanical components such as Stepped block, Bush bearing,		
At the end of the TASK -6 , students will be able to: <ol style="list-style-type: none"> 1. Develop the usage of 2D and 3D modelling. (BL-3) 2. Create the various views of machines components. (BL-3) 		
Total H:		75 H

Content beyond syllabus:

1. Development of surfaces, Section of solids

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Introduction to Basic Engineering Scales	https://mrcet.com/downloads/hs/Engineering%20Graphics%20Manual%20final.pdf
2	Engineering curves	www.nptel.ac.in/courses/112104019/
3	Orthographic Projections	www.nptel.ac.in/courses/112104019/
4	Projections of Solids	www.nptel.ac.in/courses/105104148/
5	AutoCAD	https://www.autodesk.in/campaigns/education/fusion-360?mktvar002=3510851 SEM APAC_GGL_0025&gclid=EAIaIQobChMI25i62KuD6wIVj3wrCh1V1AUJEAAYASAAEgLpmfD_BwE
6	Isometric and Orthographic Projections	https://www.youtube.com/watch?v=iXgCzZFrYlg

Text Book(s):

1. Bhatt N.D. “Elementary Engineering Drawing”, Charotar Publishers, 2014.
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
4. Engineering Drawing by Dr AVS Sridhar Kumar, Dr Krishnaiah, T P Vara Prasad, Spectrum education, Sun techno Publications, 2019

Reference Book(s):

1. Engineering Drawing and Graphic Technology -International Edition, Thomas E.French, Charles J. Vierck, Robert J. Foster, McGraw-Hill, 2014
2. Venugopal.K “Engineering Drawing and Graphics”, New Age International (P) Ltd., New Delhi, 2010.

Online Resources:

1. www.nptel.ac.in/courses/112104019/
2. www.nptel.ac.in/courses/105104148/
3. www.vlab.co.in

Web Resources:

1. <https://mrcet.com/downloads/hs/Engineering%20Graphics%20Manual%20final.pdf>
2. http://cbseacademic.nic.in/web_material/CurriculumMain21/SrSecondary/Engineering_Graphics_Sr.Sec_2020-21.pdf
3. http://cbseacademic.nic.in/web_material/Curriculum19/Main-/11_Engineering_Graphics.pdf

NARAYANA ENGINEERING COLLEGE::NELLORE								
20ES1506	PROBLEM SOLVING AND PROGRAMMING LAB							R20
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
I	0	0	3	48	1.5	40	60	100
Pre-requisite: Mathematics Knowledge, Analytical & Logical Skills								
Course Objectives: <ol style="list-style-type: none"> 1. To work with the compound data types 2. To explore dynamic memory allocation concepts 3. To able to design the flowchart and algorithm for real world problems 4. To able to write C programs for real world problems using simple and compound data types 5. To employee good programming style, standards and practices during program development 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Translate algorithms into programs (In C language) (BL - 2)							
CO 2	Code and debug programs in C program language using various constructs.(BL-3)							
CO 3	Solve the problems and implement algorithms in C. (BL - 3)							
CO 4	Make use of different data types to handle the real time data (BL - 3)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2											1	
CO2	2	2	2										2	1
CO3	2	2	3	1	2								2	2
CO4	2	2	3	1	1								2	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT	CO
TASK-1 (3H)	
1. Practice DOS and LINUX Commands necessary for execution of C Programs. 2. Study of the Editors, Integrated development environments, and Compilers in chosen platform. 3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.	CO 1
TASK-2 (6H)	
1. Practice programs: Finding the sum of three numbers, exchange of two numbers, largest of two numbers, to find the size of data types, Programs on precedence and associativity of operators, sample programs on various library functions.	CO 1
TASK-3 (6H)	
1. Write a C program to calculate the factorial of a given number 2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 & 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence. 3. Write a program to find the roots of a Quadratic equation.	CO1
TASK-4 (6H)	
1. Write a program to generate the series of prime numbers in the given range. 2. Write a program to reverse the digits of a number.	CO 2

3. Write a C program to find the sum of individual digits of a positive integer.	
TASK-5 (3H)	
1. Write a program to check for number palindrome. 2. Write a program to find the maximum of a set of numbers. 3. Write a C program to find the GCD (greatest common divisor) of two given integers	CO 2
TASK-6 (3H)	
1. Write a program to find the sum of positive and negative numbers in a given set of numbers. 2. Write C code to reverse the elements of the array. For example, [1,2,3,4,5] should become [5,4,3,2,1] 3. Write a C program to find factorial of a given integer number using recursion	CO 3
TASK-7 (6H)	
1. Write a C program that use pointers to find Addition of Two Matrices 2. Write a C program that use functions to find Multiplication of Two Matrices	CO 3
TASK-8 (3H)	
1. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters. 2. Write a C program to check whether a given string is a palindrome or not, without using any built-in functions.	CO 3
TASK-9 (6H)	
1. Illustrate the use of auto, static, register and external variables. 2. Write a program to read and print student information using structures 3. Write a C program to define a union and structure both having exactly the same numbers using the size of operators print the size of structure variables as well as union variable	CO 4
TASK-10 (6H)	
1. Write a program to split a “file” into two files, say file1 and file2. Write lines into the ‘file’ from standard input. Read the contents from ‘file’ and write odd numbered lines into file1 and even numbered lines into file2. 2. Write a program to merge two files.	CO 4

Additional Experiments:	
TASK-1	
1. Programs on bitwise operators. 2. Programs on bit fields.	CO4
TASK-2	
1. Write a program to read a set of strings and sort them in alphabetical order. 2. Programs on implementation of structures using files.	CO 4

Virtual Labs:
1. Problem Solving Lab (IIIT HYDERABAD) : http://ps-iiith.vlabs.ac.in/
List of Experiments

1. Numerical Representation 2. Beauty of Numbers 3. More on Numbers 4. Factorials 5. String Operations	6. Recursion 7. Advanced Arithmetic 8. Searching and Sorting 9. Permutation 10. Sequences
2. Computer Programming Lab (IIIT HYDERABAD) : http://cse02-iiith.vlabs.ac.in/	
List of Experiments	
1. Numerical Approximation 2. Functions 3. Advanced Control Flow 4. Arrays 5. Structures	6. Basic Control Flow 7. Pointers 8. Recursion 9. Expression Evaluation

Text Book(s):

1. "How to Solve it by Computer", R.G. Dromey, 2014, Pearson.
2. Programming in C and Data Structures, J.R. Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education, 1st Edition, 2010.

Reference Book(s):

1. "The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, 2nd Edition, Pearson.
2. "Let us C", Yeswant Kanetkar, BPB publications
3. "Pointers in C", Yeswant Kanetkar, BPB publications, 16th Edition, 2017
4. Computer Science, A Structured Programming Approach Using C by Behrouz A. Forouzan & Richard F. Gilberg, 3rd Edition, Cengage Learning
5. C Programming A Problem-Solving Approach, Behrouz A. Forouzan & E.V. Prasad, F. Gilberg, 3rd Edition, Cengage Learning
6. Programming with C RemaTheraja, Oxford, 2018
7. Programming in C, 3rd Edition, 2015, Ashok N. Kamthane, Pearson Education
8. Programming in C, 3/e : A Practical Approach by Ajay Mittal, Pearson Publication
9. Problem Solving with C by SOMASHEKARA, M. T., GURU, D. S., MANJUNATHA, K. S., PHI Learning, 2nd Edition, 2018
10. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press, 2001
11. Byron Gottfried, Schaum's Outline of Programming with C, 4th Edition, 2018, McGraw-Hill

Web Resources:

1. <https://www.includehelp.com/c-programs/advance-c-examples.aspx>
2. <https://www.programiz.com/c-programming/examples>
3. <https://www.javatpoint.com/c-programs>
4. <https://www.w3resource.com/c-programming-exercises/>
5. <https://www.sanfoundry.com/simple-c-programs/>
6. <https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx>
7. <http://www.c4learn.com/c-programs/tag/c-programs-typical-programs>

Reading Newspaper – Highlighting Vowels and Consonants	
Module – 2	8 hrs
Syllabification: Word Stress, Rules of word stress Practice on Intonation and Stress	CO2
Module – 3	8 hrs
Listening Skills : Types of Listening Skills Active listening and anticipating the speaker Listening for Specific & General Details Listening Comprehension	CO3
Module – 4	8 hrs
Defining & Describing: Objects, Places and Events Video Speech Writing Review Writing (Books / Movies / Products..etc.,)	CO4
Module – 5	8 hrs
Reading Comprehension Everyday English – Grammar, Vocabulary, LSRW Skills, Summarizing and Note making Vocabulary Building	CO5
Module – 6	8 hrs
JAM Role Play Giving and Asking Directions Information Transfer	CO6

Reference Books:

- *A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian.(Macmillian),2012*
- *Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.*
- *English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009. CUP*
- *Rizvi, Ashraf. M., Effective Technical Communication, Mc Graw Hill, New Delhi. 2005*
- *Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi. 2011.*

SEMESTER II

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20PH1002	BS	Physics for Civil Engineering	3	0	0	3	3	40	60	100
20MA1003	BS	Vector Calculus Complex Variables and Transforms	3	1	0	4	4	40	60	100
20ES1010	ES	Principles of Electrical and Electronics Engineering	3	0	0	3	3	40	60	100
20ES1005	ES	Building Material Science	2	0	0	2	2	40	60	100
20ES1006	ES	Engineering Mechanics	3	0	0	3	3	40	60	100
20PH1502	BS	Physics for Civil Engineering lab	0	0	3	3	1.5	40	60	100
20ES1505	ES	Engineering and IT workshop	0	0	4	4	2	40	60	100
20EN1502	HS	Oral Communication skills lab	0	0	2	2	1	40	60	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	14	1	13	27	19.5	320	480	800

NARAYANA ENGINEERING COLLEGE: NELLORE								
20MA1003	VECTOR CALCULUS, COMPLEX VARIABLES & TRANSFORMS (VC-CV&TS)							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	3	0	0	48	3	40	60	100
Pre-requisite: Intermediate Mathematics								
Course Objectives: <ol style="list-style-type: none">1. To illustrate the physical interpretation of gradient, divergence and curl.2. To apply the basic concepts of vector integration and their applications.3. To acquire the knowledge on the calculus of functions of complex variables.4. To understand the concepts of Laplace transforms and its properties.5. To apply the concepts of Laplace, transform to solve the ordinary differential equations.6. To understand the concepts of Fourier series and Fourier transforms and itsproperties.								
Course Outcomes: After successful completion of the course, the student will able to:								
CO 1	Utilize different operators such as gradient, curl and divergence find the function(BL-3)							
CO 2	Evaluate area and volumes by fundamental theorems of vector integration(BL-5)							
CO 3	Apply the complex functions, Cauchy’s integral Theorem to find the integral values(BL-3)							
CO 4	Solve the differential equation by using Laplace transforms and its techniques (BL-3)							
CO 5	Apply the Inverse Laplace transforms techniques to covert into time Domaine (BL-3)							
CO 6	Find the Fourier Series and Fourier Transform for the given functions.(BL-2)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2										PSO1	PSO 2
CO2	3	2	2										3	
CO3	3	3	1										3	
CO4	3	3	2										2	
CO5	3	3	2										3	2
CO6	3	3	2										2	2
1- Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	Vector Differentiation	8 H
Introduction to vector differentiation, Definition of Scalar and Vector point functions, Definition of Vector differential operator, Gradient of a Scalar point function- Definition of Gradient of a scalar point function and properties (without proof), Definition of Directional Derivative, Definition of level surface, Different Problems, Divergence of a Vector point function- Definition, Definition of Solenoidal vector and problems, Curl of a vector point function- Definition of Curl, definition of Irrotational vector, Problems, Laplacian operator- Definition and related problems, Vector Identities- Statements(without proof)		

At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Apply del to scalar and vector point function BL-3 2. Understand the concepts of Vector Differentiation BL-2 3. Illustrate the physical interpretation of gradient, divergence and curl. BL-2 4. Calculate directional derivatives and gradients BL-1 5. Apply Vector Differentiation concepts in fluid mechanics problems BL-3 		
MODULE -2	Vector Integration	8 H
Introduction to vector integration, Line Integrals-Explanation, Work done by a Force- Explanation, problems, Surface Integral-Explanation and formula for surface integrals (without proof), Problems, Volume integral- Explanation and formula for volume integral (without proof), Problems, Green's Theorem-Statement (without proof), Problems, Gauss divergence Theorem-Statement (without proof), Problems, Stake's-Theorem-Statement (without proof), Problems.		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Find the work done in moving a particle along the path over a force field BL-1 2. Evaluate the rate of fluid flow along and across curves BL-5 3. Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals BL-3 4. Use the Gauss divergence theorem to give a physical interpretation of the divergence of a Vector field. BL-3 5. Evaluate the line integrals along simple closed curves on the Plane by Green's Theorem BL-5 6. Apply Stokes' theorem to give a physical interpretation of the curl of a vector field. BL-3 		
MODULE-3	Complex Variable	Hours: (11L+4T)
<p>complex variables- differentiation: introduction to complex variables, functions of complex variable- definition, limit and continuity of a complex function, derivative of $f(z)$-definition, problems, analytic function & harmonic functions- definitions, problems, cauchy-riemann equations in cartesian coordinates-statement (without proof), problems ,cauchy-riemann equations in polar coordinates-statement (without proof), problems , conjugate harmonic functions- definition, problems, milne thomson method- working rule, problems, applications to flow problem- problems. complex variables- integration: introduction to complex integration, line integration-definition, problems, cauchy's integral theorem- statement (without proof), problems, cauchy's integral formula- statement (without proof), problems, zeros of analytic functions, singularities, poles. residues-definition, explanation. cauchy's residue theorem- statement (without proof), problems. evaluation of integrals of the type: (a) improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_0^{2\pi} (\cos \theta, \sin \theta) d\theta$</p>		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the functions of complex variable and its properties. BL-2 2. Find derivatives of complex functions. BL-1 3. Understand the analyticity of complex functions. BL-2 4. Understand the concept of differentiability, limit, continuity of complex functions and be able to calculate limits of standard complex functions BL-2 5. Apply Cauchy's integral theorem and Cauchy's integral formula in engineering problems. BL-3 6. Understand singularities of complex functions. BL-2 		
MODULE-4	Laplace Transforms	8 H
Introduction to Laplace Transforms, Definition of Laplace Transforms, Sufficient conditions for the existence of the L.T of a function, Laplace Transforms of standard Functions. First Translation (or) First Shifting theorem, Problems. Second Translation (or) Second Shifting theorem, Problems. Change of scale property, Problems. L.T. of derivatives, Problems. L.T. of integrals, Problems. Multiplication by 't', Problems. L.T. of Division by 't', Problems. Evaluation of integrals by L.T. L.T. of some special functions- Unit Step Function or Heaviside's Unit Function- Definition, problems. Unit Impulse Function or Dirac Delta function- Definition, problems. Laplace Transform of Periodic Functions- Statement (without proof), Problems.		

At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the concepts of Laplace transforms and convert into time to frequency domain BL-2 2. Apply Laplace transform techniques to solve Ordinary differential equations BL-3 3. Understand and recall the properties of the Heaviside (unit step) function and its applications BL-2 4. Solve the application of Dirac Delta function by using its properties BL-3 		
MODULE-5	Inverse Laplace Transforms	8 H
<p>Definition of Inverse Laplace Transforms, Inverse Laplace Transforms of standard Functions (without proof), Problems. Use of Partial Fractions to find Inverse Laplace Transform- problems. First Translation (or) First Shifting theorem- Statement (without proof), problems. Second Translation (or) Second Shifting theorem Statement (without proof), Problems. Change of scale property- Statement (without proof), problems. Inverse L.T of derivatives- Statement (without proof), problems. Inverse L.T to finite integrals- Statement (without proof), problems. Multiplication by Powers of 's'-Statement (without proof), Problems. Division by 's'-Statement (without proof), problems. Convolution theorem-statement (without proof), problems, Applications to Ordinary Differential Equations-Working method Explanation, problems</p>		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the concepts of inverse Laplace Transforms and convert into frequency to time domain BL-2 2. Solve the wave functions by inverse Laplace transforms BL-3 3. Apply the Convolution Theorem to obtain inverse Laplace transforms BL-3 4. solve the higher order differential equations in limiting case condition by inverse Laplace transforms BL-3 		
MODULE-6	Fourier Series and Fourier Transforms	8 H
<p>Fourier Series: Introduction to Fourier Series, Periodic function-definition, properties (without proof), Euler's formulae (without proof), Dirichlet's conditions, Fourier series in $[0, 2\pi]$-formula (without proof), Problems, Fourier series in $[-\pi, \pi]$- formula (without proof), Problems, Fourier series for even and odd functions in $[-\pi, \pi]$- formula (without proof), Problems, Half -Range Fourier sine series in $(0, \pi)$- Formula (without proof), Problems, Half -Range Fourier cosine Series in $(0, \pi)$-Formula (without derivation), Problems. Fourier Transforms: Introduction to Fourier Transforms, Fourier integral theorem Statement (without proof), Fourier sine and cosine integrals formula (without proof), problems, Fourier Transform formula & Inverse Fourier Transform formula (without proof), Properties of Fourier Transforms (without proof), problems, Fourier Sine Transform formula & Inverse Fourier Sine Transform formula (without proof), problems, Fourier Cosine Transform formula & Inverse Fourier cosine Transform formula (without proof), problems.</p>		
At the end of the Module 6, students will be able to:		
<ol style="list-style-type: none"> 1. Find the Fourier series expansion of the given function. BL-1 2. Apply Fourier series and its properties of various engineering problems. BL-3 3. Find the periodic solutions to the differential equation by using Fourier series. BL-1 4. Understand the properties of periodic functions, represent it as a Fourier BL-2 5. Apply the concepts of Fourier transforms to Find impulse BL-3 6. Make use of the Fourier transforms and its inverse in practical applications of electronics engineering. BL-3 		
Total hours		48 H

Complex Fourier series

1. Complex Fourier series
2. Parseval's Identity for Fourier Transforms

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Vector Differentiation	CO1	https://youtu.be/a19x_YG0oLg
2	vector integration	CO2	https://youtu.be/pfCwRLK29h4 https://youtu.be/KHiw9Vs-aLM
3	Laplace transforms	CO3	https://youtu.be/luJMI37-nso https://youtu.be/EDVJotmT584
4	Inverse Laplace transforms	CO4	https://youtu.be/9NqdBXNyJPk https://youtu.be/0ZlThUd-yyw
5	Fourier series	CO5	https://youtu.be/4cSZDHxyBf4
6	Fourier transforms	CO6	https://youtu.be/GtXmS5YH7XM

Text Book(s):

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers.
2. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publication.
3. Ramana B.V., "Higher Engineering Mathematics", McGraw Hill Publishers

Reference Book(s):

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley.
2. Veerarajan T., "Engineering Mathematics", Tata McGraw-Hill.
3. Dr. M Anita, "Engineering Mathematics-I", Everest Publishing House, Pune.

Online Resources/ Web References:

1. <http://keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktuebook-download.html>
2. <http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks>
3. http://www.efunda.com/math/math_home/math.cfm
4. <http://www.ocw.mit.edu/resources/#Mathematics>
5. <http://www.sosmath.com/>
6. <http://www.mathworld.wolfram.com/>

NARAYANA ENGINEERING COLLEGE:NELLORE														
20PH1002	PHYSICS FOR CIVIL ENGINEERING							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
II	3	0	0	3	3	40	60	100						
Pre-requisite: Fundamental concepts of Physics														
Course Objectives: 1. To provide knowledge on the phenomenon of heat transfer so as to understand a wide variety of practical engineering problems 2.To familiarize the basic concepts of acoustics along with its Engineering applications. 3. To provide knowledge on indoor lighting and visual comfort in the built environment. 4. To Understand the nature and characteristics of modern engineering materials. 5. Familiarize types of sensors for various engineering applications 6.To impart knowledge on the basic concepts of ultrasonics along with its Engineering applications														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	classify different modes of heat transfer and explain heat conduction in a bad conductor and compound media.													
CO 2	Apply the knowledge of acoustics for designing of engineering structures.													
CO 3	Explain building lighting system for maintaining proper levels of visual comfort.													
CO 4	Demonstrate the knowledge on characteristics and applications of modern engineering materials.													
CO 5	Identify importance of ultrasonics in engineering applications.													
CO 6	Identify the sensors for various engineering applications													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										2		
CO2	3	2	1									2		
CO3	3	2	2	1		2						2		
CO4	3	2	1			1						2		
CO5	3	2				1						2		
CO6	3	2	2			2						2		
1: Low, 2-Medium, 3- High														

COURSE CONTENT
MODULE – 1
CRYSTALLOGRAPHY AND ULTRASONICS (8h) Crystallography: Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC. Ultrasonics – Introduction, Properties and Production by magnetostriction& piezoelectric methods, acoustic grating, detection of ultrasonic waves, Non Destructive Testing – pulse echo system through transmission and reflection modes -Medical applications.
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. understand Properties of ultrasonic waves (L2) 2. explain production of ultrasonic waves by piezo-electric , Magnetostrictive methods (L2) 3. describe non-destructive testing of materials by ultrasonic waves (L2) 4. realize Medical applications of ultrasonic waves (L2)
MODULE -2

ACOUSTICS	(7hrs)
Acoustics Introduction –classification of sound, characteristics of sound, weber-Frechner law, sound intensity level, sound pressure level, Phon, Sone, Echoes, reverberation and reverberation time, Sabine's formula, Reverberation theory, Growth of sound energy in the hall, decay of sound energy in the hall, deduction of Sabine's formula, Absorption coefficient and its determination, factors affecting acoustics of buildings and their remedies.	
At the end of the Module 2., students will be able to:	
<ol style="list-style-type: none"> 1. explain characteristics of sound (L2) 2. describe Echoes, reverberation and reverberation time (L2) 3. derive expressions for Growth and decay of sound energy in the hall (L2) 4. recognize factors affecting acoustics of buildings and their remedies (L2) 	
MODULE-3	
SENSORS	(8 hrs)
Sensors:(qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Fibre optic methods of pressure sensing; Temperature sensors - bimetallic strip, pyroelectric detectors, Hall-effect sensor, smoke and fire detectors.	
At the end of the Module 3, students will be able to:	
<ol style="list-style-type: none"> 1. identify different types of sensors and applications (L3) 2. explain working of Strain and Pressure sensors (L2) 3. describe working of Fibre optic pressure and Temperature sensors (L2) 4. explain working of Hall-effect sensor, smoke and fire detectors (L2) 	
MODULE-4	
THERMAL PHYSICS	(8 hrs)
Introduction, modes of heat transfer (conduction, convection and radiation), coefficient of thermal conductivity, rectilinear flow of heat along a uniform bar, thermal conductivity of bad conductor (Lee's disc method), heat conduction through compound media (materials in series and parallel).	
At the end of the Module 1, students will be able to:	
<ol style="list-style-type: none"> 5. Explain different modes of heat transfer (L2) 6. describe Lee's disc method for finding coefficient of thermal conductivity of a bad conductor (L2) 7. explain rectilinear flow of heat along a uniform bar (L2) 8. Explain heat conduction in compound media (L2). 	
MODULE-5	
LIGHTING DESIGNS	(9 hrs)
Radiation quantities – 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.	
At the end of the Module 3, students will be able to:	
<ol style="list-style-type: none"> 1. understand radiation quantities (L2). 2. describe photopic, mesopic, scotopic visions (L2). 3. explain day light calculations, day light design of windows (L2). 4. explain principles of artificial lighting (L2). 	
MODULE-6	
MODERN ENGINEERING MATERIALS	(8 hrs)
Metallic glasses - Introduction, preparation of metallic glasses by RF sputtering technique, properties (structural, thermodynamic, mechanical, electrical, chemical and optical), applications of metallic glasses. Shape memory alloys (SMA) – Introduction, shape memory effect and its types, characteristics of SMA, properties of NiTi alloy, applications of SMA. Composites - Introduction, types and applications.	
At the end of the Module 4, students will be able to:	
<ol style="list-style-type: none"> 1. understand the preparation metallic glasses RF sputtering technique (L2) 	

2. explain properties and applications of metallic glasses (L2)
3. realize the characteristic, applications of shape memory alloys (L2)
4. explain applications of composites (L2).
Total hours:
50 hours

Content beyond syllabus:

1. nanomaterials

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Ultrasonics	CO1	https://youtu.be/hhJj36mObaw?t=892
2	Acoustics	CO2	https://youtu.be/OhXK7BfVass?t=1552
3	Sensors	CO3	https://youtu.be/wpAA3qeOYiI
4	Thermal physics	CO4	https://youtu.be/5TcPGx82Hnk
5	Lighting designs	CO5	https://youtu.be/XBPBF-T10ws
6	Modern engineering materials	CO6	https://youtu.be/vnc30eHVD8s

Text Book(s):

1. Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.
- 2.. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
- 3.. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012.

Reference Book(s):

1. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015
3. Ian R Sinclair, Sensor and Transducers, 3rd eds, 2001, Elsevier (Newnes)
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education,2018

Online Resources / Web Resources:

1. <http://www.peaceone.net/basic/Feynman/>
2. <http://physicsdatabase.com/free-physics-books/>
3. <http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf>
4. <http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html>
5. <http://link.springer.com/book>
6. <http://www.thphys.physics.ox.ac.uk>
7. <http://www.sciencedirect.com/science>
8. <http://www.e-booksdirectory.com>

NARAYANAENGINEERINGCOLLEGE:NELLORE								
20ES1003	PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING						R2020	
Semester	Hours /Week			Total hrs	Credit	Max Marks		
	L	T	P			C	CIE	SEE
II	3	0	0	48	3	40	60	100
Pre-requisite: Fundamental concepts of Electrical Circuits Analysis and Electro Magnetic Fields. Basic Knowledge on Semiconductor materials.								
Course Objectives: <div><div></div><div>1. Able to understand the performance of Electrical circuit elements.</div><div>2. To understand the Principle of Operation of electrical machines.</div><div>3. Able to Explain Typical AC Power Supply scheme.</div><div>4. To provide comprehensive idea about working principle, operation and applications of PN Diode.</div><div>5. To provide comprehensive idea about working principle, operation and applications of BJT</div><div>6. To provide comprehensive idea about working principle, operation and applications of MOSFET.</div></div>								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO1	Understand DC and AC electrical circuit analysis.(BL-2)							
CO2	Demonstrate working principles of transformers and electrical machines.(BL-2)							
CO3	Understand the generation, Transmission and distribution of Electrical Power.(BL-2)							
CO4	Understand the operation, characteristics of PN junction diode. (BL-02)							
CO5	Understand the operation, characteristics of BJT. (BL-02)							
CO6	Explain the concept of MOSFET and applications of MOSFET.(BL-02)							

CO-POMapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1										2	3
CO2	1	2	2										2	3
CO3	2	3	2										3	3
CO4	1	2	1									1	1	
CO5	1	2	1									1	1	1
CO6	1		1									1	1	
1:Low,2-Medium,3-High														

COURSECONTENT		
MODULE-1	DC & AC Circuits	08Hours
Electrical circuit elements (R- L and C) - Kirchhoff laws- Series and parallel connection of resistances with DC excitation. Superposition Theorem- Representation of sinusoidal waveforms- peak and rms values- phasor representation- real power- reactive power- apparent.		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the Basic Electrical circuit elements.(BL-2) 2. Able to understand the parallel connection of resistances.(BL-2) 3. Demonstrate on real power, reactive power and apparent power.(BL-2) 		
MODULE-2	DC & AC Machines	08Hours
Principle and operation of DC Generator-EMF equations- principle and operation of DC Motor-Performance Characteristics of DC Motor-Speed control of DC Motor-Principle and operation of Single Phase Transformer -OC and SC test on transformer-principle and operation of Induction Motor.		

At the end of the Module2,students will be able to:		
<ol style="list-style-type: none"> 1. Explain principle and operation of DC Generator & Motor.(BL-2) 2. Understand the principle and operation of DC Motor.(BL-2) 3. Explain operation of transformer and induction motor.(BL-2) 		
MODULE-3	Basics of Power Systems	08Hours
Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line–Types of Distribution systems :Primary & Secondary distribution systems.		
At the end of the Module3,students will be able to:		
<ol style="list-style-type: none"> 1. Understand the working of Electrical power generating stations.(BL-2) 2. List the varies Elements of Transmission line.(BL-1) 3. Explain Types of Distribution systems.(BL-2) 		
MODULE-4	DIODE APPLICATIONS	08Hours
Operation of PN junction diode, Volt-Ampere Characteristics, Diode Resistance, Diode as a Rectifier,Halfwaverectifier,Fullwaverectifier,Rectifierparameters,RectifierswithFilters.		
<ol style="list-style-type: none"> 1. Describe operation and characteristics of Diode.(BL-02) 2. Study various Biasing techniques of diode.(BL-02) 3. Explain the construction and operation of rectifiers.(BL-02) 		
MODULE-5	BIPOLARJUNCTIONTRANSISTOR	08Hours
BipolarJunctionTransistor(BJT)–TypesofTransistors,OperationofNPNandPNPTransistors,Input-OutputCharacteristicsofBJT-CB,CEandCCConfigurations,Relationbetween IC, IB and IE, Transistor.		
<ol style="list-style-type: none"> 1. Describe operation and characteristics of transistors.(BL-02) 2. Study various configurations of Transistor.(BL-02) 3. Understand the Analog and digital applications of Transistor.(BL-02) 		
MODULE-6	METAL–OXIDE–SEMICONDUCTOR FIELD-EFFECTTRANSISTOR	09Hours
Introduction to MOSFET, Construction of depletion mode and enhancement mode of NMOS and PMOS, Drain characteristics of MOSFET, Transfer Characteristics of MOSFET, MOSFET as Switch, CMOS Inverter and it's Characteristics.		
<ol style="list-style-type: none"> 11. Explain the construction and operation of enhancement mode NMOS.(BL-02) 12. Study the characteristics of MOSFET.(BL-02) 13. Explain various applications of MOSFET.(BL-02) 		
Total hours:		48hours

Content beyond syllabus:		
<ol style="list-style-type: none"> 1. OCC characteristics of DCgenerator 2. BJT & FET Biasing. 		
Self-Study:		
Contentstopromoteself-Learning:		
SNO	Module	Reference
1	DC & AC Circuits	https://nptel.ac.in/courses/117/106/117106108/
2	DC &AC Machines	https://nptel.ac.in/content/storage2/MP4/108102145/mod02lec03.mp4 https://nptel.ac.in/courses/108/102/108102146/
3	Basics of Power Systems	https://nptel.ac.in/content/storage2/courses/105105110/pdf/m5101.pdf https://onlinecourses.nptel.ac.in/noc18_ee15/unit?u

NARAYANA ENGINEERING COLLEGE: NELLORE								
20ES1005	BUILDING MATERIAL SCIENCE						R2020	
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
I1	2	0	0	32	2	40	60	100

		nit=5&lesson=9
4	Diode Applications	https://www.youtube.com/watch?v=IMoJUqDISQs&t=12s
5	BJT	https://www.youtube.com/watch?v=zbwqk69VcQM
6	MOSFET	https://www.youtube.com/watch?v=g30xTHas3aU

Text Book(s):

1. D.P.Kothari and I.J.Nagrath-"Basic Electrical Engineering"-Tata Mc GrawHill-2010.
2. Basic Electrical and Electronics Engineering,M.S.Sukhija,T.K.Nagsarkar, Oxford University.
3. V.K.Mehta &Rohit Mehta,"Principles of Electronics"-S.Chand-2018.
4. Basic Electrical and Electronics Engineering,S.KBhattacharya,Pearson Education,2012.

Reference Book(s):

1. L.S.Bobrow-"Fundamentals of Electrical Engineering"-OxfordUniversityPress-2011.
2. E.Hughes- "Electrical and Electronics Technology"-Pearson-2010.
3. J.Millman, C.Halkias,"Electronic Devices and Circuits", TataMc-GrawHill,
- 4thEdition,2010.4.David A.Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2009.5.Salivahanan,Kumar,Vallavaraj,"ElectronicDevicesandCircuits",TataMc-GrawHill,Second Edition.

Online Resources /Web References:

- 1.<https://nptel.ac.in/courses/108/105/108105159/>
- 2.<https://nptel.ac.in/courses/108/105/108105066/>
- 3.<https://nptel.ac.in/courses/108/105/108105066/>
- 4.<https://youtu.be/L28F1Oenyds>
5. <https://www.youtube.com/watch?v=0C4uxtS-tlQ>
6. <https://www.youtube.com/watch?v=0RSI-QJ5-4A>
7. <http://www.mathtutordvd.com/products/Engineering-Circuit-Analysis-Volume-1.cfm>
8. https://www.researchgate.net/publication/329252017_Analysis_Study_In_Principles_Of_Operation_Of_Dc_Machine
9. <https://www.engineering.com/>
10. <https://www.electrical4u.com/p-n-junction-diode/>
11. <https://nptel.ac.in/content/storage2/courses/117101106/downloads/L23.PDF>

Pre-requisite: Nil														
Course Objectives:														
1. Develop knowledge of material science and behaviour of various building materials used in construction 2. Identify the construction materials required for the assigned work 3. Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc. 4. Understand the concept of various methods of manufacture of bricks. 5. Identify rock using basic geological classification systems.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	The students will have a Identify rock using basic geological classification systems. Understand the concept of various methods of manufacture of bricks. Identify rock using basic geological classification systems.													
CO 2	The student can be in a position to adopt the suitable techniques in various types of cements and their applications in construction. Various field and laboratory tests on cement.													
CO 3	Understand to differentiate the fine aggregates and coarse aggregates under various views.													
CO 4	Understand the necessity classification of various types of woods. State the properties, seasoning of timber. Understand the types of properties of wood, aluminium and manufacture of glass.													
CO 5	To study the building material used Differentiate the uses of Galvanized iron, fiber-reinforcement plastics, steel and aluminium in construction.													
CO 6	Students can able to know the miscellaneous materials.													
CO-PO Mapping														
CO	PO									PSO				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	1	1	1	-	-	-	-	2	2	2
CO2	2	-	-	1	-	1	1	-	-	-	-	2	2	2
CO3	2	1	-	1	1	1	-	-	-	-	-	2	2	2
CO4	2	-	-	1	-	1	-	-	-	-	-	2	-	-
CO5	2	-	-	-	1	1	-	-	-	-	-	2	-	-
CO6	2	-	-	-	-	1	-	-	-	-	-	2	-	-
1- Low, 2- Medium, 3- High														
COURSE CONTENT														
MODULE – 1					STONES AND BRICKS					(5)				
Stones Introduction, classification of rocks, common building stones, quarrying of stones, dressing of stone, characteristic of good building stone, criteria for selection of stones Bricks: Clay bricks, ingredients of good brick earth, manufacturing process of bricks, characteristics of good clay bricks, classification of clay bricks, defects of clay bricks; special bricks Fly ash bricks, hollow bricks - uses.														
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Study the basic concept of Stones and Bricks (BL1) 2. Illustrate the different knowledge on manufacturing process of Bricks (BL3) 3. Study the Characteristics of good building stones and Bricks (BL1) 														
MODULE -2					LIME AND CEMENT					5H				
Lime: Introduction - limestone cycle – sources of lime - properties of lime – uses –constituent of Lime-cementing action of lime-classification of lime-precaution in handling of lime-storage of lime.														
Cement – Introduction- Portland cement- Composition of Cement- Functions of Cement Ingredients- types of cement - grades of cements- out line of manufacture of Portland cement- properties of cements - field tests for cement - storage of cement														

At the end of the Module 2, students will be able to:		
5. Study the Properties of lime and cement (BL-1) 6. Discuss the types of cement and also its grades (BL- 2) 7. Study the different field test on cement (BL-1)		
MODULE-3	AGGREGATES AND WATER	5H
Aggregates: Classification of aggregate – Coarse and fine aggregates, Particle shape and Texture, Specific gravity, Bulk density, porosity and Absorption, Moisture content of Aggregate – sand; sources, impurities – classification of sand for making concrete - Bulking of sand, Sieve analysis - tests for quality of sand. Pozzolanas - pozzolanic materials - advantages of addition of pozzolanas Water: Introduction - Quality of mixing water - Effect of mixing water from different sources - Effect of mixing water from different sources - Standards for curing water		
At the end of the Module 3, students will be able to:		
1. Identify the basic concept of coarse aggregate and Fine aggregate (BL-1) 2. Explain the different methods Causes and effects of test for quality of sand (BL-2) 3. Illustrate the importance in water for quality mixing (BL-3) 4. Analyze the various effect of mixing water from different sources (BL-4)		
MODULE-4	WOOD AND WOOD PRODUCTS	5H
Wood: Introduction, classification of trees, structure of timber, classification of timber, characteristics of good timber, seasoning of timber, defects in timber, decay in timber, preservation of timber, suitability of timber for specific uses, Properties of timber. Wood Products: Veneers; Plywood and its types, Fiber boards; laminated wood, merits of plywood and laminated wood, Lamina Boards, Block boards, Batten board, Particle boards.		
At the end of the Module 4, students will be able to:		
1. Identify the basic concept wood and wood products (BL-1) 2. Illustrate the importance of characteristics of good wood (BL-3) 3. Identify the suitability of timber for specific uses (BL-1)		
MODULE-5	FERROUS MATERIALS, POLYCRYSTALLINE AND POLYMERIC MATERIALS	5H
Ferrous metals: Types (iron, pig iron, cast iron, wrought iron, steel, rolled steel sections and reinforcing steel bars) - Rusting and Corrosion - Tensile testing of steel sections (IS: 1608)- Common anti - corrosive coatings. Ceramic Materials: introduction, properties Refractories: classification, properties Glass constituents, commercial forms of glasses, Glass fibers and its applications; Plastics- constituents, properties, applications of plastics.		
At the end of the Module 5, students will be able to:		
1. Identify the basic concept Metal and Iron (BL-1) 2. Illustrate the importance of properties of plastic and glass (BL-3) 3. Identify the applications and its uses of Glass fibers (BL-)		
MODULE-6:	MISCELLANEOUS MATERIALS	5H
Paints: Introduction, Constituents- covering power; water paints- classes; enamel paints; varnish- varnishing, types; painting surfaces - plastered, metal and wood surfaces; miscellaneous paints. - Bitumen, tar and asphalt - types and applications - Heat insulating materials; Sound insulating - materials; water proofing materials; Geosynthetics; composite materials examples, applications.		

At the end of the Module 5, students will be able to:

1. Identify the basic concept miscellaneous material (BL-1)
2. Illustrate the importance of Bitumen tar and asphalt (BL-3)
3. Identify the composite material and applications (BL-1)

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	STONES AND BRICKS	CO1	https://slideplayer.com/slide/13296100/ https://www.slideshare.net/HarshilNair/stone-ppt
2	LIME AND CEMENT	CO2	https://www.slideshare.net/gauravhtandon1/limes-79300156 https://www.slideshare.net/AbhinitiGarg23/cement-54311088
3	AGGREGATES AND WATER	CO3	https://www.slideshare.net/LATIFHYDERWadh/o/aggregates-ppt https://www.slideshare.net/TejasPise1/water-in-construction
4	WOOD AND WOOD PRODUCTS	CO4	https://www.slideshare.net/carylverina/wood-36482663
5	FERROUS MATERIALS, POLYCRYSTALLINE AND POLYMERIC MATERIALS	CO5	https://www.slideshare.net/juhisingh286/ferrous-metals-72515631
6	MISCELLANEOUS MATERIALS	CO6	https://www.slideshare.net/JessicaFrancis30/miscellaneous-building-materials-209581258

Text Book(s):

1. Building material by S K Duggal - New Age International Publishers; Second Edition
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain Laxmi Publications (P) Ltd., New Delhi

Reference Book(s):

1. Building materials by Rangawala, charotar Publishing house, New Delhi.
2. Building materials by P.C. Varghese, Prentice - Hall of India private Ltd, New Delhi
3. Building Materials and construction by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

Online Resources:

- 1 <https://www.digimat.in/nptel/courses/video/105102088/L09.html>
- 2 <https://www.digimat.in/nptel/courses/video/105102088/L10.html>

Web Resources:

- 1 http://www.issp.ac.ru/ebooks/books/open/Materials_Science_and_Technology.pdf
- 2 https://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/torraca.pdf
- 3 <http://web.pdx.edu/~pmoeck/phy381/lecture1.pdf>
- 4 <https://www.nap.edu/read/10436/chapter/2>

NARAYANA ENGINEERING COLLEGE: NELLORE														
20ES1006	ENGINEERING MECHANICS							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
II	2	1	0	48	3	40	60	100						
Pre-requisite: Concepts of Differentiation and integration topics in mathematics														
Course Objectives:														
1. To learn the fundamentals of mechanics concept of force and its types. 2. To learn the effect of friction on equilibrium. 3. To develop knowledge in analyzing different types of trusses. 4. To learn the geometrical properties like centroid and center of gravity. 5. To gain proficiency in understanding the concept moment of inertia. 6. To learn kinematics, kinetics of particle and rigid body, related principles.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO1	Compute the resultant of system of forces in plane and space acting on bodies. (BL-3)													
CO2	Solve the mechanics problems associated with friction forces. (BL-3)													
CO3	Determine the support-reactions and analyze the internal forces of the members of various Trusses and frames. (BL-4)													
CO4	Calculate the location of centroid of composite areas. (BL-4)													
CO5	Apply transfer theorems to determine properties of various sections. (BL-4)													
CO6	Solve problems related to kinetics. (BL-3)													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1										1	
CO2	2	2	2										1	
CO3	2	2	2											1
CO4	2	2	2										2	1
CO5	2	2	2										1	
CO6	2	3	2										1	
1:Low,2-Medium,3-High														
COURSE CONTENT														
MODULE – 1			System of Forces				8 H							
Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.														
At the end of theModule1, students will be able to:														
1. Resolve the forces in mechanical systems. (BL-3) 2. Identify the moments and forces. (BL-1)														

3. Draw free body diagram. (BL-3)		
MODULE -2	Friction	08 H
Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes.		
At the end of theModule1,students will be able to:		
<ol style="list-style-type: none"> 1. Understand the concept of friction. (BTL-2) 2. Demonstrate the terminology related to friction.(BTL-3) 3. Solve the problems related to applications of friction.(BTL-3) 		
MODULE-3	Analysis of Trusses	08 H
Introduction to plane trusses, analysis of plane trusses by method of Joints, method of sections & tension coefficient method.		
At the end of theModule3, students will be able to:		
<ol style="list-style-type: none"> 1. Identify different types of trusses. (BL-1) 2. Determine the support reactions. (BL-3) 3. Analyze the plane trusses by method of joints and the method of sections.(BL-4) 		
MODULE-4	Centroid	8 H
Definition of Centroid & Centre of Gravity, Axes of Symmetry, Location of Centroid of Rectangle, Triangle, Semicircle, Quardrant and sector of a circle by method of integration. Numerical problems on Centroid of Composite sections.		
At the end of theModule4, students will be able to:		
<ol style="list-style-type: none"> 1. Identify the center of gravity of simple geometrical shapes. (BL-1) 2. Calculate the center of gravity of complex shapes.(BL-4) 3. Determine the center of gravity of common solids.(BL-3) 		
MODULE-5	Moment Of Inertia	8 H
Concept of Moment of inertia, perpendicular axis theorem, parallel axis theorem, and moment of inertia of Rectangular, Circular, Semicircular, Quadrant of a circle Triangular sections by method of integration. Numerical Problems on moment of inertia of composite section.		
At the end of theModule5, students will be able to:		
<ol style="list-style-type: none"> 1. Compute moment of inertia for various geometric shapes.(BL-3) 2. Demonstrate the parallel axis theorem and perpendicular axis theorem. (BL-3) 3. Calculate moment of inertia of a given complex section.(BL-4) 		
MODULE-6	Kinetics& Kinematics	8 H
Rectilinear and Curvilinear motion, Velocity, Acceleration, Motion of a projectile, Relative motion. Kinetics of rectilinear motion, Newton's laws of motion, D'Alembert's principle, Work-energy method,Impulse-momentum equation, Kinetics of circular motion, Rotation.		
At the end of theModule6, students will be able to:		
<ol style="list-style-type: none"> 1. Write equations of motion for rigid bodies. (BL-1) 2. Compute velocity and acceleration of a particle in rectilinear and curvilinear motions.(BL-3) 3. Predict the path of projectile.(BL-3) 		
Total h:		48 h

Content beyond syllabus:
1. Principle of virtual work.

Self-Study:

Content to promote self-Learning:

SN O	Topic	Reference
1	System of Forces	https://nptel.ac.in/courses/112/103/112103109/
2	Friction	https://nptel.ac.in/courses/112/103/112103109/
3	Analysis of Trusses	https://nptel.ac.in/courses/112/103/112103109/
4	Centroid	https://nptel.ac.in/courses/112/103/112103109/
5	Moment of Inertia	https://nptel.ac.in/courses/112/103/112103109/
6	Kinetics & Kinematics	https://nptel.ac.in/courses/112/103/112103109/

Text Book(s):

1. S. Bhavikatti, "Engineering Mechanics", 4th edition, New Age International, 2008.
2. R.K. Bansal, "A text book of Engineering Mechanics", Laxmi Publications, 2010
3. Irving Shames, G.K.M. Rao, "Engineering Mechanics: Statics and Dynamics", 4th edition, Pearson, 2009.

Reference Book(s):

1. Basudeb Bhattacharya, "Engineering Mechanics", 2nd edition, Oxford University Press (India), 2015.
2. K L Kumar, Veenu Kumar, "Engineering Mechanics", 4th edition, Tata McGraw Hill, 2010.
3. Engineering Mechanics, R.S. Khurmi, S. Chand, 2012.

Online Resources:

1. <https://www.classcentral.com/course/statics1-564>
2. <https://www.my-mooc.com/en/categorie/mechanical-engineering>

NARAYANA ENGINEERING COLLEGE:NELLORE														
20PH1502	Engineering Physics lab (Civil Engineering)							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
II	0	0	2	36	1	40	60	100						
Pre-requisite: Nil														
Course Objectives: <ol style="list-style-type: none">1. To provide student to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field. To prepare students for performing requirement analysis and design of variety of applications.2. To enable the students to understand the importance of sensors and resonance phenomenon.3. To make the students to identify the variation of illuminating power of the lamp with the applied voltage and inverse square law of light														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	learn important concepts of physics through involvement in the experiments by applying theoretical knowledge.													
CO 2	To make the students to identify the importance of sensors and resonance phenomenon.													
CO 3	identify the variation of illuminating power of the lamp with the applied voltage and inverse square law of light													
CO 4	To make the students to understand the important parameters of optical fibres and Hall effect phenomenon.													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1										2		
CO2	2	1				1						2		
CO3	2	1				1						2		
CO4	2	1										2		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	CO
Task 1 - Determination of spring constant of springs using Coupled Oscillator	
<p>objective:To study normal modes of oscillation of two coupled pendulums and to measure the normal mode frequencies as well as spring constant.</p> <p>Two identical compound pendulums are coupled by means of a spring. Normal mode oscillations are excited and their frequencies are measured.</p>	CO 1
Task - 2 Determination of the rigidity modulus of the material of a given wire using Torsional Pendulum	

<p>objective: To determine the rigidity modulus of the material of a given wire using Torsional Pendulum</p> <p>A torsion pendulum consist of a disk-like mass suspended from thin rod. When the mass is twisted about the axis of the wire , the wire exerts a torque on the mass, tending to rotate it back to its original position. If twisted and released, the mass will oscillate back and forth to its original position executing a simple harmonic motion. This experiment can be used to assess the shear elastic behavior of a given material .</p>	CO 1
Task -3 . Determination of thermal conductivity of a bad conductor (Lee's disc method).	
<p>objectives: 1.To know about different modes of heat transfer, via conduction, convection and radiation</p> <p>2.To find the coefficient of thermal conductivity of a bad conductor by Lee's method.Thermal conductivity (k), is the property of a material that indicates its ability to conduct heat. Conduction will take place only if there exists a temperature gradient in a solid (or stationary fluid) medium. Conductive heat flow occurs in direction of the decreasing temperature. This transfer will continue until thermal equilibrium is reached. The rate at which the heat is transferred is dependent upon the magnitude of the temperature gradient, and the specific thermal characteristics of the material. Thermal conductivity is quantified in the units of W/mK,</p>	CO 1
TASK -4 Determination of temperature change using Strain Guage sensor	
Objective: Determination of temperature change using Strain Guage sensor	CO 2
TASK -5 Determination of pressure variations using optical fiber sensors.	
Objective: Determination of pressure variations using optical fiber sensors.	CO 2
TASK-6 Determination of pressure variation using Strain Guage sensor	
Objective: Determination of pressure variation using Strain Guage sensor	CO 2
TASK -7 Determination of temperature changes using optical fiber sensors	
Objective: Determination of temperature changes using optical fiber sensors	CO2
TASK -8 Verification of laws of transverse vibration of a stretched string using sonometer	
<p>objective: To Verify laws of transverse vibration of a stretched string using sonometer</p> <p>In this experiment we will verify three laws which establish</p> <p>1)Relation between natural frequency (n) and length of vibrating segment(l).</p> <p>2)Relation between natural frequency (n) and tension (T) in the string.</p> <p>3) Relation between natural frequency(n) and linear mass density (m).</p>	CO 2
TASK -9 To study the variation of illuminating power of the lamp with the applied voltage	

Objectives : To study the variation of illuminating power of the lamp with the applied voltage	CO 3												
TASK -10 verification of inverse square law of light													
Objective: verification of inverse square law of light	CO 3												
Additional Experiments:													
TASK -11 To determine the numerical aperture and acceptance angle of a given optical fiber													
Objective: To determine the numerical aperture and acceptance angle of a given optical fiber.	CO 4												
In optical fibres light travel by multiple total internal reflections. Numerical aperture represents light gathering power of optical fibre. Acceptance angle represents maximum limiting angle at one end of optical fibre for the light ray to travel by multiple total internal reflections through the core region of the fibre.													
1. Optical fibers may be used for accurate sensing of physical parameters and fields like pressure, temperature and liquid level.													
2. For military applications like fiber optic hydrophones for submarine and underwater sea application and gyroscopes for applications in ships, missiles and aircrafts.													
TASK -12: Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.													
The objective :To determine	CO4												
a) sign of the charge carriers,													
b) charge carrier concentration,													
c) mobility of the charge carriers of a given semiconductor													
Virtual lab: 1) Laser beam divergence and spot size https://vlab.amrita.edu/?sub=1&brch=189&sim=342&cnt=1													
2. Michelson's Interferometer- Wavelength of laser beam https://vlab.amrita.edu/?sub=1&brch=189&sim=1106&cnt=1													
3. Melde's String Apparatus https://vlab.amrita.edu/?sub=1&brch=201&sim=882&cnt=1													
Self-Study:													
Contents to promote self-Learning:													
<table><tr><th>SN O</th><th>Topic</th><th>CO</th><th>Reference</th></tr><tr><td>1</td><td>Newton rings</td><td></td><td>https://youtu.be/PU-SeNfIRcs</td></tr><tr><td>2</td><td>Diffraction grating experiment - Wavelength of</td><td></td><td>https://youtu.be/N0lxwqANsd4</td></tr></table>	SN O	Topic	CO	Reference	1	Newton rings		https://youtu.be/PU-SeNfIRcs	2	Diffraction grating experiment - Wavelength of		https://youtu.be/N0lxwqANsd4	
SN O	Topic	CO	Reference										
1	Newton rings		https://youtu.be/PU-SeNfIRcs										
2	Diffraction grating experiment - Wavelength of		https://youtu.be/N0lxwqANsd4										

		mercury spectrum		
	3	Experiment - Laser Grating- Determination of Wavelength of Given Laser Source		https://youtu.be/764Fr0mnOrQ

Text Book(s):

1. C. L. Arora, "Practical Physics", S. Chand & Co., New Delhi, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering Students", S M Enterprises, 2nd Edition, 2014.

Reference Book(s):

- 1.S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
- 2.C.H. Bernard and C.D. Epp, John Wiley and Sons, "Laboratory Experiments in College Physics" Inc., New York, 1995.
- 3.Dr.Ruby Das, C.S.Robinson, Rajesh Kumar and Prasanth Kumar "A text book of Engineering Physics Practical", 1st edition, Sahu University Science Press, 2010.
- 4.Jayaraman, "Engineering Physics Laboratory Manual", 1st edition, Pearson Education, 2014.

Web Resources:

1. <https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB>.
2. https://www3.nd.edu/~wzech/LabManual_0907c.pdf.
- 3.<https://www.morebooks.de/store/gb/book/engineering-physics-lab-manual/isbn/978-3-330-34402>.

NARAYANA ENGINEERING COLLEGE:NELLORE								
20ES1505	ENGINEERING & ITWORK SHOP							R2020
PART – A ENGINEERING WORK SHOP								
Semester	Hours / Week			Total hrs	Credits	Max Marks		
	L	T	P			C	CIE	SEE
II	0	0	4	64	2	40	60	100
Pre-requisite: Basic mathematics.								
Course Objectives:								
<div>1. To know basic workshop processes and adopt safety practices while working with various tools and equipment.</div> <div>2. To identify, select and use various marking, measuring, holding, striking and cutting tools & equipment.</div> <div>3. To know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system</div> <div>4. To gain knowledge about the usage of tools like Word processors, Spreadsheets, Presentations.</div> <div>5. To learn about Networking of computers and use Internet facility for Browsing and Searching</div>								
Course Outcomes: After successful completion of the course, student will be able to:								
CO1	Understand the safety aspects in using the tools and equipment.(BL-2)							
CO2	Apply tools for making models in respective trades of engineering workshop.(BL-3)							
CO3	Apply basic electrical engineering knowledge to makes house wiring circuits and check their functionality.(BL-3)							
CO4	Understand to disassemble and assemble a Personal Computer and prepare the Computer ready to use(BL-2)							
CO5	Apply knowledge to Interconnect two or more computers for information sharing. (BL-3)							
COURSE CONTENT (TRADES FOR PRACTICE)								
Trade -1 Carpentry (6 H)								
Familiarity with different types of woods and tools used in wood working and make following joints from out of 300x40x25mms of wood stock. a) Half-Lap joint. b) Mortise and Ten on joint								
Trade-2 Fitting (6 H)								
Familiarity with different types of tools used in fitting and do the fitting exercises out of 80 x 50 x 5 mm M.S. stock. a) V-fit b) Dovetail fit								
Trade - 3 Sheet Metal Work (6 H)								
Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from out of 22 or 20 guage G.I. sheet. a) Tapered tray b) Conical funnel								

Trade - 4 Electrical House Wiring (6 H)

Familiarities with different types of basic electrical circuits and make the following electrical connections.

- a) Two lamps in series
- b) Two way switch
- c) Tube light
- d) Two lamps in parallel with 3 pin plug and switches

Trade 5 – Welding(8H)

Familiarity with different types of tools used in welding and do the following welding exercises.

1. Single V butt joint 2. Lap joint

Text Book(s):

1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjar Roy S.K. “Elements of Workshop Technology” Vol-I 2008 & Vol-II 2010 Media Promoters & Publishers Pvt. Limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid, “Manufacturing Engineering and Technology” 4th Edition, Pearson Education India Edition, 2002.
3. P. Kannaiah & K. L. Narayana “Workshop manual” 2nd Ed., Scitech publications Pvt. Ltd., Hyderabad, 2008.

Reference Book(s):

1. Gowri P., Hariharan and Suresh Babu A., “Manufacturing Technology-I”, Pearson Education 2008.

WebResources:

1. <https://www.muett.edu.pk/sites/default/files/images/users/41/Workshop%20Intro.pdf>
2. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=98826>

PART-B IT WORKSHOP LAB

Course Objectives:

1. To provide technical training on Productivity tools like Word processors, Spreadsheets, Presentations.
2. To make the students know about the internal parts of a computer, assembling, installing the operating system.
3. To teach connecting two or more computers.

Course Outcomes: After successful completion of the course, student will be able to:

CO 1	Understand functionalities of a computer and operating system.	(BL-2)
CO 2	Practice Word processors, Presentation and Spreadsheet tool.	(BL-2)
CO 3	Connect computer using wired and wireless connections.	(BL-2)

CO-PO Mapping

CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1													
CO2	1													
CO3	1													

1: Low, 2-Medium, 3- High

COURSE CONTENT	CO
Task-1 Learn about Computer (4H)	
Identify the internal parts of a computer and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.	CO 1
Task -2 Assembling a Computer (4H)	
Disassemble and assemble the PC back to working condition. Troubleshoot the computer and identify working and non-working parts. Identify the problem correctly by various methods available (eg: beeps). Record the process of assembling and trouble-shooting a computer.	CO 1
Task-3 Install Operating system (2H)	CO 1
Install Linux, any other operating system (including proprietary software) and make the system dual boot or multi boot. Record the entire installation process.	
TASK-4 Operating system features (2H)	CO 1
Record various features that are supported by the operating system(s) installed. Submit a report on it. Access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Install new application software and record the installation process.	
TASK-5 Word Processor (6H)	CO 2
Create documents using the word processor tool. Tasks to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Submit a report of the word processor considered. Create documents using the word processor tool. Mail Merge in word processor for creating appointment orders for 10 employee records in excel.	
TASK-6 Spreadsheet (4H)	CO 2
To create, open, save the spreadsheet and format them as per the requirement. Some of the tasks to be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells, working with pivot tables and charts. Submit a report of the Spreadsheet application considered.	
TASK-7 Presentations (6H)	CO 2
To create, open, save and run the presentations, Select the style for slides, format the slides with different fonts, colors, create charts and tables, insert and delete text, graphics and animations, bulleting and numbering, hyperlink, set the time for slide show, Record slide show. Submit a report of the Presentation tool considered.	
TASK-8 Wired network & Wireless network (4H)	CO 3

Select a LAN cable, Identify the wires in the cable, Define the purpose of each wire, Study the RJ45 connector, Use crimping tool to fix the cable to the connector, Test the cable using LAN tester, Connect two or more computers using cross and straight cables, Configure the computers, share the data between the computers.	
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Additional Experiments:	
TASK -1 IoT	CO 3
Raspberry Pi Study the architecture of Raspberry pi, configure software, Install SD card, Connect the cables, Install Raspbian (or any other) operating system, Configure Wi-Fi, remotely connect to your Raspberry Pi.	
TASK -2 OUTLOOK, MACROS	CO 3
Practice the following tasks and submit report A. Configure outlook and access mails. B. Create Macros in word and spreadsheet tools	

Text Book(s): <ol style="list-style-type: none"> 1. B.Govindarajulu, “IBM PC and Clones Hardware Trouble shooting and Maintenance”, 2nd edition, Tata McGraw-Hill, 2002 2. “MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI. 3. “Introduction to Information Technology”, ITL Education Solutions limited, Pearson Education.
Reference Book(s): <ol style="list-style-type: none"> 1. Rusen, “Networking your computers and devices”, PHI 2. Bigelows, “Trouble shooting, Maintaining & Repairing PCs”, TMH.
On-line/Web Resources: https://turbofuture.com/computers/Dissassembling-and-Assembling-the-computer-system https://www.instructables.com/id/Disassemble-a-Computer/ https://www.windowcentral.com/how-do-clean-installation-windows-10 https://www.tutorialspoint.com/ms_excel_online_training/index.asp https://www.raspberrypi.org

NARAYANA ENGINEERING COLLEGE:NELLORE								
20EN1502	ORAL COMMUNICATION SKILLS LAB							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
II	0	0	2	32	1	40	60	100
Pre-requisite:Nil								
Course Objectives: <ol style="list-style-type: none"> 1. Understand the role of communication in personal & professional success and develop awareness of appropriate communication strategies. 2. Understand and learn to distinguish informal speech from formal speech through role plays and can handle a concern or complaint, with empathy and understanding. 3. Improves speaking ability in English both in terms of fluency and comprehensibility. 4. Understand the essential points in preparing an oral presentation 5. To improve the mass communication and provide an opportunity to exercise their rights to express them effectively 6. To equip students with knowledge and techniques to effectively tackle the interview process 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	To develop knowledge, skills, and judgment around human communication that facilitates their ability to work collaboratively with others.							
CO 2	Use listening skills to create more effective, less confrontational, more productive professional & personal relationships and understand techniques required for excellent telephone etiquette.							
CO 3	Develop their public speaking abilities to speak both formally and informally.							
CO 4	Learn the skills necessary to deliver effective presentation with clarity and impact.							
CO 5	Understand the nuances of English language and skills required for effective participation in group activities.							
CO 6	Learn to face different types of interviews with confidence and understand the procedure & preparation required for attending an interview.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1									3		2		
CO2	1									2		3		
CO3	1									3		2		
CO4	1									3		3		
CO5	1									3		2		
CO6	1									2		3		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	CO
Module - 1	
Ice - Breaking Activity – Introducing Oneself and Others – Greetings – Taking Leave - Introduction to Communication Skills – Verbal & Non Verbal Communication - Barriers to effective communication - Kinesics - Proxemics – Chronemics - Haptics- Paralanguage.	CO1
Module - 2	
Situational Dialogues and Role play – Expressions in various Situations - Greetings – Apologies – Requests – Giving directions -Social and Professional etiquettes – TelephoneEtiquettes	CO2
Module - 3	
Just a Minute (JAM) - Asking for Information and Giving Directions–Description (Oral): Pictures, Photographs, Products, and Process	CO3
Module – 4	
Presentation Skills – Oral presentations (individual and group) through Seminars / PPTs - Fluency & accuracy in speech – Improving self- expression– Tonal variations – Listener oriented speaking - Developing persuasive speaking skills.	CO4
Module - 5	
Debate : concepts, types, do's and don'ts - intensive practice- Group Discussion and Group Discussion : Dynamics of group discussion,intervention, summarizing, modulationof voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation.	CO5
Module - 6	
Interview Skills: Concept and process, pre-interview planning, opening strategies,answering strategies, interview through Tele - Conference & video - conference and Mock Interviews.	CO6

Reference Book(s):

- Rizvi, Ashraf. M., *Effective Technical Communication*, McGraw Hill, New Delhi. 2005
- Raman, Meenakshi & Sangeetha Sharma. *Technical Communication: Principles and Practice*, Oxford University Press, New Delhi. 2011.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
- *English for Technical Communication for Engineering Students*, Aysha Vishwamohan, Tata McGraw-Hill 2009
- *Communication Skills* by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009

Web Resources:

- Grammar/Listening/Writing 1-language.com
- <http://www.5minuteenglish.com/>
- <https://www.englishpractice.com/Grammar/Vocabulary>
- English Language Learning Online
- <http://www.bbc.co.uk/learningenglish/>
- <http://www.better-english.com/>
- <http://www.nonstopenglish.com/>
- <https://www.vocabulary.com/>
- BBC Vocabulary Games
- Free Rice Vocabulary Game Reading
- <https://www.usingenglish.com/comprehension/>
- <https://www.englishclub.com/reading/short-stories.htm>
- <https://www.english-online.at/Listening>
- <https://learningenglish.voanews.com/z/3613>
- <http://www.englishmedialab.com/listening.html> Speaking
- <https://www.talkenglish.com/>
- BBC Learning English – Pronunciation tips
- Merriam-Webster – Perfect pronunciation Exercises All Skills
- <https://www.englishclub.com/>
- <http://www.world-english.org/>
- <http://learnenglish.britishcouncil.org/>

Online Dictionaries

- Cambridge dictionary online : <https://dictionary.cambridge.org/>
- MacMillan dictionary : <https://www.macmillandictionary.com/>
- Oxford learner's dictionaries : <https://www.oxfordlearnersdictionaries.com/>

SEMESTER III

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20MA1006	BS	Probability Statistics and Numerical Methods	2	1	0	3	3	40	60	100
20ES1014	ES	Fluid Mechanics	3	0	0	3	3	40	60	100
20CE2001	PC	Building Construction and Planning	3	0	0	3	3	40	60	100
20CE2002	PC	Strength of Materials	3	0	0	3	3	40	60	100
20CE2003	PC	Surveying	3	0	0	3	3	40	60	100
20CE2501	PC	Building drawing	0	0	3	3	1.5	40	60	100
20CE2502	PC	Strength of Materials lab	0	0	3	3	1.5	40	60	100
20CE2503	PC	Surveying Lab	0	0	3	3	1.5	40	60	100
20CD6001	SC	Career competency Development I	0	0	2	2	1	40	60	100
20CC6001	SC	Value added course/Certificate course I	0	1	0	1	1	40	60	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	14	2	14	30	21.5	400	600	1000

NARAYANA ENGINEERING COLLEGE: NELLORE								
	FLUID MECHANICS							
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	3	0	3	48	3	40	60	100

Pre-requisite: Nil

Course Objectives:

1. To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
2. To impart ability to solve engineering problems in fluid mechanics.
3. To enable the students measure quantities of fluid flowing in pipes, tanks and channels.
4. To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
5. To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	student will understand stress-strain relationship in fluids, classify their behavior and also establish force balance in static systems.
CO 2	Students will be able to apply Bernoulli principle and compute pressure drop in flow systems of different configurations
CO 3	Students will be able to Know about the dynamic and kinematics of fluid flows
CO 4	Students will be able to Understand about the orifices, mouth pieces and notches
CO 5	Students will be able to Understand about the energy losses flow through pipes

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-	-	1
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	1	1	-	-	-	-	-	-	-	-	1	-	-
1- Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENT	(9H)
Properties of fluids: introduction: Dimensions and units – properties of fluids-mass density, specific weight, specific volume, specific gravity, viscosity-units, dynamic and kinematic viscosity, newton's law of viscosity, Newtonian and non-Newtonian fluids, variation of		

viscosity with temperature; surface tension-surface tension on liquid droplet, hollow bubble and liquid jet; capillarity-capillary rise and capillary fall. Pressure Measurement: Fluid Pressure at a Point; Pascal's law, Hydrostatic law, Atmospheric, Absolute, gauge, atmospheric and vacuum pressures; Hydrostatic paradox; Pressure measurement – manometers- Simple, differential and Micro Manometers; vapor pressure and cavitation.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the fluid Properties 2. Summarize the Fluid Pressure 3. Demonstrate Fluid Pressure and Its Measurements 		
MODULE -2	HYDROSTATIC FORCES AND BUOYANCY	(9H)
Hydrostatic forces on surfaces: Total Pressure and Centre of Pressure- on Horizontal Plane Surface; Vertical Plane Surface; Inclined Plane Surface and Curved Surfaces. Buoyancy: Buoyancy; Buoyant Force and Centre of Buoyancy, Stability of submerged bodies and floating bodies; Meta center and meta centric height, analytical method for meta centric height.		
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the Hydrostatic forces on Surfaces 2. Demonstrate the Stability of submerged bodies and floating bodies 3. Explain the analytical method for meta centric height 		
MODULE-3	KINEMATICS AND DYNAMICS OF FLUID FLOW	(13H)
Kinematics of Fluid Flow: Introduction, Methods of describing fluid motion; Classification of fluid flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; three-, two- and one- dimensional flows; Irrotational and rotational flows. Streamline; Path line; Streak line. Rate of flow, continuity equation, continuity equation in three-dimension, equation for velocity and acceleration, Local acceleration, convective acceleration; Velocity potential and stream function; Dynamics of Fluid flow: Forces acting on a Fluid in Motion; Equations of motion; Euler's equation of motion; Bernoulli's equation; assumptions. Practical applications of Bernoulli's equation: Venturi meter, Rate of flow through venturi meter, inclined venturi meter; Orifice meter, Rate of flow through Orifice Meter; Measurement of velocity by Pitot tube, Pitot-static tube.		
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 1. Methods of describing fluid motion Illustrate the continuity equation 2. Summarize the stream function and velocity potential function 3. Illustrate the Euler's equation of motion 4. Explain the Bernoulli's equation 5. Demonstrate the venture meter and Orifice meter. 		
MODULE-4	ORIFICES, MOUTHPIECES, NOTCHES AND WEIRS	(8H)
Orifices and Mouthpieces: Orifice-Classification of Orifices; Flow through an orifice, Hydraulic co- efficient, Determination of coefficients for an Orifice, Flow through large rectangular Orifice; Flow through submerged Orifice – fully sub-merged and partially sub- merged. Mouth piece-Classification of Mouthpieces, Flow through external and internal cylindrical Mouthpiece. Notches and Weirs: Introduction, Classification of Notches and Weirs, Flow through		

rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Cipolletti weir; Discharge over Broad crested weir, narrow crested weir and submerged weir.

At the end of the Module 4, students will be able to:

1. Illustrate the Orifices and
2. Summarize the Mouthpieces
3. Explain the various Notches and Weirs

MODULE-5	FLOW THROUGH PIPES	(9H)
Flow through pipes: Energy losses in pipelines; loss of energy due to friction-Darcy Weisbach equation; Minor energy losses in pipelines; Hydraulic Grade Line and Total Energy Line; Siphon; Pipes in series, concept of equivalent length; pipes in parallel & branched pipes. Laminar & Turbulent flow in pipes: Reynolds's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hazen Poiseuille equation). Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, and friction factor for pipe flow.		
At the end of the Module 5, students will be able to: <ol style="list-style-type: none"> 1. Explain the Darcy Weisbach equation 2. Illustrate the Reynolds's experiment 3. Demonstrate the Hazen Poiseuille equation 		
		Total hours: 48 hours

Term work:

1. Field Trip to Dams & Canal Regulators
2. Solve three reservoir problem / pipe network analysis using Excel or any programming language.
3. Determination of friction factor for a pipe using any programming language.
4. Application of any fluid mechanics software to analyze the problem.
5. Developing a demo model related to any fluid flow phenomenon (physical model/ soft model).
6. Assignment on drawing of flow net graphically.

Content beyond syllabus

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Fluids & Their Properties	CO1	http://mechteacher.com/properties-of-fluids/
2	Hydrostatic forces on Surfaces	CO2	https://gradeup.co/hydrostatic-forces-on-surface-study-notes-for-civil-eng-i-bc391f60-742d-11e7-a81f-e934d7098572
3	Laminar Flow and Fluid Dynamics	CO3	https://en.wikipedia.org/wiki/Reynolds_number https://en.wikipedia.org/wiki/Fluid_dynamics
4	Orifice and Mouth piece	CO4	https://www.youtube.com/watch?v=Y5k4vxoztFo

	5	Flow through Pipes	CO5	http://bu.edu.eg/portal/uploads/Engineering,%20Shoubra/Civil%20Engineering/3015/crs-14332/Files/FLUIDS%20-%20III.pdf
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Text Book(s):

1. A text of Fluid mechanics and hydraulic machines by Dr.R.k.Bansal – Laxmi Publications (P)Ltd., New Delhi.
2. Hydraulics and Fluid Mechanics by P. M. Modi and S. M. Seth, Standard Book House.

Reference Book(s):

1. Fluid Mechanics by Mahanoy A K, 'Second Edition, Prentice Hall of India Private Limited, New Delhi.
2. Theory and Applications of Fluid Mechanics, by K.Subrahmanya, Tata McGraw Hill.
3. Introduction to Fluid Machines by S.K.Som & G.Biswas, Tata Mc.Grawhill publishers Pvt. Ltd. 3rdEdition, 2011.

Online Resources:

1. https://en.wikipedia.org/wiki/Fluid_dynamics
2. <https://www.youtube.com/watch?v=Y5k4vxoztFo>

Web Resources:

1. <https://books.google.co.in/books?id=FzQz6A6SnyoC&printsec=frontcover#v=onepage&q&f=false>
2. https://easyengineering.net/no-hydraulics-and-fluid-mechanics/#Download_Link

NARAYAN ENGINEERING COLLEGE: NELLORE														
PC		BUILDING CONSTRUCTION AND PLANNING												
SEMESTER III	Hours/Week					Total hours	Credits C	Maximum Marks						
	L	T	P	CIE	SEE			GT						
	3	0	0	40	60			100						
Pre-requisite: Nil														
Course Objectives: 1. To explain the different components of building with their function. 2. To explain the construction procedure of various components. 3. To explain types of finishing, treatment methods and supporting structures. 4. To demonstrate the building construction byelaws and regulations. 5. To explain the planning procedures of various types of buildings.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1		Students will be able to study the concept and construction procedure for Foundations, Masonry and Floors.												
CO 2		Students will be able to know the concept and construction procedure for Arches, Lintels, Doors and Windows, Roofs.												
CO 3		Students will be able to Understand the concept and construction procedure for Finishings, Treatment methods and Supporting structures.												
CO 4		Students will be able to learn the types of building and bye laws and regulations for various buildings.												
CO 5		Students will be able to apply the concepts of planning in Residential, Commercial and other public buildings.												
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO 5	2	2	-	-	-	-	-	-	-	-	-	-	-	-
1-Low; 2-Medium; 3-High														

COURSE CONTENT		
MODULE 1	COMPONENTS OF BUILDING-I	10H
FOUNDATIONS: Components of a building, Concept of foundations; Factors affecting selection of foundations; requirements of a good foundation; Types of foundations-shallow foundations, deep foundations; causes of failures of foundations. MASONRY: Introduction, terms used in masonry; brick masonry-terms used in brick masonry, bonds in brick masonry, supervision of brick work, defects in brick work. Partition walls. FLOORS: Components of ground floor, selection of flooring material, materials used for flooring, types of flooring.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Understand the concept and construction procedure for Foundations. 2. Understand the concept and construction procedure for Masonry. 3. Understand the concept and construction procedure for Floors. 		
MODULE -2	COMPONENTS OF BUILDING-II	10H

<p>ARCHES: Introduction, technical terms, stability of an arch, types of arches. LINTELS: Introduction, classification of lintels. Stairs: Technical terms, requirement of a good stair, dimension of a step, types of stairs; Elevators, Escalators. DOORS AND WINDOWS: Introduction, location of doors and windows; Doors- size of doors, door frames, types of doors; windows-Introduction, types of windows; ventilators. ROOFS: Introduction, types of roofs; Pitched Roof-Basic elements of pitched roof, types of pitched roofs, trusses, roof covering materials, light weight roofing; flat roofs-advantages, types; curved roofs.</p>		
<p>At the end of the Module 2, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the concept and construction procedure for Arches. 2. Understand the concept and construction procedure for Lintels. 3. Understand the concept and construction procedure for Doors, Windows and Ventilators. 4. Understand the concept and construction procedure for Roofs. 		
MODULE -3	FINISHINGS, TREATMENT AND SUPPORTING STRUCRURES	10H
<p>POINTING: Introduction, preparation of surface, method of pointing, types of pointing's. PLASTERING: Introduction, terminology, no of coats of plastering, methods of cement plastering, types of plastering finishes, defects in plastering. DAMP PROOFING: Introduction, causes, effects, materials used for damp proofing, methods of damp proofing, DPC treatment in buildings; WATER LEAKAGES: Reasons, preventive measures, water proofing of flat roofs. SCAFFOLDING: Introduction, component parts and types; FORM WORK: Introduction, requirements of good form work, cost of form work, material used for preparing form work, form work for-column footings, columns, beam and slab, stairs, walls; removal of form work, failure of form work.</p>		
<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the concept and construction procedure for Pointing and Plastering. 2. Understand the concept and construction procedure for Damp proofing. 3. Understand the concept and treatment procedure for Damp proofing and Water leakages. 4. Understand the concept and construction procedure for Formwork. 		
MODULE -4	PLANNING AND REGULATIONS OF BUILDINGS	9H
<p>PLANNING OF BUILDINGS: Types of buildings, types of residential buildings, site selection for residential building; Space requirement for a building-point to be considered, determining areas for different units of buildings. BUILDING BYELAWS AND REGULATIONS: Introduction, Terminology, Objectives of building byelaws, Minimum plot sizes, Open space requirements, Plinth area, floor area, carpet area, Floor area ratio (FAR), Floor space Index (FSI), Principles underlying building byelaws.</p>		
<p>At the end of the Module 4, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the types of building and criteria required to plan a building. 2. Remember the Building Byelaws and Regulations. 		
MODULE -5	PLANNING OF BUILDINGS	9H
<p>PLANNING OF RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings. PLANNING OF PUBLIC BUILDING: Planning of Educational institutions, Hospitals, Office buildings, Industrial buildings, Hotels and Motels, Hostels.</p>		

At the end of the Module 5, students will be able to:

1. Apply the concepts in planning a residential building.
2. Apply the concepts in planning a public building.

TOTAL HOURS: 48

Text Book(s):

1. Construction management by Sanga Reddy and Meyyappan — Kumaran Publications.
2. Essentials of Management by Joseph L. Massie, Prentice Hall of India
3. Construction Management and Accounts by Shama -Satyaprakashan, Tech India Publications.

Reference Book(s):

1. C.P.W.D. Manuals
2. Public Works Accounts Code, PWD, Tamilnadu
3. Construction Project Management –Theory and Practice by Kumar NeerajJha, , Pearson publications, 2nd edition, 2012.
4. Construction Contracts by Jimmie Hinze, , McGraw hill education, 2013.
5. Contracts and Legal environment by Joseph T. Bockreth, , McGraw hill education, 2013.

Online Resources:

1. <https://en.wikipedia.org/wiki/Building>
2. <https://en.wikipedia.org/wiki/Construction>
3. <https://www.youtube.com/watch?v=cBDA9myvt1s>

Web References:

1. https://www.researchgate.net/publication/333756572_Building_Materials_Construction_Planning_Textbook_free_PDFDrivecom

NARAYANA ENGINEERING COLLEGE: NELLORE								
PC	STRENGTH OF MATERIALS							R2020
Semester	Hours / Week			Total hrs.	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. To explain the simple stresses and strains 2. To Summarize the shear force and bending moment diagrams 3. To Differentiate the flexural stresses and shear stresses 4. To analyze the stress and strain on oblique sections 5. To explain the torsion and theories of columns 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students will able to Understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tridimensional elastic solids							
CO 2	The students will be able to draw bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading.							
CO 3	The students will be able to draw I, T angle and channel sections and shear stress distribution for beams under the different conditions of loading.							
CO 4	The stress, strain, and deflection suffered by bi-dimensional (and simple tridimensional) structural elements when subjected to different loads (e.g., normal, shear, tangential oblique plane).							
CO 5	The student will be able to apply knowledge to analyse concept of deflection, diagram in columns under various loading conditions using different analysis methods. Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	2	-	-	-	-	-	-	1	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	-	-	-
CO3	2	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-	-	-
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE –1	SIMPLE STRESS AND STRAINS	9H
Simple Stress and Strains: Types of external loads – internal stresses –normal and shear stresses – strain – Hooke’s law – working stress –stress strain diagrams – Poisson’s ratio – relationship between elastic constants – Elongation of bars of constant and varying sections –		

statically indeterminate problems in tension and compression – Temperature effects – strain energy and complementary energy strain energy due to tension, compression and shear		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the stress and strain 2. Summarize the stress strain diagram 3. Relationship between elastic constants 		
MODULE –2	Shear Force and Bending Moment	10H
Shear Force and Bending Moment: Different types of beams – various types of loading – Relationship connecting intensity of loading, shearing force and bending moment – shear force and bending moment diagrams for cantilever beams and simply supported beams for different types of loading		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Differentiate types of beams 2. Demonstrate the shear force and bending moment diagrams 3. Explain the simply supported and cantilever beams 		
MODULE –3	ANALYSES OF STRESS AND STRAIN ON OBLIQUE SECTIONS	9H
Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections		
Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections		
<ol style="list-style-type: none"> 1. Theory of simple bending 2. Illustrate the bending equation: $M/I = f/y = E/R$ 3. Illustrate the flexural stresses of I, T 4. Explain the beam sections like rectangular, circular, triangular, I, T 		
MODULE –4	ANALYSES OF STRESS AND STRAIN ON OBLIQUE SECTIONS,	8H
Analysis of Stress and Strain on Oblique Sections: Stress on inclined planes for axial and biaxial stress fields – principal stresses –Mohr's circle of stress. Thin and Thick Cylinders: Stresses in thincylinders – thick cylinders – Lamé's equation – stresses in thick cylinders due to internal and external pressures		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the axial and biaxial stress 2. Summarize the Mohr's circle of stress 3. Explain the various cylinders 		
MODULE –5	TORSION, THEORIES OF COLUMNS	12H
Torsion: Torsion of solid and hollow circular shafts – Pure shear –strain energy in pure shear and torsion Springs: Close coiled and open coiled helical springs Theory of Columns: Direct andbendingstressesinshortcolumns-Kernofasection.Bucklingandstability– Euler'sbuckling/crippling load for columns with different end conditions– Rankine's formula		

At the end of the Module 6, students will be able to:

- 1.Explain the Torsion of solid and hollow circular shafts equation
- 2.Illustrate the **Springs**
- 3.Demonstrate the Rankine's formula

Total Hours: 48H

Term work:

1. Solve problem on shear force and bending moment diagrams.
2. Application of flexural stress theorems.
3. Developing a demo model open coiled and close coiled helical springs

Content beyond syllabus:

Development of material strength

Contents to promote self-Learning:

SNO	Topic	Reference
1	SIMPLESTRESSANDSTRAINS	https://www.youtube.com/watch?v=B9lyGZzb_6M&UrsYr8yHz7xJsKb6D603XUPxu2eKFM
2	SHEAR FORCE AND BENDING MOMENT	https://www.youtube.com/watch?v=C-FEVzI8oe8
3	FLEXURESTRESSESANDSHEARSTRESSES	https://www.youtube.com/watch?v=1wRBxADwXN www.youtube.com/watch?v=VpaEsqjzaGY
4	ANALYSES OF STRESS AND STRAIN ON OBLIQUE SECTIONS, THIN AND THICK CYLINDERS	https://www.youtube.com/watch?v=wWF-0bDxnIo https://www.youtube.com/watch?v=X9FnJiA3j
5	TORSION, THEORIES OFCOLUMNS	https://www.youtube.com/watch?v=pD0DaVNjQj0 https://www.youtube.com/watch?v=F692spiIyHU

TextBook(s):

1. Strength of Materials by R.KRajput, S.Chand&CompanyLtd.
2. Strength of Materials by B.S.Basavarajaiah, Universities Press, Hyderabad.4.
- Strength ofmaterialsbyR.K.Bansal,LaxmiPublications,2005.

ReferenceBook(s):

1. Timoshenko, Strength of Materials Vol.I & Vol.II ,C B S Publishers & Distributers , New Delhi
2. S.S Bhavik Kati, Structural analysis Vol, Vikas Publications(P)Ltd.4thEdition.

Online Resources:

1. <https://www.youtube.com/watch?v=GkFgysZC4Vc&list=PL27C4A6AEA552F9E6>
https://www.youtube.com/watch?v=B9lyGZzb_6M&list=PLIhUrsYr8yHzft7ygw5THZo4aDcsxEadP

Web References:

1. <https://www.youtube.com/watch?v=26pvB8YpTIE>
2. <https://www.youtube.com/watch?v=cFLxpvhi20A>

NARAYANA ENGINEERING COLLEGE: NELLORE								
PC	SURVEYING							
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. Understand the concepts of different types of surveying and the procedures for carrying out the survey works. 2. Learn the advanced surveying equipment's and its techniques. 3. To measure the area by chaining. 4. To measure the height and distance by theodolite. 5. To measure the angles and distances by using tacheometric and trigonometric methods. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to generalized the basic concept of surveying and chain surveying							
CO 2	Students able to identify the methods of compass surveying and Plane Table surveying							
CO 3	Students able to calculate the levelling surveying							
CO 4	Students able to compute the Theodolite and Traversing surveying							
CO 5	Students able to measure the contouring & computation of areas and volumes							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	-	1	-	-	-	1	-	1	2	2	1
CO2	2	2	1	-	-	-	1	-	-	1	-	1	2	-
CO3	2	2	-	-	-	-	1	-	-	-	-	1	2	-
CO4	2	2	-	1	1	-	-	-	-	-	-	1	2	1
CO5	3	2	-	1	1	-	-	-	-	-	-	1	2	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	BASIC CONCEPTS & CHAIN SURVEYING	(8H)
Basic concepts: Surveying– History, primary divisions, Classification, Principles of surveying, Basic Measurements; Instruments and Basic methods; units of measurement, Plan and map, Scales. Errors- Accuracy and Precision, Sources and types of errors. Chain Surveying: Principles of chain survey, Methods of measuring distance, Direct and indirect ranging, Metric chains, Chaining on plane and sloping ground, Basic problems in chaining, chaining past obstacles, Cross–staff survey, Plotting of chain survey, Errors		
At the end of the Module 1, students will be able to: Discuss the different traditional method of surveying (BL -2) <ol style="list-style-type: none"> 1. Detail study of basic concept of surveying (BL-1) 2. Study the definition and principles of surveying (BL-1) 3. Analyze the different problems in chaining (BL – 2) 4. Study the different errors in chaining (BL-4) 		
MODULE-2	COMPASS SURVEY & PLANE TABLE SURVEYING	(9H)

Compass survey: Introduction, Bearings and angles, Designation of bearings, fore bearing and back bearing, Theory of Magnetic compass (i.e., prismatic compass), Measurement of bearings of lines, Open and closed traverse, calculation of included angles, Magnetic Declination, Local Attraction-Related Problems, Errors in compass survey.

Plane table surveying: Introduction, Accessories, Working operations, Methods of plane tabling, Two point and Three-point problems.

At the end of the Module 2, students will be able to:

1. Identify the basic concept of compass surveying (BL – 4)
2. Explain the different methods of plane table surveying (BL-2)
3. Illustrate the importance working of prismatic and surveyor compass (BL-4)

MODULE-3	LEVELLING	(9H)
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levelling: Introduction, basic definitions, methods of levelling, levelling instruments-dumpy level, levelling staff, Sensitivity of a Level tube , Temporary adjustments of dumpy level, theory of simple and differential levelling, Classification of direct levelling methods, Calculation of reduced levels by height of instrument and rise & fall methods, Reciprocal levelling, Profile levelling Difficulties in levelling, errors in levelling.

At the end of the Module 3, students will be able to:

1. Discuss the different process of leveling (BL- 3)
2. Analyze the fly leveling and reciprocal leveling (BL-2)
3. Illustrate the importance of errors in leveling (BL-4)
4. Identify the basic concept of terms used in leveling (BL-4)

MODULE-4	THEODOLITE TRAVERSING	(10H)
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Theodolite: Vernier Theodolite, Basic definitions, Fundamental lines and desired relations; Temporary adjustments; Measurement of a horizontal angle, Repetition and Reiteration methods of horizontal angle measurement, Measurement of vertical angle.

Traverse surveying: Introduction, Selection and marking of traverse stations, methods of traversing, traversing by free needle and fast needle method, traversing by direct observation of angles, checks in closed traverse, closing error, methods of balancing the traverse, Omitted measurements.

At the end of the Module 4, students will be able to:

1. Discuss the Introduction and definition of Theodolite surveying (BL-2)
2. Study the method of repetition and reiteration survey (BL-3)
3. Discuss the Errors in theodolite (BL-4)
4. To understand Traverse surveying (BL-3)
5. Illustrate the different types of traverses (BL-2)

MODULE-5	CONOTURING & COMPUTATION OF AREAS AND VOLUMES	(12H)
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Contouring: Introduction, contour interval, Characteristics of contours, Methods of locating contours - Direct and indirect methods, Contour gradient, Uses of contour maps. **Areas:** methods of determining areas, areas by sub-division into triangles, areas from offsets to a base line-regular and irregular intervals, Simpson's rule. **Volumes:** embankments and cutting for a level section, two level sections, three level section and multi-level section, prismoid formula, trapezoidal formula, volume from spot levels, volume of earth work from contour plan.

At the end of the Module 5, students will be able to:

4. Study the characteristics of contours and uses of contour maps (BL-2)
5. Analyze the different problems to computation of Areas and volumes (BL-1)

Total hours:		48 hours
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Term work:				
1. The sources are from Website				
Content beyond syllabus:				
Minor instruments: uses and working of the minor instrument-Box sextant, Planimeter, Pentagraph, Clinometers.				
Self-Study:				
Contents to promote self-Learning:				
SNO	Topic	CO	Reference	
1	BASIC CONCEPTS & CHAIN SURVEYING	CO1	http://www.neurisa.org/resources/documents/jmcnichols.pdf http://www.amsheela.org.in/dwn/civil/II_YEAR_2MARK_04_surveying-i_2015_07_16_10_57_06_997.pdf	
2	COMPASS SURVEY & PLANE TABLE SURVEYING	CO2	http://ce.cet.ac.in/downloads/Study%20Material/Su/Plane%20Table%20Surveying.pdf http://www.ace-edu.in/wp-content/uploads/2018/06/Surveying-Lab-1.pdf	
3	LEVELLING	CO3	https://www.slideshare.net/gauravhtandon1/levelling-26905390	
4	THEODOLITE TRAVERSING	CO4	http://gn.dronacharya.info/CivilDept/Downloads/questionIIIsem/UNIT-4B.pdf http://www.ce.memphis.edu/1112/notes/project_3/traversing_traverse.pdf	
5	CONTURING & COMPUTATION OF AREAS AND VOLUMES	CO5	https://www.slideshare.net/engkhanmsh/volume-and-area-calculation https://www.slideshare.net/gauravhtandon1/contouring-26	

Text Book(s):	
1. Surveying Vol. 1 & II by Dr. K. R. Arora, Standard Book House.	
2. Surveying Vol. I & II by B.C. Punmia, Laxmi Publications	
Reference Book(s):	
1. Text book of surveying by C.Venkataramaiah, Universities Press.	
2. Plane Surveying by Chandra AM, New age International Pvt.Ltd.	
3. Surveying Vol. I &II byS.K. Duggal, McGraw Hill Education (India) private limited.	
4. Surveying and Levelling by Kanetkar T.P., and Kulkarni, Vols. I and II, United Book Corporation.	
5. Surveying and levelling by R.Subramaniah, Oxford university press.	
6. Surveying by Mimi Das Saikia, PHI Publications.	
Online Resources:	
1. http://nptel.ac.in	
2. https://nptel.ac.in/courses/105104101/	
Web Resources:	
1. http://www.sasurieengg.com/e-course-material/CIVIL/II-Year%20Sem%204/CE6404%20SUR%20II.pdf	
2. https://lecturenotes.in/subject/273/advanced-surveying-as	
3. http://www.vssut.ac.in/lecture_notes/lecture1428642587.pdf	
4 https://www.academia.edu/25746683/ADVANCED SURVEYING LECTURE MODULE	

NARAYANA ENGINEERING COLLEGE: NELLORE								
PC	BUILDING DRAWING							
Semester	Hours/Week			Total hrs.	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. Understanding concepts of building planning and drawing terminology 2. Developing knowledge on Brick Bonds, Doors & Windows 3. Planning the plan and sectional views for Residential buildings. 4. Developing drawing plan and sectional views for School buildings. 5. Planning the plan and sectional views for Industrial buildings. 								

room, Kitchen with (Load bearing wall structure) for the given line sketch and specifications	
TASK-9	OFFICE BUILDING
Objective: Draw Plan, Elevation & Section of the office building for the given line sketch and specifications.	
TASK -10	SCHOOL BUILDING
Objective: Draw Plan, Elevation & Section of the School building for the given line sketch and specifications	
ADDITIONAL EXPERIMENTS	
TASK-11	TWO STORIED RESIDENTIAL BUILDING
Objective: Draw Plan, Elevation & Section of the two storied residential building for the given line sketch and specifications	
TASK -12	INDUSTRIAL BUILDING
Objective: Drawing plan, elevation and section of an industrial building for the given line sketch and specifications	

Content beyond syllabus: Planning of overhead Water Tanks

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Planning of various buildings	https://en.wikipedia.org/wiki/Plan_(drawing)
2	Drawing terminology	https://www.slideshare.net/MuhammedSalim8/introduction-to-civil-engineering-drawing
3	Residential and public buildings	http://mohua.gov.in/upload/uploadfiles/files/Chap-4.pdf
4	Plan and sectional views for residential and public buildings	http://www.sqipolytechnic.in/civil/downloads/Building-Drawing.pdf

Text Book(s):

1. Building Planning and Drawing by Dr.N.KumaraSwamy and A.KameswaraRao, Charotar Publishing House.
2. Building Planning Drawing and Scheduling by Guru charan singh and Jagadish Singh, Standard Publishers Distributors.

Reference Book(s):

1. Building Drawing with an integrated approach to Build environment by M.G.Shah, C.M.Kale and S.Y.Patki, McGraw-Hill Publishing Company Limited, New Delhi.
2. Civil Engineering Drawing Series “B” by R.Trimuty, M/S Premier Publishing House.

Online Resources:

1. https://en.wikipedia.org/wiki/Fluid_dynamics
2. <https://www.youtube.com/watch?v=Y5k4vxoztFo>

NARAYANA ENGINEERING COLLEGE: NELLORE								
PC	STRENGTH OF MATERIALS LAB							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. Having exposure to understand the behaviour of materials 2. Acquiring knowledge on under different types of loading 3. Acquiring expertise different types of structures 4. Having exposure in stress strain mild steel drawing plan 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Illustrate the drawing terminology							
CO 2	Analyse the loading conditions							
CO 3	Analyse the different types of beams							
CO 4	Apply the formulas and equations							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	2	-	-	-	-	-	-	-	-	-	2	2
CO2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	-	3	2
CO4	3	-	2	-	-	-	-	-	-	-	-	-	3	1
1: Low, 2-Medium, 3- High														

TASK -1:	TENSION TEST ON MILD STEEL BAR
OBJECTIVE: The mechanical properties of mild steel specimen under tension load	
TASK-2:	DOUBLESHEAR TEST ON MILD STEEL BAR
OBJECTIVE: There are two types of shear test one type shear test and second type shear test	
TASK-3:	TORSION TEST ON MILD STEEL BAR
OBJECTIVE: The mechanical properties of mild steel specimen under torsion	
TASK-4:	IZOD IMPACT TEST
OBJECTIVE: the impact resistance of mild steel specimen and cast-iron section	
TASK-5:	CHARPY IMPACT TEST
OBJECTIVE: the impact resistance of mild steel specimen and cast-iron section	
TASK-6:	ROCK WELL HARDNESS TEST

OBJECTIVE: the No. of mild steel, cast iron, brass, aluminium and spring steel	
TASK-7:	RINELL HARDNESS TEST
OBJECTIVE: determine the indentation hardness of mild steel specimen, cast iron specimen, brass specimen	
TASK-8:	SPRING TEST
OBJECTIVE: the stiffness and modulus of rigidity of the spring wire	
TASK-9:	FATIGUE STRENGTH TEST
OBJECTIVE: Fatigue tests are commonly loaded in tension – tension, compression – compression and tension into compression and reverse.	
TASK-10:	ENDING TEST OF WOODEN / STEEL BEAM
OBJECTIVE: the behaviour of mild steel rod subjected to gradual increasing equal loads at 1/3 span	
TASK-11:	COMPRESSION TEST ON WOOD AND BRICK
OBJECTIVE: the load carrying capacity of bricks under compression with the help of compression testing machine	
TASK-12:	
OBJECTIVE: beam supports, loading yoke, slotted weight hanger, dial gauges	
TASK-13:	TENSION TEST ON HYSD BAR
OBJECTIVE: Draw Plan, Elevation & Section of the two storied residential building for the given line sketch and specifications.	
TASK-14:	ROCK WELL HARDNESS TEST FOR ALUMINIUM
OBJECTIVE: the impact resistance of mild steel specimen and aluminium	
Total hours:48	

Content beyond syllabus:

planning of overhead Water Tanks

Self-Study:

Contents to promote self-Learning:

SNO	Topic	Reference
1	Torsion test on mild steel bar	https://www.youtube.com/watch?v=jpogdcw_Uh0
2	Spring test	https://www.youtube.com/watch?v=vrDzIWICgoU
3	Rockwell Hardness test	https://www.youtube.com/watch?v=z_6nUbHNI3g
4	Charpy Impact test	https://www.youtube.com/watch?v= MsAFzbl0zs

Text Book(s):

1. Gere, J.M.Mechanics of Materials. Brooks/Cole Thomson Learning

Reference Book(s):

1. Popov, E.P. Engineering Mechanics of Solids. Prentice-Hall of India Limited, New Delhi, India
2. Timoshenko, S.P. and Young, D.H. Elements of strength of materials. East-West Press Private Limited, New Delhi, India
3. Case, J., Chilver. And Ross, C.T.F. Strength of Materials and Structures. Elsevier, New Delhi

Online Resources:

1. <https://www.youtube.com/watch?v=6ZVZw5IHJ0>

Web Resources:

1. <https://www.youtube.com/watch?v=DSr4G3l8e78>

NARAYANA ENGINEERING COLLEGE: NELLORE								
PC	SURVEYING LAB							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100

Course Objectives:

To know about various surveying instruments & their applications in the field.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1	Do Plane surveying with chain, compass & plane table.
CO 2	Do Levelling & Contouring.
CO 3	Operate the theodolite & Calculate Horizontal and vertical angles.

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	2	2	-	-	-	-
CO2	3	2	-	-	-	-	-	-	2	2	-	-	-	1
CO3	3	2	-	-	-	-	-	-	2	2	-	-	-	-
1: Low, 2-Medium, 3- High														

TASK -1:	CHAIN SURVEY
OBJECTIVE: Survey of a given area by using chain survey (Closed traverse) and plotting	
TASK-2:	COMPASS SURVEY
OBJECTIVE: Determine of distance between two inaccessible points with compass.	
TASK-3:	COMPASS SURVEY
OBJECTIVE: Survey of a given area by prismatic compass (closed traverse) and plotting after adjustment.	
TASK-4:	PLANE TABLE SURVEY
OBJECTIVE: Radiation method, Intersection methods by plane table survey	
TASK-5:	PLANE TABLE SURVEY
OBJECTIVE: Two-point and three-point problems in plane table survey	
TASK-6	LEVELLING
OBJECTIVE: Reduction of levels : (i) Height of collimation method, (ii) Rise and fall method	
TASK-7:	DUMPY LEVEL
OBJECTIVE: Fly leveling (Differential Leveling) of a given area by using dumpy level	
TASK-8:	THEODOLITE SURVEYING

OBJECTIVE:	Measurement of horizontal angles with theodolite by using method of repetition and reiteration.
TASK-9:	THEODOLITE SURVEYING
OBJECTIVE:	Measure horizontal distance between two inaccessible points.
TASK-10:	THEODOLITE SURVEYING
OBJECTIVE:	Measurement of vertical angles with theodolite.
TASK-11:	COUNTOUR SURVEYING
OBJECTIVE:	Contour plan of a given area
ADDITIONAL EXPERIMENTS	
TASK-12:	COMPASS SURVEY
OBJECTIVE:	Measurement of bearings of sides of traverse with prismatic compass and computation of correct induced angle
TASK-13:	LEVELLING
OBJECTIVE:	Fixing benchmark with respect to temporary benchmark with dumpy level by fly leveling and check leveling.
Total hours:48	

Text Book(s):

1. Surveying Vol I & II by K. Arora, Standard Book House
2. Surveying Vol. I& II by B.C. Purnima, Laxmi Publication

Reference Book(s):

1. Text book of Surveying, by C. Venkata Ramaiah, University Press
2. Plane Surveying by Chandra AM, New age International Pvt. Ltd.
3. Surveying Vol.I &II by S. Duggal, McGraw Hill Education (India) private limited.
4. Surveying and Levelling by Kanetkar T.P., and Kulkarni, Vols. I and II, United Book Corporation

Online Resources:

1. <https://ctt.mtu.edu/sites/default/files/flyers/Surveying%20manual.pdf>
2. <http://www.uoh.edu.sa/en/Subgates/Faculties/CM/Departments/Civil/PublishingImages/Pages/Survey-Lab/SURVEYING%20MANUAL MAHAMID.pdf>

Web Resources:

1. <https://stwilfreds.in/images/uploads/surveying-lab-manual.pdf>
2. <https://blog.hexagongeosystems.com/manual-total-stations-designed-for-surveyors-simplify-demanding-surveying-and-stakeout-tasks-with-flexline-manual-total-stations/>

SEMESTER IV

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE2004	PC	Geotechnical Engineering-I	3	0	0	3	3	40	60	100
20CE2005	PC	Hydraulics engineering	3	0	0	3	3	40	60	100
20CE2006	PC	Structural Analysis	2	1	0	3	3	40	60	100
20CE2007	PC	Surveying&Geomatics	3	0	0	3	3	40	60	100
	OE	Open elective I	3	0	0	3	3	40	60	100
20CE2504	PC	Hydraulics Engineering lab	0	0	3	3	1.5	40	60	100
20CE2505	PC	Structural Analysis practice	0	0	3	3	1.5	40	60	100
20CE2506	PC	Surveying & Geomatics Lab	0	0	3	3	1.5	40	60	100
20CD6002	SC	Career competency Development II	0	0	2	2	1	40	60	100
20CC6002	SC	Value added course/Certificate course II	0	1	0	1	1	40	60	100
20MC8002-12	MC	Mandatory course II	2	0	0	2	0	--	--	--
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	16	2	14	32	21.5	400	600	1000

NARAYANA ENGINEERING COLLEGE: NELLORE														
	GEOTECHNICAL ENGINEERING - I													
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P			CIE	SEE	TOTAL						
IV	3	0	0	48	4	40	60	100						
Pre-requisite: Nil														
Course Objectives:														
1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.														
2. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils.														
3. To impart knowledge of design of both finite and infinite slopes.														
4. To understand theory of elasticity and its application to soils.														
5. To learn application of theory of plasticity to describe engineering behaviour of soils.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Students able to understand the origin of soil and to identify different types of soil and apply the knowledge of soil and rock to judge its behavior and suitability for civil engineering structures.													
CO 2	Students able to describe Darcy’s law for the flow of water through saturated soils; determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil.													
CO 3	Students able to calculate seepage, pore water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems Understand the principles of compaction and its control.													
CO 4	Students able to understand the various physical and engineering characteristics of different types of soil													
CO 5	Students able to describe the direct shear test method.													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	-	-	-	-	-	-	-	-	-	2	1
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	1
CO3	3	1	1	-	-	-	-	-	-	-	-	-	2	1
CO4	3	1	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	-
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	SOIL CLASSIFICATION	10H
Introduction Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship – Relative density. Index Properties of Soils Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils and unified soil classification.		

At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Study the Index Properties of Soils (BL -2) 2. Detail study of I.S. Classification of soils. C (BL-1) 3. Study the Hydrometer Method (BL-1) 		
MODULE-2	PERMEABILITY & EFFECTIVE STRESS	9H
Permeability – capillary rise – flow of water through soils – Darcy’s law permeability– Factors affecting permeability – laboratory determination of coefficient of permeability – Permeability of layered soils –Insitu permeability tests (Pumping in & pumping out test). Effective Stress: Total, neutral and effective stress –principle of effective stress - quick sand condition		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Study the permeability in soil (BL- 4) 1. Understand the laboratory determination of permeability (BL-2) 2. Illustrate the different Insitu permeability tests (BL-4) 		
MODULE-3	SEEPAGE & COMPACTION	10H
Seepage through soils – 2-D flow and Laplace’s Equation –Flow nets: Characteristics and Uses. Compaction Mechanism– factors affecting compaction – effects of compaction on soil properties – Field compaction equipment – compaction quality control.		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Study the compaction mechanism (BL-2) 2. Analyze the effect on soil under compaction (BL-1) 3. Understand the concept of seepage (BL-2) 		
MODULE-4	CONSOLIDATION OF SOIL	10H
Consolidation – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log ,p curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre consolidation pressure and its determination- Terzaghi’s 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Discuss the different process of primary and secondary consolidation (BL- 3) 2. Analyze the Terzaghi’s Theory (BL-2) 3. Illustrate the importance coefficient of consolidation (BL-4) 		
MODULE-5	SHEAR STRENGTH	9H
shear strength– Mohr’s– Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands - dilatancy– Critical Void Ratio – Liquefaction- shear strength of clays		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. Study the Importance of Shear Strength (BL-3) 2. Discuss the Types of laboratory strength test on shear (BL-4) 3. To understand Mohr’s coulomb Failure (BL-3) 		
Total hours:		48 hours

Term work: The sources are from Website			
Content beyond syllabus:			
Self-Study:			
Contents to promote self-Learning:			
SNO	Topic	CO	Reference
1	SOIL CLASSIFICATION	CO1	https://www.slideshare.net/SARASWATIPARIYA/index-property-of-soil
2	PERMEABILITY & EFFECTIVE STRESS	CO2	https://www.slideshare.net/JISMIJACOB/soil-permeability-ppt
3	SEEPAGE & COMPACTION	CO3	https://www.slideserve.com/dyami/chapter-2-seepage-in-soil
4	CONSOLIDATION OF SOIL	CO4	https://www.slideshare.net/DrAbdulmannan/lecture-8-consolidation-and-compressibility-67797802-
5	SHEAR STRENGTH	CO5	slideshare.net/wajahatullah8/lecture-11-shear-strength-of-soil-ce240

Text Book(s):

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.12th Edition, 2012.
2. Soil Mechanics and foundation engineering by Purus Hotham Raj, Pearson Publishers, 2nd edition, 2013.

Reference Book(s):

1. Geotechnical Engineering by C. Venkataraman, New age International Pvt .Ltd, 7th Edition, 2013.
2. Principles of Geotechnical Engineering by Baraja M.Das & Khaled Sobhan, Cengage, 8th Edition.
3. Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering by VNS Murthy, Taylor & Francis Group,13th Edition, 2015.

Online Resources:

3. <https://www.youtube.com/watch?v=UZ4OSBkJZWY>
4. <https://www.youtube.com/watch?v=tJrc4hA3GwU>

Web Resources:

1. <https://nptel.ac.in/courses/105/103/105103097/>
2. <https://www.geoengineer.org/education/soil-mechanics>
3. <https://vulcanhammer.net/geotechnical-courses/soil-mechanics/>
4. <http://www.nptelvideos.in/2012/11/soil-mechanics.html>

NARAYANA ENGINEERING COLLEGE: NELLORE														
20CE2005	HYDRAULICS ENGINEERING							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
IV	2	1	0	48	3	40	60	100						
Pre-requisite: Student should have knowledge about the following subjects. 1.Fluid Mechanics														
Course Objectives: 1. To develop a basic knowledge of open channel flow relationships by applying fluid properties, hydrostatics, and the conservation equations for mass, momentum, and energy. 2. To gain proficiency in applying the conservation equations to open channel flow problems. 3. To learn concepts of impact of jets on vanes & impulse turbine. 4. To learn the basics of reaction turbines. 5. To gain proficiency in understanding hydraulic turbines. 6. To learn the basics and design of centrifugal pumps.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Students able to illustrate types of flows and types of channels and velocity distribution.													
CO 2	Students able to understand the non-uniform flow in open channels													
CO 3	Students able to classify the concepts on impact of jets and impulse turbines													
CO 4	Students able to demonstrate the reaction turbines components and working principle													
CO 5	Students able to discuss the working principles of centrifugal pumps													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1	2	2	3	-	-	-	-	-	-	2	1
CO2	2	1	2	1	2	1	-	-	-	-	-	-	2	1
CO3	2	2	-	-	2	-	-	-	-	-	-	-	3	1
CO4	2	1	2	1	2	1	-	-	-	-	-	-	2	2
CO5	2	2	1	1	2	2	-	-	-	-	-	-	1	2
1-Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	FLOW IN OPEN CHANNELS	(10H)
Introduction, Classification of flows, types of channels, velocity distribution, the chezy equation, empirical formulae for the chezy constant; most economical section of channel, most economical Rectangular, Triangular channel sections; most economical trapezoidal channel section, Best side slope for most economical trapezoidal channel section; most economical circular channel section for maximum velocity and maximum discharge conditions. Concept of specific energy, Specific energy curves; critical depth, critical velocity, Critical flow, Critical flow in a rectangular channel, Critical slope, discharge curve; Different slope conditions. At the end of the Module 1, students will be able to:		
1. Understanding of the 3 basic equations of flow (continuity, momentum and energy) by correctly applying them to different problem statements. The typical case involves using a combination of equations to solve simultaneously for the unknown of interest. Also typical is the need for "appropriate" assumptions in a problem (BL2) 2. To learn the fundamentals of Uniform and Non-Uniform flow in open channels (BL1)		

3. Analyse the channel sections like rectangular, triangular, trapezoidal etc. (BL4)		
MODULE -2	NON-UNIFORM FLOW IN OPEN CHANNELS	(10H)
<p>Gradually Varied Flow: Introduction, Dynamic equation; Dynamic equation for GVF in wide Rectangular channel, classification of channel bottom slopes, Surface Profiles; Characteristics of surface profiles, Back water Curves and Draw down curves; Computation of surface profiles by single step method.</p> <p>Rapidly Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Hydraulic jump in rectangular channels, height and length of the jump, Energy loss in a hydraulic jump, Types of hydraulic jump; applications of hydraulic jump.</p>		
<p>At the end of the Module 2, students will be able to:</p> <ol style="list-style-type: none"> 1. To give an idea about the gradually varied flow their equations and computations. (BL2) 2. To give an idea about the rapidly varied flow their equations and computations. (BL2) 3. To know the applications of momentum principles. (BL3) 		
MODULE-3	IMPACT OF JETS & IMPULSE TURBINE	(10H)
<p>Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for Work done and efficiency.</p> <p>Impulse Turbine: Hydraulic Turbines - Introduction, layout of a hydro power plant, head and efficiencies of hydraulic turbines, Classification of hydraulic turbines; Pelton turbine- Introduction, parts, Velocity triangles, work done and efficiency, working proportions, design of Pelton wheel.</p>		
<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 1. To impart the knowledge of impact of jets (BL2) 2. To know about hydraulic turbines (BL2) 3. To impart the knowledge of pelton wheel turbine (BL2) 		
MODULE-4	REACTION TURBINES	(9H)
<p>Radial flow Reaction Turbine: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio. Francis turbine: main components and working, work done and efficiencies, design proportions.</p> <p>Axial flow Reaction Turbine: Kaplan turbine- main components and working, working proportions; Draft tube-types of draft tubes, draft tube theory and efficiency of draft tube; Cavitation: causes, effects.</p>		
<p>At the end of the Module 4, students will be able to:</p> <ol style="list-style-type: none"> 1. To make the student is expected to prepare models for prototypes of hydraulic structures. (BL3) 2. To impart the knowledge on pumps and turbines. (BL2) 3. Differentiate between radial flow and axial flow reaction turbine (BL4) 		
MODULE-5	CENTRIFUGAL PUMPS & DIMENSIONAL ANALYSIS	(9H)
<p>Centrifugal Pumps: Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed, Priming, specific speed, limitation of suction lift, net positive suction head (NPSH); Cavitation effects, Multistage centrifugal pumps.</p>		

Dimensional Analysis and Similitude: Introduction, derived quantities, Dimensional homogeneity; Methods of dimensional analysis- Rayleigh's method, Buckingham–Pi theorem; model analysis; similitude - types of similarities; Dimensionless numbers; Model laws.	
At the end of the Module 5, students will be able to:	
1. To make the student is expected to have thorough knowledge on the selection of pumps for practical purposes. (BL3)	
2. To understand the dimensional analysis methods and modal analysis. (BL2)	
3. Differentiate between centrifugal pump and reciprocating pump. (BL4)	
Total hours:	48 Hours

Term work:

1. Graphical determination of energy loss in Hydraulic Jump.
2. Assignment on GVF computation using Direct Step and VenTe Chow method.
3. Report on Site visit to Hydropower generation plant/Research Institute.

Content beyond syllabus:

1. **Hydropower Engineering** – Classification of hydropower plants, load factor, utilization factor, capacity factor, estimation of hydropower potential.

Self-Study:

Contents to promote self-Learning:

SN O	Topic	CO	Reference
1	MODULE-1	CO1	https://youtu.be/vLfsrd7td14
2	MODULE-2	CO2	https://youtu.be/rXaf8U2nTzc
3	MODULE-3	CO3	https://youtu.be/aE2JruZYnZ4
4	MODULE-4	CO4	https://youtu.be/IXS2ED1STu4
5	MODULE-5	CO5	www.nptel.ac.in

Text Book(s):

- 1) Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.

Reference Book(s):

- (1) Fluid mechanics and Fluid Machines by Rajput, S.Chand& Co.
- (2) Flow in Open channels by K.Subramanya. Tata McGrawHill Publishers.
- (3) Open channel Hydraulics, VenTe Chow, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
- (4) Elements of Open channel flow, Ranga Raju, Tata Mc.Graw Hill, Publications.

Online Resources:

1. https://www.e4training.com/hydraulic_courses/courses1.php
2. https://www.e4training.com/hydraulic_pumps/index.php
3. https://www.e4training.com/hydraulic_pumps/pumps1.php

NARAYANA ENGINEERING COLLEGE: NELLORE								
20CE2006	STRUCTURAL ANALYSIS							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	3	0	3	48	3	40	60	100
Pre-requisite: 1. Engineering Mechanics 2.Strength of Materials								
Course Objectives: <ol style="list-style-type: none"> 1. Ability to idealize and analyze statically determinate and indeterminate structures. 2. To equip the students with the force and displacement methods of structural Analysis. 3. To Identify the formulation and sign conventions associated with the Slope Deflection method. 4. To Understand flexibility matrices to solve problems in beams 5. To learn matrix stiffness method for analysis of skeletal structures. 6. To Calculate the internal forces in cable and arch type structures 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to analyze statically indeterminate Beams and Frames							
CO 2	Students able to analyze indeterminate structures							
CO 3	Students able to analyze the structure using Flexibility method							
CO 4	Students able to analyze the structure using Stiffness method							
CO 5	Students able to analyze the three hinged arches, Draw influence line diagram							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-	-	-
1- Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	STATICALLY INDETERMINATE BEAMS AND FRAMES	(10H)
Statically indeterminate Beams and Frames Determinateness of structures, stability and indeterminacy, External and Internal Redundancy Methods of Analysis-Force Method and Displacement Method. Clapeyron's Theorem of Three Moments, Application of theorem for -General Loading, Fixed Beams, sinking of supports. (Involving not more than 3 unknowns) Castigliano's Second Theorem, Application of theorem for -General Loading, Fixed Beams, sinking of supports and frames. (Involving not more than 3 unknowns)		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Apply equations of equilibrium to structures and compute the reactions (BL3) 2. Calculate the deflections of truss structures and beams (BL3) 3. Analyze force method and displacement method on beams (BL4) 		

MODULE -2	ANALYSIS OF INDETERMINATE STRUCTURES	(10H)
Analysis of Indeterminate Structures Slope Deflection Method, sign conventions, development of slope deflection equations, modification for simple ends, Application to beams and sway and non-sway Frames. (Involving not more than 3 unknowns) Moment Distribution Method, carry over moment, distribution factors, fixed end moments, modification of stiffness for simple ends, Application to beams and sway and non-sway frames. (Involving not more than 3 unknowns)		
At the end of the Module 2, students will be able to: 1. Calculate the slope deflections for beams and frames (BL3) 2. Analyze beams and rigid frames using Moment Distribution method (BL4) 3. Discuss about sway and non-sway frames (BL2)		
MODULE-3	FLEXIBILITY METHOD	(9H)
Flexibility Method Fundamental concepts, formulation of flexibility matrix, application to beams and sway and non-sway frames. (Involving not more than 3 unknowns) Application to pin jointed plane trusses. (Involving not more than 3 unknowns).		
At the end of the Module 3, students will be able to: 1. Determine response of structures by classical, iterative and matrix methods (BL3) 2. Analyze the Structural Beams using Flexibility Matrix Method (BL4)		
MODULE-4	STIFFNESS METHOD	(9H)
Stiffness Method Fundamental concepts, formulation of stiffness matrix, application to beams using member approach. (Involving not more than 3 unknowns) Application to sway and non-sway frames. (Involving not more than 3 unknowns)		
At the end of the Module 4, students will be able to: 1. Determine response of structures by classical, iterative and matrix methods (BL3) 2. Analyze the Structural Beams using Stiffness Matrix Methods (BL4)		
MODULE-5	THREE HINGED ARCHES AND INFLUENCE LINE DIAGRAM	(10H)
Three Hinged Arches and Influence Line Diagram Three Hinged Arches: Concept, analysis of parabolic and semi-circular arch with supports at same and different levels. Horizontal thrust, radial shear and normal thrust for parabolic and semi-circular arch. Influence Line Diagram: Basic concepts, influence line diagram for reactions, shear and bending moment for simply supported and overhanging beams.		
At the end of the Module 5, students will be able to: 1. Explain Arches and its behavior under different loading and support conditions (BL2) 2. Calculate the internal forces in cable and arch type structures (BL3) 3. Draw the influence line diagram for beams (BL3)		
Total hours:		48 hours

Term work:

1. The Term work shall include assignments based on above syllabus to be completed during Tutorial class.
2. The tutorials should also include analysis of continuous beams/portal frames/using excel sheets/structural analysis software's.

Content beyond syllabus:**1. Conjugate beam method****Self-Study:**

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Analysis of frames	CO1	https://www.youtube.com/watch?v=Lo4tXDwmUKg
2	Slope Deflection Method	CO2	https://www.youtube.com/watch?v=1iMKqDgOCIQ
3	Flexibility Method	CO3	https://academic.csuohio.edu/duffy_s/Class%20Info%20on%20Web/511_06.pdf
4	Stiffness Method	CO4	https://engineering.purdue.edu/~aprakas/CE474/CE474-Ch5-StiffnessMethod.pdf
5	Moving Loads and Influence Lines, Three hinged arch	CO5	https://www.slideshare.net/MadujithSagara/influence-lines-structural-analysis-theories https://nptel.ac.in/content/storage2/courses/105105109/pdf/m5132.pdf

Text Book(s):

1. Structural Analysis by S.S. Bhavikatti, Volume 1 and 2, Vikas Publishing House, Pvt. Ltd.
2. Theory of Structures by S. Ramamurtham, Dhanpat Rai Publishing Company (p) Ltd.

Reference Book(s):

1. Theory of Structures- B.C.Punmia, Ashok kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd.
2. Mechanics of Structures Vol. II - S.B. Junnerkar and H.J. Shaha, Charotar Publishing House.
3. Advanced Structural Analysis by A.K. Jain, Nem Chand Bros.

Online Resources:

1. http://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf
2. <http://web.iitd.ac.in/~sbhalla/cel717.pdf>
3. <https://link.springer.com/journal/40091>
4. <http://journals.azad.ac.ir/ijase/>
5. <http://textofvideo.nptel.iitm.ac.in/105101086/lec4.pdf>

Web Resources:

1. <https://www.youtube.com/watch?v=strain energy>
2. nptel.ac.in/courses/105106050/20
3. nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/.../m2I7.pdf
4. textofvideo.nptel.iitm.ac.in/

NARAYANA ENGINEERING COLLEGE: NELLORE								
20CE2007	SURVEYING & GEOMATIC							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV	3	0	0	48	4	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. These subject deals with geodetic measurements and Control Survey methodology and its adjustments. 2. The student is also exposed to the Modern Surveying. 3. To provide knowledge of Total Station & advanced surveying instruments. 4. Develop skills in using Total Station & advanced surveying instruments and analyze data. 5. Develop skills to set out Curves in the field using both Total Station. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to apply the knowledge of principles and purpose of Tacheometry in finding out the constants							
CO 2	Students able to formulate the Triangulation and setting out of curve by linear and angular methods.							
CO 3	Students able classify the different types of curves							
CO 4	Students able to Summarize the basic principles of GPS and total station, EDM in civil engineering							
CO 5	Students able to memorize the basic principles of remote sensing and geographical information systems							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	--	-	-	1	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	1	-	-	1	-	-	-	-	-	-	1	-	1
CO5	3	1	-	-	1	-	-	-	-	-	-	1	-	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	TACHEOMETRIC SURVEYING	(8H)
Tacheometric surveying: Definition, Advantages of tachometric surveying, Basic systems of tacheometric measurement, Principle of stadia measurements, Determination of constants K and C, Inclined sight with staff vertical, Inclined sight with staff normal to the line of sight, Movable hair method, Tangential method, Sub tense bar, Errors in tachometry.		
At the end of the Module 1, students will be able to: Discuss the basic system of tacheometric measurement (BL -2) <ol style="list-style-type: none"> 1. Detail study of determination of constant K and C (BL-1) 2. Study the Tangential Method (BL-1) 3. Study the different errors in tachometry survey (BL-4) 		
MODULE-2	TRIANGULATION & SETTING OUT WORKS	(9H)
Triangulation: Principles of triangulation, Uses of triangulation survey, Classification of triangulation, operations of triangulation survey, Signals and towers, Satellite station, Base line & Extension of the base line. Setting out works: Introduction, Control stations; Horizontal control,		

Reference grid, Vertical control, Positioning of a structure; offset pegs, setting out a foundation-reference pillars, batter boards, setting out with a theodolite; Graded stakes; setting out a sewer; Setting out a culvert.

At the end of the Module 2, students will be able to:

1. Identify the Triangulation surveying (BL – 4)
2. Study the setting out work by using theodolite (BL-2)
3. Illustrate the important uses of theodolite (BL-4)

MODULE-3	CURVES	(9H)
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Curves: Simple curves–Definitions and Notations, designation of a curve, Elements of simple curves, location of tangent points, selection of peg interval, Methods of setting simple curves (based on equipment) – Rankines method, Two theodolite method. Compound curves – Elements of compound curve, setting out compound curve. Reverse curves – Elements of reverse curve, relationship between various elements.

At the end of the Module 3, students will be able to:

1. Discuss the different process of curves (BL- 3)
2. Analyze the methods of setting simple curves (BL-2)
3. Illustrate the importance elements of curves (BL-4)

MODULE-4	MODERN FIELD SURVEY SYSTEMS	(10H)
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Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

At the end of the Module 4, students will be able to:

1. Study the modern field survey systems (BL-3)
2. Discuss the Errors in Total station (BL-4)
3. To understand concept of EDM and GPS (BL-3)

MODULE-5	CONCEPTS OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS	(12H)
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Remote Sensing: Concept of remote sensing, Principles of remote sensing, Components of remote sensing, Elements in remote sensing, Platforms for remote sensing, Types of remote sensing, Remote sensing systems, the principal steps used to analyses remotely sensed data, Data reception, transmission and processing. **Geographic Information Systems (GIS):** Definition, Objectives of GIS, Components of GIS, GIS architecture, Data – Raster and vector data processing methods, Data input, Data storage and retrieval, Data manipulation and analysis, Data output, Applications of GIS in Civil Engineering.

At the end of the Module 5, students will be able to:

1. Study the characteristics of concept of Remote sensing and GIS (BL-2)
2. Analyze the elements in Remote sensing (BL-1)
3. Understand the concept of Applications of GIS in Civil Engineering (BL-2)

Total hours: 48 hours

Term work:

1. The sources are from Website

Content beyond syllabus:

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy,

ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	TACHEOMETRIC SURVEYING	CO1	https://www.youtube.com/watch?v=hZjGSV0kk
2	TRIANGULATION & SETTING OUT WORKS	CO2	https://www.slideshare.net/ShivamMehta25/ng-out-work https://www.slideshare.net/sheilasham/triangulation-28081746
3	CURVES	CO3	https://www.slideshare.net/Lord1911/curves-their-application-in-survey
4	MODERN FIELD SURVEY SYSTEMS	CO4	https://www.slideshare.net/mshanmugaraj1/modern-surveying
5	CONCEPTS OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS	CO5	https://www.slideshare.net/amalmurali47/seminar-28925946 https://www.slideshare.net/arniontech/gis-presentation-13885167

Text Book(s):

1. Surveying, Vol- II and III by Arora, K.R., StaUKnda00rd Book House.
2. Advanced Surveying: Total Station, GIS and Remote Sensing by Madhu, N, Sathikumar, R and Satheesh Gopi, Pearson India.
3. Surveying Vol. I & II by B.C. Punmia, Laxmi Publications

Reference Book(s):

1. Geomatics Engineering by Manoj, K. Arora and Badjatia, Nem Chand & Bros.
2. Surveying and Levelling, Vol. I and II by Bhavikatti, S.S., I.K. International.
3. Higher Surveying by Chandra, A.M., New Age International (P) Limited.
4. Remote sensing and Geographical information system by Anji Reddy, M., B.S. Publications.

Online Resources:

1. <https://nptel.ac.in/courses/105104101/> <http://nptel.ac.in>

Web Resources:

- 1) <https://www.youtube.com/watch?v=hZjGSV000kk>
- 2) <https://www.slideshare.net/mshanmugaraj1/modern-surveying>
- 3) <https://www.youtube.com/watch?v=slo3ejj1vRM>
- 4) <https://www.youtube.com/watch?v=NCOB2L4qtvA>
- 5) <https://www.youtube.com/watch?v=VfDAd-MO94o>

NARAYANA ENGINEERING COLLEGE: NELLORE														
20CE2504	HYDRAULICS ENGINEERING LAB							R2020						
Semester	Hours / Week			Total hrs	Credit C	Max Marks								
	L	T	P			CIE	SEE	TOTAL						
IV	0	0	3	48	1.5	40	60	100						
Pre-requisite: Student should have knowledge about the following subjects. 1.Fluid Mechanics														
Course Objectives: 1. To provide practical knowledge in verification of principles of fluid flow 2. To impart knowledge in measuring pressure, discharge and velocity of fluid flow 3. To understand Major and Minor Losses 4. To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and Head														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Students able to analyze flow rates, velocities, energy losses and momentum flux for fluid system and also understand the fundamentals of laminar and turbulent boundary layer.													
CO 2	Students able to present data or governing equations in non-dimensional form, design experiments, and perform model studies													
CO 3	Students able to decide when appropriate to use ideal flow concepts and the Bernoulli equation.													
CO 4	Students able to calibrate various flow measuring devices in pipe and open channel flow.													
CO 5	Students able to determine various losses and velocity in pipe flow in field.													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	2	-	-
1-Low, 2-Medium, 3- High														
														co
Task- 1: Calibration of Venturimeter.														CO1
Objective: To study the variation of Cod and discharge with respect the head.														CO1
Task- 2: Calibration of Orifice meter.														CO1
Objective: To Determine the coefficient of Discharge (Cd) using the orifice meter.														CO1
Task- 3: Determination of Coefficient of discharge for an external mouth piece by variable head method.														CO2
Objective: To Determine the coefficient of Discharge (Cd) of the given mouth piece.														CO2
Task- 4: Calibration of contracted Rectangular Notch and /or Triangular Notch.														CO2
Objective: To Determine the coefficient of discharge of Rectangular notch.														CO2
Task- 5: Determination of Coefficient of loss of head in a sudden contraction and friction factor.														CO3
Objective :TO Determine the Head loss in pipe Fitting														CO3

Task- 6: Verification of Bernoulli's equation.	CO3
Objective: 1.To Determine the variation of the pressure along a converging-diverging pipe section. 2. The objective is to validate Bernoulli's assumptions and theorem by experimentally proving that the sum of the terms in the Bernoulli equation along a streamline always remains a constant.	CO3
Task- 7: Impact of jet on vanes.	CO3
Objective: To Verify the momentum equation experimentally through Impact of jet experiment.	CO3
Task- 8: Study of Hydraulic jump.	CO4
Objective: To Determine the Hydraulic jump in a Horizontal rectangular channel and development of different relationships between Height, length, efficiency and energy loss of a jump.	CO4
Task- 9: Performance test on Pelton wheel turbine.	CO4
Objective: Performance characteristics (output and efficiency variation with speed) for different openings of the nozzle at a constant input head.	CO4
Task- 10: Performance test on Francis turbine.	CO4
Objective: To Study the Characteristics curves of a Francis turbine at constant Head condition.	CO4
Task- 11: Efficiency test on centrifugal pump.	CO5
Objective: To plan the operational characteristics curves of multistage centrifugal pump.	CO5
Task- 12: Determination of Coefficient of discharge for a small orifice by a constant head method.	CO5
Objective: To Determine the coefficient of Discharge (Cd) using the small orifice meter.	CO5
Virtual labs: 1. http://eerc03-iiith.vlabs.ac.in/List%20of%20experiments.html	

Text Books:

- (1) Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.

Reference Book(s):

- (1) Fluid mechanics and Fluid Machines by Rajput, S.Chand& Co.
- (2) Flow in Open channels by K.Subramanya. Tata McGrawHill Publishers.
- (3) Open channel Hydraulics, VenTe Chow, Tata McGraw Hill Publishing Co. Ltd, New Delhi.
- (4) Elements of Open channel flow, Ranga Raju, Tata Mc.Graw Hill, Publications.

NARAYANA ENGINEERING COLLEGE: NELLORE								
20CE2505	STRUCTURAL ANALYSIS PRACTICE							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV	0	0	3	48	1.5	40	60	100
Pre-requisite:								
Course Objectives: <ol style="list-style-type: none"> 1. Ability to idealize and analyze statically determinate and indeterminate structures. 2. To equip the students with the force and displacement methods of structural Analysis. 3. To Identify the formulation and sign conventions associated with the Slope Deflection method. 4. To Understand flexibility matrices to solve problems in beams 5. To learn matrix stiffness method for analysis of skeletal structures. 6. To Calculate the internal forces in cable and arch type structures 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to analyze statically indeterminate Beams and Frames							
CO 2	Students able to analysis of indeterminate structures							
CO 3	Students able to analyze the structure using Flexibility method							
CO 4	Students able to analyze the structure using Stiffness method							
CO 5	Students able to analyze the three hinged arches, Draw influence line diagram							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-	-	-
1- Low, 2-Medium, 3- High														

COURSE CONTENT
Task 1: Statically indeterminate Beams and Frames
Practice problems on Determination of degree of indeterminacy, Clapeyron's Theorem of Three Moments and Castigliano's Second Theorem for General loading (involving not more than 3 unknowns)
Task 2: Analysis of Indeterminate Structures
Practice problems on Slope Deflection Method and Moment Distribution Method applied to beams and sway and non-sway Frames. (Involving not more than 3 unknowns)
Task 3: Flexibility Method
Practice problems on Flexibility Method applied to beams, pin jointed trusses and sway and non-sway frames. (Involving not more than 3 unknowns)
Task 4: Stiffness Method
Practice problems on Stiffness Method applied to beam and sway and non-sway frames.

(Involving not more than 3 unknowns)			
Task 5: Three Hinged Arches and Influence Line Diagram			
Practice problems on Influence Line Diagram for reactions, shear and bending moment for simply supported and overhanging beams. Practice problems on Three Hinged Parabolic and Semi-circular Arches to determine Horizontal thrust, radial shear and normal thrust			
Task 6: Approximate Methods of Analysis			
Practice problems on approximate methods of analysis of multi-storied multi-bay 2-D rigid jointed frames by substitute frame method, portal method and cantilever method.			
Self-Study:			
Contents to promote self-Learning:			
SNO	Topic	CO	Reference
1	Analysis of frames	CO1	https://www.youtube.com/watch?v=Lo4tXDwmUKg
2	Slope Deflection Method	CO2	https://www.youtube.com/watch?v=1iMKqDgOCIQ
3	Flexibility Method	CO3	https://academic.csuohio.edu/duffy_s/Class%20Info%20on%20Web/511_06.pdf
4	Stiffness Method	CO4	https://engineering.purdue.edu/~aprakas/CE474/CE474-Ch5-StiffnessMethod.pdf
5	Moving Loads and Influence Lines, Three hinged arch	CO5	https://www.slideshare.net/MadujithSagara/influence-lines-structural-analysis-theories https://nptel.ac.in/content/storage2/courses/105105109/pdf/m5132.pdf
Text Book(s):			
1. Structural Analysis by S.S. Bhavikatti, Volume 1 and 2, Vikas Publishing House, Pvt. Ltd.			
2. Theory of Structures by S. Ramamurtham, Dhanpat Rai Publishing Company (p) Ltd.			
Reference Book(s):			
1. Theory of Structures- B.C.Punmia, Ashok kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd.			
2. Mechanics of Structures Vol. II - S.B. Junnerkar and H.J. Shaha, Charotar Publishing House.			
3. Advanced Structural Analysis by A.K. Jain, Nem Chand Bros.			
Online Resources:			
1. http://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf			
2. http://web.iitd.ac.in/~sbhalla/cel717.pdf			
3. https://link.springer.com/journal/40091			
4. http://journals.azad.ac.ir/ijase/			
5. http://textofvideo.nptel.iitm.ac.in/105101086/lec4.pdf			

NARAYANA ENGINEERING COLLEGE: NELLORE								
20CE2506	SURVEYING & GEOMATIC LAB							R2021
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV	0	0	3	48	1.5	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. This subject deals with geodetic measurements and Control Survey methodology and its adjustments. 2. The student is also exposed to the Modern Surveying. 3. To provide knowledge of Total Station & advanced surveying instruments. 4. Develop skills in using Total Station & advanced surveying instruments and analyses data. 5. Develop skills to set out Curves in the field using both Total Station. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Apply the knowledge of principles of theodolite in finding out the angles, distances, traversing							
CO 2	Apply the knowledge of principles of tachometric in finding out the height, distances and elevation							
CO 3	Student able to do contouring, traversing, find out area from total station							
CO 4	Students able to take measurements using ASD							
CO 5	Students able to generate a simple curve, contour plan and building layout for given area							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	-	-	-	-	2	-	1
CO2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	1	-	1
CO5	2	-	-	-	2	-	-	-	-	-	-	1	-	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT
Task -1: Measurement of horizontal and vertical angles theodolite by method of repetition & reiteration method.
Task -2: Determination of horizontal distance between two inaccessible points with theodolite.
Task -3: Locating given building by theodolite traversing
Task -4: Determination of elevation of point by trigonometric levelling
Task -5: Height and distances using principles of tachometric surveying
Task -6: To set out a simple circular curve by Rankine's method
Task -7: To study the various electronic surveying instruments like EDM, Total Station etc
Task -8: Determine of area using total station
Task -9: Traversing using total station.
Task -10: Contouring using total station.

Task -11: To take measurements using ASD Spectrometer.
Task -12: To take measurements using ASD Field Spec range.
Additional experiments
Task -14: Contour plan of given area.
Task -15: To give layout of given plan of building.
Task -16: Determination of remote height using total station.
Virtual labs:
1. http://sliitr.vlabs.ac.in/sliitr/List%20of%20experiments.html?domain=Civil%20Engineering

Text Book(s):
1. S.S. Bhavikatti, “Surveying theory & Practice”, 2nd edition, Dreamtech press, wiley distributors.
2. C. Venkataramaiah, “Text book of surveying”, 2nd edition, university press, 2018.
Reference Book(s):
1. Arora K R “Surveying” Vol 1, 2& 3, Standard book house, Delhi, 2004.
Online Resources
1. https://nptel.ac.in/courses/105104101/
Web Resources:
1. https://leica-geosystems.com/en-in/products/total-stations/manual-total-stations

SEMESTER V

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE2008	PC	Design of Reinforced Concrete Structures	3	0	0	3	3	40	60	100
20CE2009	PC	Geotechnical Engineering-II	3	0	0	3	3	40	60	100
20CE2010	PC	Water Resources Engineering	3	0	0	3	3	40	60	100
	OE	Open elective II	3	0	0	3	3	40	60	100
20CE4001-05	PE	Professional Elective I	3	0	0	3	3	40	60	100
20CE2507	PC	Computer Aided Drafting of Buildings	0	0	3	3	1.5	40	60	100
20CE2508	PC	Geotechnical Engineering Lab	0	0	3	3	1.5	40	60	100
20CD6003	SC	Career competency Development III	0	0	2	2	1	40	60	100
20CC6003	SC	Value added course/Certificate Course III	0	1	0	1	1	40	60	100
20CE7501	PR	Internship I/on job training/Com Ser Project	0	0	0	0	1.5	00	100	100
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	15	1	11	27	21.5	360	640	1000

NARAYANA ENGINEERING COLLEGE:NELLORE														
20CE2002	DESIGN OF REINFORCED CONCRETE STRUCTURES							R2020						
Semester	Hours / Week			Total hrs	Credit C	Max Marks								
	L	T	P			CIE	SEE	TOTAL						
V	3	1	0	48	4	40	60	100						
Pre-requisite: Student should have knowledge of fundamentals of Materials of constructions, Strength of Materials and Concrete Technology.														
Course Objectives: 1. To realize the basic concept of reinforcement in Reinforced Cement Concrete and its methods. 2. To analyze stress and load carrying capacity in different structural elements. 3. To design and detail the structural elements as per IS codes. 4. To impart understanding of various aspects of design of Reinforced Concrete.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Illustrate the concepts of Reinforced Cement Concrete, compare various design methodologies, identify grades of concrete and steel, types of loads acting on structures, and analyse beams.													
CO 2	Design Beams using Limit state analysis for shear,torsion and Bond													
CO 3	Differentiate between one way and two way slabs, Design one way, one way continuous and two way slabs.													
CO 4	Understand behavior of compression members and Design them using Limit state method													
CO 5	Design footings economically and suitably recommend the appropriate type according to site conditions. Economically design Staircase.													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	3	-	-	-	-	-	-	-	-	-	2	-
1: Low, 2-Medium, 3- High														
COURSE CONTENT														
MODULE – 1				INTRODUCTION								(10H)		
Concepts of RCC Design: Introduction to Working stress method - Limit State method – Material Stress- Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS: 456 – 2000.														
Design of Beams: Limit state analysis and design of singly reinforced, doubly reinforced.														
Design of Flanged Beams: Limit state analysis and Design of T and L beam sections.														
At the end of the Module 1, students will be able to:														
1. Explain the methods of RCC Design (BL2) 2.Ability to Design the single reinforced beam and Double reinforced beams using limit State method(BL3)														
MODULE -2				BEAMS								(10H)		

Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

At the end of the Module 2, students will be able to:

1. Understand the concepts of Shear, Torsion and bond(BL3)
2. Ability to Design the Simply supported and continuous beams using anchorage and Development length (BL2)

MODULE-3	SLABS	(10H)
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Design of One way and Two way Slabs: Simply Supported Slabs on all Four Sides, Moment in Two way Slabs with Corners held down. Choosing Slab Thickness. I.S. Code Provisions. Detailing of Reinforcement.

At the end of the Module 3, students will be able to:

1. Understand the Difference between One way and Two way slabs(BL2)
2. Design the One way and Two way slabs as per IS Codal provisions (BL4)

MODULE-4	COLUMNS	(9H)
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Columns: Short and Long Columns, Minimum Eccentricity, Short Column under Axial Compression, Column with Helical and Tie Reinforcement.

At the end of the Module 4, students will be able to:

1. Understand the Types of Columns (BL4)
2. Design the Columns as per IS Codal provisions (BL4)

MODULE-5	FOOTINGS AND STAIRCASE	(9H)
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Design of Footings - isolated (square, rectangular) and Combined footings.

Design of Stair case – Dog legged and Open well.

At the end of the Module 5, students will be able to:

1. Design Footings as per IS Codal provisions (BL4)
2. Design staircases as per IS Codal provisions (BL4)

Total hours:		48 Hours
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Term work:

LIST OF TOPICS :

1. Prepare a case study of failure of structures due to wrong design, use of poor quality of materials and faulty construction methods.
2. Design the structural elements-Beams, slabs and columns for residential building (One and Two story building).
3. Visit to nearby multi-storeyed building/Apartment etc and collect the structural details.

Content beyond syllabus:

1. Cantilever Slab.
2. Waffle Slab
3. Design of Pile foundations

Self-Study:

Contents to promote self-Learning:

SN	Topic	CO	Reference
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O			
1	Introduction	CO1	http://www.engineerstudent.co.uk/reinforced-concrete-structures.html
2	Beams	CO2	https://en.wikipedia.org/wiki/Beams.html
3	Slabs	CO3	https://ia600801.us.archive.org/1/items/ReinforcedconcretestructuresByNKrishnaRaju.pdf
4	Columns	CO4	https://archive.org/details/Reinforcedconcretestructures_BCPunmia
5	Footings and Stair case	CO5	https://nptel.ac.in/courses/105/105/105105108/ https://archive.org/details/https://archive.org/details/Reinforcedconcretestructures_BCPunmia

Text Book(s):

1. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi
2. Limit State Design of Reinforced Concrete by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
3. Design of Reinforced Concrete Structures by K.Subramanian , Oxford University press India.

Reference Book(s):

1. Design of RCC Structures by M.L.Gambhir P.H.I. Publications, New Delhi.
2. Limit State Design of RCC Structures – P.C.Varghese, Printice Hall of India, New Delhi
3. Reinforced Concrete Design by Pillai & Menon, TMH Publishers.
4. Analysis of Skeletal Structures by Seetharamulu Kaveti, TMH publications.
5. IS 456 (2000): Plain and Reinforced Concrete- Code of Practice.

Online Resources:

4. <https://link.springer.com/journal/11223>
5. <https://www.journals.elsevier.com/Reinfocedconcretestructures>
6. <http://www.aboutcivil.org/reinforcedconcretestructures.html>
7. <http://nptel.ac.in/courses/105105108/>
8. <http://nptel.ac.in/downloads/112106141/>

Web References:

1. <http://www.nptel.ac.in>
2. <http://www.rmct.com/Resources>
3. <https://ia600801.us.archive.org/1/items/Reinforcedconcretestructures.PDF>
4. <https://archive.org/download/ReinforcedconcretestructuresbyPCVarghese>

NARAYANA ENGINEERING COLLEGE:NELLORE								
20CE2009	GEOTECHNICAL ENGINEERING-II							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100
Pre-requisite: 1.Geotechnical Engineering-I								
Course Objectives: <ul style="list-style-type: none">• To provide a coherent development to the students for the courses in sector of Geotechnical Engineering etc.• To present the foundations of many basic Engineering tools and concepts related Geotechnical Engineering.• To give an experience in the implementation of engineering concepts which are applied in field of Geotechnical Engineering.• To involve the application of scientific and technical principles of planning, analysis, design of foundation.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand soil exploration methods							
CO 2	Determine the stability of slopes by using different methods							
CO 3	Determine the earth pressures on foundations and retaining structure							
CO 4	Analyse the shallow foundations							
CO 5	Analyse the deep foundations							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	1	-	-	-	-	-	-	-	-	1	1
CO2	3	3	2	1	-	-	-	-	-	-	-	-	1	1
CO3	3	3	2	1	-	-	-	-	-	-	-	-	1	1
CO4	3	3	2	1	-	-	-	-	-	-	-	-	1	1
CO5	3	3	2	1	-	-	-	-	-	-	-	-	1	1
COURSE CONTENT														
MODULE – 1					SOIL EXPLORATION								(9H)	
Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.														
At the end of the Module 1, students will be able to:														
1. Illustrate the stages of soil exploration. 2. Explain about plate load test. 3. Understand about preparation of investigation report.														
MODULE -2					STABILITY OF SLOPES								(9H)	
Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop’s Simplified method – Taylor’s Stability Number- Stability of slopes of earth dams under different conditions.														

At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Differentiate between infinite and finite earth slopes. 2. Discuss about types of slope failures. 3. Explain about the bishop's simplified method. 		
MODULE-3	EARTH PRESSURE THEORIES	(10H)
Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Rebhann's and Culmann's graphical method. Retaining walls: Types of retaining walls – stability of retaining walls.		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the rankine's earth pressure theory. 2. Illustrate the types of retaining walls. 3. Explain about coulomb's earth pressure theory. 		
MODULE-4	SHALLOW FOUNDATIONS	(10H)
Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi's, Meyerhoff's and Skempton's Methods. Allowable bearing pressure: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures – Settlement Analysis.		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. What are the shallow foundations? 2. Explain about allowable bearing pressure. 3. Explain about terzaghi's methos. 		
MODULE-5	DEEP FOUNDATIONS	(10H)
Pile foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests – Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.		
Well foundations: Types – Different shapes of wells – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Explain different types of pile foundation. 2. Discuss about pile load test. 3. Brelify tell about well foundations. 		
Total hours:		48 Hours

Term work:				
Content beyond syllabus:				
Self-Study:				
Contents to promote self-Learning:				
SNO	Topic	CO	Reference	
1	Soil exploration	CO1	https://theconstructor.org/geotechnical/site-investigation-soil-exploration/312/	
2	Stability of slopes	CO2	http://www.gpcet.ac.in/wp-content/uploads/2018/04/UNIT-2-1.pdf	

3	Earth pressure theories	CO3	https://www.jntua.ac.in/gate-online-classes/registration/downloads/material/a159166952256.pdf
4	Shallow foundations	CO4	https://theconstructor.org/geotechnical/shallow-foundations-types/5308/
5	Deep foundations	CO5	https://theconstructor.org/geotechnical/types-of-deep-foundation/7252/

Text Book(s):

1. C.Venkataramaiah, "Geotechnical Engineering", New Age Publications.
2. Arora, "Soil Mechanics and Foundation Engineering" Standard Publishers and Distributors, Delhi.
3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil "Mechanics and Foundations", Laxmi, publications Pvt. Ltd., New Delhi.

Reference Book(s):

1. Purushotama Raj, "Soil Mechanics and Foundation Engineering", Pearson Publications.
2. Das, B.M., "Principles of Foundation Engineering", 6th edition (Indian edition) Thomson Engineering (1999).
3. Varghese, P.C., "Foundation Engineering", Prentice Hall of India., New Delhi.
4. V.N.S. Murthy, "Foundation Engineering", CRC Press, New Delhi.
5. Bowles, J.E., "Foundation Analysis and Design", 4th Edition, McGraw-Hill Publishing company, New York.

Online Resources:

9. <https://civilquery.com/types-of-deep-foundation-and-their-uses-in-construction/>
10. <https://civilquery.com/types-of-deep-foundation-and-their-uses-in-construction/>
11. <https://www.apsed.in/post/rankine-earth-pressure-theory>
12. <https://www.yourarticlelibrary.com/soil/soil-exploration-purpose-planning-investigation-and-tests/45862>

Web References:

1. <https://www.yourarticlelibrary.com/soil/soil-exploration-purpose-planning-investigation-and-tests/45862>
2. <https://www.mdpi.com/2076-3417/12/12/6205>

NARAYANA ENGINEERING COLLEGE: NELLORE														
20CE2014	WATER RESOURCE ENGINEERING							R2020						
Semester	Hours / Week			Total hrs	Credit C	Max Marks								
	L	T	P			CIE	SEE	TOTAL						
V	3	0	0	48	3	40	60	100						
Pre-requisite: Basic knowledge of Steel structures engineering at UG Level.														
Course Objectives:														
<div>1. Impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth</div> <div>2. To impart the knowledge of various irrigation techniques , requirements of the crops</div> <div>3. To Describe the various hydrograph components</div> <div>4. To learn about distribution systems for canal irrigation, design of unlined and lined irrigation canals design sediment problems associated with canal</div> <div>5. To get concept of various surface and subsurface geophysical methods for groundwater explorations.</div>														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Understand various components of hydrologic cycle that affect the movement of water in the earth (BL-2)													
CO 2	understand Various Infiltration technique (BL-23)													
CO 3	Analyze the distribution of water.(BL-5)													
CO 4	Understand the concepts of movement of ground water beneath the earth (BL-2)													
CO 5	Distribution systems for canal irrigation and the basics of design of Reservoir(BL- 4)													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-		-	-	-	-	-	-	-	2	2	-	2	-
CO2	-		-	3	-	-	-	-	-	-	-	-	1	2
CO3	2	2	2	-	-	-	2	-	-	1	-	-	1	-
CO4	2	2	2		-	1	-	-	-	-	-	-	2	-
CO5	2	1	2	2	-	2	2	-	-	-	-	-	1	1
1: Low, 2-Medium, 3- High														
COURSE CONTENT														
MODULE – 1		INTRODUCTION TO HYDROLOGY										(10H)		
History of hydrology, applications in engineering, sources of hydrological data; Hydrologic cycle; catchment, stream patterns; basin characteristics, classifications of watersheds; precipitation- types and forms of precipitation; weather systems for precipitation, characteristics of precipitation in India; measurement of precipitation , types of rain gauges, Presentation of Rainfall data, computation of average rainfall over a basin.														
At the end of the Module 1, students will be able to:														
<div>1. (BL-2)</div> <div>2. (BL-4)</div>														
MODULE -2		ABSTRACTIONS FROM PRICIPITATIONS										(10H)		
Introduction, Evaporation, factors affecting evaporation, measurement of evaporation, methods to reduce evaporation losses; Transpiration, Factors effecting transpiration; Evapotranspiration, measurement of evapotranspiration; Infiltration, infiltration capacity factors affecting infiltration capacity, measurement of infiltration, classification of infiltration capacities, infiltration indices.														

At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. To study (BL-2) 2. Analyze troubles. (BL-4) 3. To understand the. (BL-2) 		
MODULE-3	HYDROGRAPHS	(10H)
Runoff process, Components of stream flow, Factors affecting runoff, Estimation of runoff, Empirical formulae and Infiltration method; Flow-duration curve, Flow-mass curve; Hydrographs, Components of hydrograph, Base flow separations, Unit hydrograph, Derivation of Unit hydrograph, Unit hydrograph of different durations, Use and limitations of UH, Duration of the Unit hydrograph.		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the (BL-2) 2. Illustrate the (BL-2) 3. Analyze the (BL-2) 		
MODULE-4	GROUND WATER	(10H)
Introduction, Aquifer, Aquiclude, Aquifuge, aquifer parameters- porosity, Specific yield, Specific retention; Divisions of sub-surface water; Water table; Types of aquifers; storage coefficient-coefficient of permeability and transmissibility; well hydraulics- Darcy's law; Steady radial flow to a well –Dupuit's theory for confined and unconfined aquifers; Tube well; Open well; Yield of an open well–Constant level pumping test, Recuperation test.		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. . (BL-4) 2. BL-2) 3. (BL-2) 		
MODULE-5	RESERVOIR PLANNING	(8H)
Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass in flow curve; Determination of safe yield from a reservoir of a given capacity; Reservoir sedimentation; Life of reservoir; Reservoir sediment control.		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Ability to BL-3) 2. understanding (BL-2) 3. Ability t(BL-3) 		
Total hours:		48 Hours

Term work:

4. Field Visit to water treatment Plant.

Content beyond syllabus:

1. Groundwater systems
2. Floodplain management
3. Multipurpose reservoir 3 operation

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
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1	INTRODUCTION TO HYDROLOGY	CO1	https://www.slideshare.net/AbdulHakimMobin/1-introduction-to-hydrology-108132250
2	ABSTRACTIONS FROM PRICIPITATIONS	CO2	https://uomustansiriyah.edu.iq/media/lectures/5/5_2019_09_29!02_25_26_PM.pdf
3	HYDROGRAPHS	CO3	https://www.slideshare.net/FritzLejarso1/hydrograph
4	GROUND WATER	CO4	https://www.epa.gov/sites/default/files/documents/groundwater.pdf
5	RESERVOIR PLANNING	CO5	https://www.slideshare.net/SunnyAgarwal7/reservoir-planning-83659195

Text Book(s):

1. Irrigation Engineering and Hydraulic Structures by S. K. Garg; Khanna Publishers, Delhi
2. Irrigation And Water Power Engineering by Punmia, Laxmi Publications Pvt. Ltd., New Delhi.

Reference Book(s):

1. Engineering Hydrology by K.Subramanya, The Tata McGraw Hill Company, Delhi
2. Engineering Hydrology by Jayarami Reddy, Laxmi publications Pvt. Ltd., New Delhi

Online Resources:

1. <https://nptel.ac.in/courses/105104103>
2. <https://archive.nptel.ac.in/courses/105/104/105104103/>
3. <https://www.digimat.in/nptel/courses/video/105108130/L14.htm>

Web References:

1. https://oldweb.nitw.ac.in/media/uploads/2021/08/29/7_water-resources-engineering.pdf
2. <https://www.digimat.in/nptel/courses/video/105104103/L24.html>

NARAYANA ENGINEERING COLLEGE : NELLORE								
20CE2508	COMPUTER AIDED CIVIL ENGINEERING DRAWING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
V	0	0	3	48	1.5	40	60	100
Pre-requisite:								
Course Objectives: <ul style="list-style-type: none">1. Visualizing and applying basic drafting fundamentals.2. Preparing and editing engineering drawings.3. Creating CAD drawings.4. Calculating part features using math skills.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	To make the student prepare engineering drawings conventionally involving various design parameters							
CO 2	To introduce fundamentals of computer aided drawing in Civil Engineering							
CO 3	To enable the student develop drawing of building components							
CO 4	To enable the students Communicate designs graphically							
CO 5	To teach methodologies for understanding and verification of CAD							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	1	-	-	-	-	2	-	-	-	2	2	1
CO2	2	-	1	-	-	-	-	1	-	-	-	2	2	1
CO3	2	-	1	-	-	-	-	2	-	-	-	2	2	1
CO4	2	-	1	-	-	-	-	1	-	-	-	2	2	1
CO5	2	-	1	-	-	-	-	1	-	-	-	2	2	1
1-Low, 2-Medium, 3-High														

COURSE CONTENT	
TASK -1: Introduction to computer aided drafting	
Objective: Introduce computer applications in developing drawing skills	
TASK -2: Software for CAD – Introduction to different software's	
Objective: To understand the different civil engineering Softwares	
TASK -3: Practice exercises on CAD software	
Objective: To develop skill to use software to create 2D and 3D models.	
TASK -4: Detailing of Building Components using CAD Software.	
Objective: Acquaint with AUTOCAD software	
TASK -5: Drawing of Line diagram of Residential Building Using CAD software.	
Objective: Understand planning the components of building and standard dimensions.	
TASK -6: Drawing of Plan, Section & Elevation for Residential Buildings Using CAD Software.	
Objective: Understand basic terms plan section and elevation in drawing	
TASK -7: Drawing Line diagram for Multi Storey Residential Buildings	
Objective: Understand planning the components of building and standard dimensions.	
TASK -8: Drawing of Plan, Section & Elevation for Residential Multi Storey Buildings Using CAD Software.	
Objective: Understand building bye-laws	

TASK -9: Drawing of Plan, Section & Elevation for Hospital Building Using CAD Software
Objective: Develop floor plan, elevation and section
TASK -10: Drawing of Plan, Section & Elevation for Industrial Buildings Using CAD Software.
Objective: Draw various views of building.
Virtual Labs:
1. https://3dp-dei.vlabs.ac.in/exp/simulation-additive-manufacturing/simulation.html

Text Book(s):
<ol style="list-style-type: none"> 1. Engineering graphics with Auto CAD - R.B. Choudary , Anuradha Publishes 2. Ajeet Singh (2002), “Working with AUTOCAD 2000 with updates on AUTOCAD 200I”, Tata- Mc Graw-Hill Company Limited, New Delhi 3. N. Kumara Swamy, A. Kameswara Rao “Building Planning and Drawing”
Reference Book(s):
<ol style="list-style-type: none"> 1. Balagopal and Prabhu (1987), “Building Drawing and Detailing”, Spades publishing KDR building, Calicut, (Corresponding set of) CAD Software Theory and User Manuals. 2. Sikka, V.B. (2013), “A Course in Civil Engineering Drawing”, S. K. Kataria & Sons, 3. Sham Tickoo Swapna D (2009), “AUTOCAD for Engineers and Designers”, Pearson Education

NARAYANA ENGINEERING COLLEGE : NELLORE								
20CE2508	GEOTECHNICAL ENGINEERING LAB							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
V	0	0	3	48	1.5	40	60	100
Pre-requisite:								
Course Objectives: <ol style="list-style-type: none"> 1. Communicate a various characteristics of soils 2. To impart knowledge on soil exploration. 3. To enable the students to differentiate between compaction and consolidation of soils and to determine the consolidation settlement. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to identify various soils based on their characteristics.							
CO 2	Students able to evaluate permeability and seepage of soils.							
CO 3	Students able to determine plasticity characteristics of various soils							
CO 4	Students able to design consolidation process by predicting settlement of soils							
CO 5	Students able to determine the shear strength of the soil.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	1	-	-	-	-	2	-	-	-	2	2	1
CO2	2	-	1	-	-	-	-	1	-	-	-	2	2	1
CO3	2	-	1	-	-	-	-	2	-	-	-	2	2	1
CO4	2	-	1	-	-	-	-	1	-	-	-	2	2	1
CO5	2	-	1	-	-	-	-	1	-	-	-	2	2	1
1-Low, 2-Medium, 3-High														

COURSE CONTENT
TASK -1: Specific gravity.
Objective: To enable the student to find out the index properties of the soil and classify it.
TASK -2: Atterberg's Limits.
Objective: To enable the student to characterize and classify soils based on different limits .
TASK -3: Field density-Core cutter and Sand replacement methods.
Objective: To determine the in situ density of natural or compacted soils
TASK -4: : Grain size analysis by sieving.
Objective: To determine the percentage of each size of grain that is contained within a soil sample
TASK -5: Permeability of soil - Constant and Variable head tests
Objective: To determine the coefficient of permeability of a soil.
TASK -6: Compaction test
Objective: To establish the maximum dry density that may be attained for a given soil with a standard amount of compaction effort
TASK -7: Direct Shear test
Objective: To determine the shear strength of a soil
TASK -8: Triaxial Compression test (UU Test)
Objective: It enables parameters such as cohesion (c'), internal angle of friction (ϕ') and shear strength to be determined

TASK -9: Unconfined Compression test
Objective: To determine a measure of the unconfined compressive strength fine-grained soils
TASK -10: CBR Test.
Objective: To impart knowledge on bearing capacity of soils in road constructions.
TASK -11: Consolidation test (Demonstration)
Objective: To enable the student to understand the consolidations and settlement of soils.
TASK -12: Vane Shear test
Objective: To understand the shear tests based on drainage conditions
ADDITIONAL EXPERIMENTS
TASK -1: Differential free swell (DFS)
Objective: To determine increase in volume of soil without any external constraint when subjected to submergence in water
TASK -2: Hydrometer Analysis Test (Demonstration)
Objective: To determine the particle size distribution of fine-grained soil
Virtual Labs:
2. https://smfe-iiith.vlabs.ac.in/List%20of%20experiments.html
3. http://ce.cet.ac.in/visuallab.php

Text Book(s):
1. Soil Mechanics and Foundation Engg by K. R. Arora, Standard Publishers and Distributors, Delhi 7 th edition 2009.
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
Reference Book(s):
1. Soil Mechanics and Foundation by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi 17 th edition 2017.
2. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, New age International Pvt . Ltd, New Delhi 3 rd edition 2016.
3. Principles of Geotechnical Engineering by Braja M. Das Cengage Learning

SEMESTER VI

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20CE2011	PC	Concrete technology	3	0	0	3	3	40	60	100
20CE2012	PC	Environmental Engineering	3	0	0	3	3	40	60	100
20CE2013	PC	Highway Engineering	2	0	0	2	2	40	60	100
	OE	Open Elective III	3	0	3	3	3	40	60	100
20CE4006-10	PE	Professional Elective II	3	0	0	3	3	40	60	100
20CE4011-15	PE	Professional elective III	3	0	0	3	3	40	60	100
20CE2509	PC	Concrete Tech and Highway Engineering lab	0	0	3	3	1.5	40	60	100
20CE2510	PC	Environmental Engineering Lab	0	0	2	2	1	40	60	100
20CD6004	SC	Career competency Development IV	0	0	2	2	1	40	60	100
20CC6004	SC	Value added course/Certificate course IV	0	1	0	1	1	40	60	100
20MC8002-12	MC	Mandatory course III	2	0	0	2	0	00	00	00
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	17	1	13	30	21.5	400	600	1000

NARAYANA ENGINEERING COLLEGE:NELLORE

20CE2002		CONCRETE TECHNOLOGY							R2020
Semester		Hours / Week		Total	Credit		Max Marks		
	L	T	P	hrs	C	CIE	SEE		TOTAL
VI	3	1	0	48	4	40	60		100

Pre-requisite: Student should have knowledge of fundamentals of Materials of constructions, Building Materials.

Course Objectives:

1. Understand the theoretical concept of Concrete material which includes Cement, Admixtures and Aggregates,
2. Learn different types of aggregates, admixtures & know the mechanism of hydration of cement.
3. Comprehend the properties of Fresh Concrete, & manufacturing process of concrete
4. Understand the properties of hardened concrete, factors affecting Elasticity, creep & Shrinkage in concrete.
5. Understand the concept of mix design of concrete & its importance in estimation of composition of materials.
6. Know various types of special concretes & its application.

Course Outcomes: After successful completion of the course, the student will be able to:

CO 1 Explain the properties of the constituent materials of concrete and its Manufacturing.

CO 2 Study the behavior of concrete at its fresh and hardened state, describe and carry out tests relevant to the use of concrete on site.

CO 3 Explain factors affecting strength of concrete and their properties.

CO 4 Define special concretes, their application for practical purpose.

CO 5 Understand the factors influencing concrete mix & know the BIS method of mix design.

CO-PO Mapping

CO	P												P O	
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	-	-	-	-	2	1	-	-	-	-	-	-	-
CO2	3	-	-	-	-	2	1	-	-	-	-	-	-	-
CO3	3	-	-	-	-	2	1	-	-	-	-	-	-	-
CO4	3	-	-	-	-	2	1	-	-	-	-	-	-	-
CO5	3	-	-	-	-	2	1	-	-	-	-	-	2	-

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE – 1 CEMENTS AND MANUFACTURE OF CONCRETE (10H)

Cement: Portland cement, chemical composition, hydration, setting and fineness of cement, structure of hydrated cement, mechanical strength of cement gel, water held in hydrated cement paste, heat of hydration; Tests on cements – Fineness of cement using sieve test and air- permeability method, Normal consistency and setting times using Vicat apparatus, soundness test using Le-Chatelier apparatus (detailed procedures to be covered in laboratory); Grades of cement.

Manufacture of concrete: Batching, mixing, transporting, placing, compacting, finishing, and curing; Ready Mixed Concrete (RMC): Introduction, advantages of RMC, components of RMC plant, process adopted in RMC plant, handling and placing, code recommendations.

At the end of the Module 1, students will be able to:

1. Explain the composition of cement, Tests on cement (BL2)
2. Explain the process of manufacturing of cement (BL2)

MODULE -2	FRESH CONCRETE AND ADMIXTURES	(10H)
<p>Fresh concrete: Workability, Factors affecting workability, Measurement of workability by different tests, setting time of concrete, Effect of time and temperature on workability, Segregation, bleeding; Water/cement ratio-Abram's law, Gel/Space ratio. Admixtures: Introduction, Types of admixtures, plasticizers, action of plasticizers, super plasticizers, effect of super plasticizers on fresh concrete and properties of hardened concrete; Retarders, accelerators; Air-entraining admixtures, factors affecting amount of air-entrainment, effect of air-entrainment on the properties of concrete; pozzolanic admixtures-types, fly ash, effect of fly ash on fresh and hardened concrete, high volume fly ash concrete, silica fume, available forms, effect of silica fume on fresh and hardened concrete.</p>		
<p>At the end of the Module 2, students will be able to: 1. Understand the Workability and its factors (BL3) 2. Understand the Admixtures and their types (BL3)</p>		
MODULE-3	HARDENED CONCRETE	(10H)
<p>Strength of concrete: Factors affecting strength of concrete, gain of strength with age, Effect of maximum size of aggregate on strength, relation between compressive and tensile strength, bond strength; Testing-compression test, determination of tensile strength, factors influencing the strength results; Elasticity- elastic properties of concrete, modulus of elasticity and strength, Factors affecting modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio; Creep- measurement of creep, factors affecting creep, effect of creep; Shrinkage- mechanism of shrinkage, classification of shrinkage, Factors affecting shrinkage</p>		
<p>At the end of the Module 3, students will be able to: 1. Understand the factors affecting strength of concrete (BL2) 2. Explain the Elasticity, Creep, Shrinkage of concrete (BL2)</p>		
MODULE-4	SPECIAL CONCRETES & NON-DESTRUCTIVE TESTING	(9H)
<p>Special Concretes: Light weight concrete, no-fines concrete, high density concrete, fibre reinforced concrete, self-compacting concrete, high strength concrete, high performance concrete, cold weather concreting, hot weather concreting, polymer concrete. Non Destructive Testing: Importance, Methods-Rebound hammer test, penetration and pull-out test, Ultrasonic pulse velocity test, Principles, applications and limitations; Corrosion meter, Cover meter and core cutter.</p>		
<p>At the end of the Module 4, students will be able to: 1. Explain the special concretes and their uses (BL4) 2. Understand the concepts of NDT (BL4)</p>		
MODULE-5	MIX DESIGN	(9H)
<p>Durability: Durability and impermeability; cracking, carbonation, alkali-silica reaction, chemical attack, physical aggression; Concrete Mix Design: Introduction, object of mix design Factors governing mix design, Methods of expressing proportions, statistically quality control, Introduction to different methods of mix design, Concrete mix design by I.S. method.</p>		
<p>At the end of the Module 5, students will be able to: 1. Explain the Durability of concrete (BL4) 2. Understand the Concrete Mix Design (BL4)</p>		
Total hours:		48 Hours

Term work:**LIST OF TOPICS :**

1. Prepare a case study of failure of structures due to wrong design, use of poor quality of materials and faulty construction methods.
2. Mix Design of M50 Grade concrete using BIS method.
3. Visit to nearby multi-storeyed building/Apartment construction and Study the workability of concrete.

Content beyond syllabus:

1. Advanced materials usage in concrete

Self-Study:

Contents to promote self-Learning:

SN O	Topic	CO	Reference
1	Cement And Manufacture Of Concrete	CO1	http://www.engineerstudent.co.uk/concrete.html
2	Fresh Concrete And Admixtures	CO2	https://en.wikipedia.org/wiki/Freshconcrete.html
3	Hardened Concrete	CO3	https://ia600801.us.archive.org/1/items/concrteByMSshetty.pdf
4	Special Concretes & Non-Destructive Testing	CO4	https://archive.org/details/concretetechnologynysanthakumar
5	Mix Design	CO5	https://nptel.ac.in/courses/105/105/105105108/ https://archive.org/details/https://archive.org/details/concreteMLGambhir

Text Book(s):

1. Concrete technology by M.S.Shetty, S.Chand& Company Pvt. Ltd., New Delhi
2. Concrete Technology by, A.R. Santha Kumar, Oxford University Press, New Delhi
3. Concrete Technology by M.L. Gambhir, Tata Mc. Graw Hill Publishers, New Delhi

Reference Book(s):

1. Properties of Concrete by Neville, A.M., Low Priced Edition.
2. Text Book of Concrete Technology by P.D. Kulkarni, R.K.Ghosh and Y.R.Phaul, New International.
3. Concrete Technology by A.M. Neville and J.J. Brooks, Pearson Publications.
4. High Performance Concretes and Applications by S.P. Shah, S.H. Ahmad and Edward Arnold, Taylor and Francis Publishers.

Online Resources:

1. <https://link.springer.com/journal/1243>
2. <https://www.journals.elsevier.com/concretechnology>
3. <http://www.aboutcivil.org/concretechnology.html>
4. <http://nptel.ac.in/courses/105105108/>

5. <http://nptel.ac.in/downloads/112106141/>

Web References:

1. <http://www.nptel.ac.in>
2. <http://www.rmct.com/Resources>
3. <https://ia600801.us.archive.org/1/items?concretetechnology.PDF>
4. <https://archive.org/download/concretetechnologybyNeville>

NARAYANA ENGINEERING COLLEGE: NELLORE								
20CE2014	ENVIRONMENTAL ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			C	CIE	SEE
VI	3	0	0	48	3	40	60	100
Pre-requisite: Basic knowledge of Steel structures engineering at UG Level.								
Course Objectives:								
6. To provide a coherent development to the students for the courses in sector of engineering like Waste Water treatment, solid Waste Management, house drainage etc.								
7. To analyze the Waste water sources and waste water characteristics.								
8. To develop various waste water treatment process.								
9. To give an experience in the implementation of engineering concepts which are applied in field of waste Water treatment process.								
10. Emphasizes on design criteria, design equations, kinetics, hydraulic diagrams for the design of unit operations and processes for wastewater treatment systems								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand source of water for water supply scheme with reference to quantity and quality of water (BL-2)							
CO 2	Understand and apply the methods of treatment for purification of water (BL-23)							
CO 3	Analyze the distribution of water.(BL-5)							
CO 4	Understand the concepts of collection & conveyance, Quality and quantity of sewerage (BL-2)							
CO 5	Apply appropriate treatment and disposal methods of sewage and septage (BL- 4)							

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

1: Low, 2-Medium, 3- High

COURSE CONTENT		
MODULE – 1	QUALITY AND ANALYSIS OF WATER	(10H)
<p>Water demand – Types – Factors affecting water demand – Fluctuations in water demand – Design period – Population forecasting methods and their suitability – Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.</p> <p>At the end of the Module 1, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand water quality concepts and their effect on treatment process selection. (BL-2) 2. Understand the importance and methods of operation and maintenance of water supply systems 3. Analyze water quality standards. (BL-4) 		
MODULE -2	WATER TREATMENT	(10H)
<p>Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants – feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other</p>		

Disinfection practices.		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. To study coagulation-flocculation Processes . (BL-2) 2. Analyze troubles in operation comparison of filters. (BL-4) 3. To understand the theory of chlorination & chlorine demand. (BL-2) 		
MODULE-3	WATER DISTRIBUTION	(10H)
Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house, waste detection and prevention. .		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Understand the Layout of Water distribution systems. (BL-2) 2. Illustrate the laying and testing of pipe lines (BL-2) 3. Analyze the waste detection and prevention (BL-2) 		
MODULE-4	WASTE WATER COLLECTION	(10H)
Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. Analyze B.O.D. – C.O.D. equations. (BL-4) 2. To Study storm water overflows combined flow.(BL-2) 3. Understand the Conservancy and water carriage systems. (BL-2) 		
MODULE-5	WASTE WATER & SLUDGE TREATMENT	(8H)
Layout and general outline of various units in a waste water treatment plant – primary treatment: design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks and Imhoff Tanks, working principles and design – soak pits.		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Ability to estimate sewage generation and design sewer system including Sewage pumping stations (BL-3) 2. understanding the characteristics and composition of sewage, self Purification of streams (BL-2) 3. Ability to perform basic design of the unit operations and processes that are Used in sewage treatment(BL-3) 		
Total hours:		48 Hours

Term work:

4. Field Visit to water treatment Plant.

Content beyond syllabus:

1. Fugitive Emission Control and Water Use Minimization
2. Design of waste-water treatment plant
3. Treatment of surface and ground water for drinking water

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Quality And Analysis Of Water	CO1	https://www.slideshare.net/JasmineJohn/water-quality-12836163
2	Water Treatment	CO2	https://www.youtube.com/watch?v=KMP9-49I1U4
3	Water Distribution	CO3	https://dreamcivil.com/water-distribution-system/
4	Waste Water Collection	CO4	https://www.youtube.com/watch?v=l53uHFQ2nII
5	Waste Water & Sludge Treatment	CO5	https://www.sludgeprocessing.com/sludge-basics/what-is-sludge-treatment/

Text Book(s):

1. Elements of public health engineering by K. N. Duggal; S. Chand & Company Ltd., New Delhi, 2014.
2. Environmental Engineering Vol. I& II - Water supply engineering by S. K. Garg; Khanna Publishers, New Delhi, 2017

Reference Book(s):

1. Water Supply and Sanitary Engineering Vol. 1 by Gurucharan Singh; Standard Publishers Distributors, Delhi, 2009
2. Water Supply and Sanitary Engineering by G.S. Birde; Dhanpatrai and sons, Delhi, 1998.
3. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi, 2005

Online Resources:

4. <https://www.digimat.in/nptel/courses/video/105104099/L01.html>
5. <http://nptel.ac.in/courses/105104102/>
6. <http://nptel.ac.in/courses/105106119/>

Web References:

1. <https://nptel.ac.in/courses/103107084>
2. https://onlinecourses.nptel.ac.in/noc22_ch45/preview
3. <https://nptel.ac.in/courses/105106119>

NARAYANA ENGINEERING COLLEGE:NELLORE								
20CE2013	HIGHWAY ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100
Pre-requisite: Basic knowledge of Highway engineering at UG Level.								
Course Objectives: <ol style="list-style-type: none"> 1. To know planning and different types of roads. 2. To Learn about Geometric Design of Highway alignment. 3. To learn about materials used in construction of flexible& rigid pavements. 4. To learn about methods to design of flexible and rigid pavements. 5. To study the traffic characteristic and parking facilities. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to know about types of roads and their development from time to time and current projects. (BL-2)							
CO 2	Analyze the planning process required for highways and design the geometric features. (BL-4)							
CO 3	Evaluate and recommend suitable highway materials. (BL-5)							
CO 4	Design of flexible& rigid pavement. (BL-6)							
CO 5	Analyze the traffic characteristic, parking facilities and their solutions using intersections. (BL- 4)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1	-	2	2	-	-	-	1	2	-	2	-
CO2	1	2	2	2	1	-	-	-	2	-	1	1	-	2
CO3	1	1	1	-	1	-	-	-	-	-	2	2	1	1
CO4	-	1	2	2	2	-	-	-	-	-	1	1	2	-
CO5	2	2	1	1	-	-	-	-	-	-	-	2	1	1
1: Low, 2-Medium, 3- High														
COURSE CONTENT														
MODULE – 1	HIGHWAY PLANNING AND ALIGNMENT												(9H)	
Significance of highway planning – Modal limitations towards sustainability – History of road development in India – factors influencing highway alignment – Soil suitability analysis – Road ecology – Engineering surveys for alignment, objectives, conventional and modern methods – Classification of highways – Locations and functions – Typical cross sections of Urban and Rural roads.														
At the end of the Module 1, students will be able to:														
1. Understand the planning and alignment of Highway Engineering. (BL-2)														
2. Analyze the Soil suitability and engineering survey for alignment. (BL-4)														
3. Understand the classification of highways. (BL-2)														
4. Understand the typical cross section of roads. (BL-2)														
MODULE -2	HIGHWAY GEOMETRICS												(9H)	

Highway classification (Rural and Urban roads), Road Geometrics – Highway cross section elements – Camber – Sight Distance, Horizontal Alignment Design, Super Elevation, Extra widening, Transition curves, set back distance, Design of Vertical curves.

At the end of the Module 2, students will be able to:

1. To study the Highway Geometrics. (BL-2)
2. Analyze the Alignment Design. (BL-4)
3. To understand the Design of vertical curves. (BL-2)

MODULE-3	HIGHWAY MATERIALS AND CONSTRUCTION	(10H)
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Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification – Concrete Mix Design, construction of bituminous and rigid pavements, Highway Maintenance – Material recycling.

At the end of the Module 3, students will be able to:

1. Understand the Highway material and construction Material. (BL-2)
2. Illustrate the soil classification for Highway and soil test. (BL-2)
3. Analyze the construction and Rigid pavement. (BL-2)

MODULE-4	PAVEMENT DESIGN	(10H)
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Pavement Analysis – Factors affecting pavement thickness – Soil – Wheel load – Temperature – Environmental factors; Flexible Pavement Design – Axle Load surveys – CBR method of Design, Rigid Pavement Design – IRC method.

At the end of the Module 4, students will be able to:

1. Analyze the Highway pavement. (BL-4)
2. To Study the factors affecting pavement. (BL-2)
3. Understand the wheel load and Axle load surveys. (BL-2)
4. Design the flexible pavement CBR and Rigid pavement. (BL-6)
5. To understand the IRC Methods of standards. (BL-2)

MODULE-5	TRAFFIC ENGINEERING	(10H)
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Characteristics of traffic elements – Design of Intersections, Interchanges, Parking Layout & Road signs – Urban traffic management - Traffic regulation and control, Accidents, Causes and Preventions

At the end of the Module 5, students will be able to:

1. Understand the study of Traffic Engineering. (BL-2)
2. Understand the Design of Intersection and Interchange Traffic Elements. (BL-2)
3. To study the Traffic regulation and control, accident, causes and prevention. (BL-2)

Total hours:	48 Hours
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Term work:

1. Field visit for flexible and rigid pavement construction.

Content beyond syllabus:

1. Pavement distress in flexible and rigid pavements
2. Types of maintenance
3. Pavement Management Systems

Self-Study:

Contents to promote self-Learning:

SN O	Topic	CO	Reference
1	Highway Planning and Alignment	CO1	https://nptel.ac.in/courses/105101087
2	Highway Geometrics	CO2	https://archive.nptel.ac.in/courses/105/107/105107220
3	Highway materials and Construction	CO3	https://www.civil.iitb.ac.in/tvm/nptel/405_InTse/web/web.html
4	Pavement Design	CO4	https://www.civil.iitb.ac.in/tvm/nptel/401_InTse/web/web.html
5	Traffic Engineering	CO5	https://nptel.ac.in/courses/105101087

Text Book(s):

1. Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand& Bros, Roorkee (U.A).
2. Venkata Ramaiah, C., Transportation Engineering Volume-1, Universities press.

Reference Book(s):

1. IRC 37-2018: Guidelines for Design of Flexible pavements.
2. IRC 58-2015: Guidelines for Design of Rigid Pavements.
3. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.
4. Rangwala S.C, Highway Engineering, Charotar publishers, Gujarat.
5. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
6. Kadiyali, L.R. & Lal, N.B., Principles & Practices of Highway Engineering, Khanna Publishers, New Delhi.

Online Resources:

1. <http://www.cdeep.iitb.ac.in/nptel>

Web References:

1. <https://studentsfocus.com/ce8604-he-notes-highway-engineering-notes-civil-6th-sem/>
2. <https://civilenggforall.com/highway-engineering-made-easy-gate-handwritten-notes-download-pdf/>
3. <https://easvengineering.net/ce6504-highway-engineering-question-html/>
4. [https://www.academia.edu/35583606/CE2255 Highway Engineering notes](https://www.academia.edu/35583606/CE2255_Highway_Engineering_notes)

NARAYANA ENGINEERING COLLEGE : NELLORE								
20CE2509	COCRETE TECH & HIGHWAY ENGINEERING LAB							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	0	0	3	48	1.5	40	60	100
Pre-requisite:								
Course Objectives: <ol style="list-style-type: none"> To find the various physical characteristics of cement, coarse and fine aggregates To find the various properties of green and hardened concrete. To enable the students to identify the physical characteristics of aggregates and bitumen. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to find the characteristics of fine and coarse aggregates							
CO 2	Students able to evaluate the properties of the binding materials for their suitability in building construction							
CO 3	Students able to understand the workability behaviour of concrete through various tests.							
CO 4	Students able to determine the physical characteristics of aggregates.							
CO 5	Students able to determine the physical characteristics of bitumen.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	1	-	-	-	-	2	-	-	-	1	3	1
CO2	2	-	1	-	-	-	-	1	-	-	-	1	2	1
CO3	2	-	1	-	-	-	-	2	-	-	-	1	2	1
CO4	2	-	1	-	-	-	-	1	-	-	-	1	3	1
CO5	2	-	1	-	-	-	-	1	-	-	-	1	3	1
1-Low, 2-Medium, 3-High														

COURSE CONTENT
TASK -1: Normal Consistency of fineness of cement.
Objective: To find the amount of water to be added to <i>cement</i> to get a paste of <i>normal consistency</i>
TASK -2: Initial setting time and final setting time of cement.
Objective: To evaluate setting time of cement through vicats apparatus
TASK -3: Specific gravity and soundness of cement
Objective: To determine properties of cement through lechatlier apparatus
TASK -4: : Workability test on concrete by compaction factor, slump and Vee-bee
Objective: To understand the workability behaviour of concrete
TASK -5: Determination of compressive strength of concrete.
Objective: To determine whether correct mix proportions of various mix proportions of various materials were used to get the desired strength.
TASK -6: Non-Destructive testing on concrete
Objective: To evaluate the strength of hardened concrete through non-destructive tests
TASK -7: Aggregate Crushing value

Objective: To determine suitability of coarse aggregates to use in different types of roads.
TASK -8: Aggregate Impact Test
Objective: To evaluate a relative measure of the resistance of an aggregate to sudden shock or impact.
TASK -9: Abrasion Test.
Objective: To determine hardness property of aggregates
TASK -10: Penetration Test.
Objective: To determine hardness property of bitumen
TASK -11: Ductility Test
Objective: To measure of adhesive property of bitumen and its ability to stretch.
TASK -12: Softening Point Test
Objective: To know the temperature up to which a bituminous binder should be heated for various road use applications
Virtual Labs: <ol style="list-style-type: none"> 4. https://cs-iitd.vlabs.ac.in/List%20of%20experiments.html 5. https://ts-nitk.vlabs.ac.in/transportation-engineering/List%20of%20experiments.html

Text Book(s): <ol style="list-style-type: none"> 3. Concrete Manual by M.L.Gambhir, Dhanpat Rai&co., Fourth edition 4. S.K. Khanna and C.E.G Justo, Highway Materials Testing Laboratory Manual, Nem Chand Bros. Roorkee
Reference Book(s): <ol style="list-style-type: none"> 4. Building construction and materials (Lab Manual) by Gambhir, TMH publishers. 5. Lab manual on High way Engineering by Ajay.K.Duggal & Vijay .P.Puri, New Age Publications, New Delhi.

NARAYANA ENGINEERING COLLEGE : NELLORE								
	<u>ENVIRONMENTAL ENGINEERING LAB</u>							
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	0	0	2	32	1	40	60	100
Pre-requisite:								
Course Objectives: To introduce the concept of environmental pollution, contamination and its sources particularly in context to water and waste water. • To learn principles of environmental engineering applied to the design and implementation of water supply schemes.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	To implement and demonstrate instructions regarding various parameters of water and sewage quality testing							
CO 2	To implement and demonstrate experimental procedures and software application for water supply network design							
CO 3	To produce report on various parameters of water and sewage quality tests							
CO 4	To present and justify results of water and sewage quality tests.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	1	1	-	-	-	-	-	2	-	-
CO2	2	-	-	-	1	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	1	1	-	-	-	-	-	2	-	-
CO4	2	-	-	-	1	-	-	-	-	-	-	2	-	-
CO5	2	-	-	-	1	-	-	-	-	-	-	2	-	-
1-Low, 2-Medium, 3-High														

COURSE CONTENT	
Task 1: Determination of pH and turbidity	
Objective: To Understand pH value	
Task 2: Determination of conductivity and total dissolved solids	
Objective: To Understand Determination of conductivity and total dissolved solids	
Task 3: Determination of alkalinity and acidity.	
Objective: To find alkalinity and acidity	
Task 4: Determination of chlorides	
Objective: To find Determination of chlorides	
Task 5: Determination of iron	
Objective: To Understand Determination of iron	
Task 6: Determination of dissolved oxygen	
Objective: To Understand Determination of dissolved oxygen	
Task 7: Determination of nitrates	
Objective: To ability Determination of nitrates	
Task 8: Determination of optimum dose of coagulant.	
Objective: To ability Determination of optimum dose of coagulant	
Task 9: Determination of chlorine demand.	
Objective:.. To Understand : Determination of chlorine demand	
Task 10: Determination of total phosphorus	

Objective: To Understand Determination of total phosphorus
Additional Experiments:
Task 1: Determination of B.O.D.
Task 2: Determination of C.O.D
Task 3: Presumptive coliform test
Virtual Labs: 1. https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html 2. https://ee1-nitk.vlabs.ac.in/exp/determination-of-alkalinity/simulation.html 3. https://ee1-nitk.vlabs.ac.in/exp/determination-of-total-iron/simulation.html 4. https://ee1-nitk.vlabs.ac.in/exp/determination-of-chloride/simulation.html
Text Book(s): 1. Water supply Engineering, by Santhosh Kumar Garg, Khanna publishers. 2. Chemical analysis of water and soil, by Dr. KVSG Murali Krishna, Reem.
Reference Book(s): 1. Wastewater Engineering, Treatment, Disposal and Reuse by Metcalf and Eddy. 2. Environmental Engineering I Water Supply Engineering by Modi. P. N 3. Water Supply and Sanitary Engineering by G. S. Birdie & J. S. Birdie. Environmental Science and Engineering by J.G.Henry and G.W.Heinke – Person Education.

SEMESTER VII

Subject Code	Category	Course Title	Contact Periods per week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
20HS5001-8	HE	Humanities and Social Science Elective	2	0	0	2	2	40	60	100
20CE2014	PC	Design of steel structures	3	0	0	3	3	40	60	100
20CE2015	PC	Estimation and quantity surveying	3	0	0	3	3	40	60	100
	OE	Open Elective IV	2	0	2	4	3	40	60	100
20CE4016-20	PE	Professional elective IV	3	0	0	3	3	40	60	100
20CE4021-25	PE	Professional elective V	3	0	0	3	3	40	60	100
20CE2511	PC	CAD Lab	0	0	2	2	1	40	60	100
20CE2512	PC	Estimation and quantity surveying Practice	0	0	3	3	1.5	40	60	100
20CD6005	SC	Career competency Development V	0	0	2	2	1	40	60	100
20CC6501	SC	Skill development Training	0	0	2	2	1	40	60	100
20CE7502	PR	Internship II/on job training/Com Ser Project	0	0	3	3	1.5	00	100	100
20MC8002-12	MC	Mandatory course IV	2	0	0	2	0	00	00	00
		Counseling/Mentoring	0	0	1	1	0	--	--	--
		Sports/Hobby Clubs/Activities	0	0	2	2	0	--	--	--
		Activity Point Programme	During the Semester					20 Points		
		Total	18	0	17	35	23	400	700	1100

At the end of the Module 2, students will be able to:		
4. To study the concept of tension and compression member on steel. (BL-2) 5. Analyze the design of laced and battened column. (BL-4) 6. To understand the Design of column base and slab base. (BL-2)		
MODULE-3	DESIGN OF BEAMS AND ROOF TRUSSES	(10H)
Design of Beams: Plastic moment – Bending and shear strength laterally supported and unsupported beams design – Built up sections – large plates Web buckling Crippling and Deflection of beams, Roof Trusses: types of trusses – Design loads – Load combinations as per IS Code, detailing – Design of simple roof trusses elements (purlins, members and joints).		
At the end of the Module 3, students will be able to:		
4. Understand the design of beam and roof trusses. (BL-2) 5. Illustrate the laterally supported and unsupported column. (BL-2) 6. Analyze the load combination by using IS code. (BL-2)		
MODULE-4	DESIGN OF ECCENTRIC CONNECTIONS	(10H)
Design of eccentric connections: Design of eccentric connections with brackets, Beam end connections – Web angle – Un-stiffened and stiffened seated connections (bolted and Welded types)		
At the end of the Module 4, students will be able to:		
4. Analyze the Eccentric connections. (BL-4) 5. To Study the connections with brackets and beam end connections. (BL-2) 6. Understand the concept of seated connections. (BL-2) 7. Design the bolted and welded connections by seated angles (BL-6)		
MODULE-5	PLATE GIRDER	(8H)
Plate Girder: Design consideration – I S Code recommendations, Design of plate girder, Welded – Curtailment of flange plates stiffeners.		
At the end of the Module 5, students will be able to:		
4. Understand the study of Traffic Engineering. (BL-2) 5. Understand the Design of Intersection and Interchange Traffic Elements. (BL-2) 6. To study the Traffic regulation and control, accident, causes and prevention. (BL-2)		
Total hours:		48 Hours

Term work:			
5. Field visit for steel structures buildings like industries , railway stations , factories and steel buildings			
Content beyond syllabus:			
4.			
Self-Study:			
Contents to promote self-Learning:			
SNO	Topic	CO	Reference

1	INTRODUCTION & DESIGN OF CONNECTIONS	CO1	https://2cl405uud.files.wordpress.com/2013/06/connection-design-e28093-design-requirements.pdf
2	DESIGN OF TENSION & COMPRESSION MEMBERS	CO2	https://www.youtube.com/watch?v=nSHj-IfFjU https://www.youtube.com/watch?v=Jr6HNm1XYDI
3	DESIGN OF BEAMS AND ROOF TRUSSES	CO3	https://dcstructural.com/wp-content/uploads/2020/09/TFEC-4-2020-Design-Guide-for-Timber-Roof-Trusses.pdf
4	DESIGN OF ECCENTRIC CONNECTIONS	CO4	https://www.youtube.com/watch?v=Cgu1ZripS5U
5	PLATE GIRDER	CO5	https://www.structuralguide.com/plate-girder/

Text Book(s):

1. Limit State Design of Steel Structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi.
2. Limit State Design of Steel Structures by Subramanyam.N, Oxford University press, New Delhi
3. Design of Steel Structures by Dr. B. C. Punmia, A.K.Jain, Lakshmi Publications

Reference Book(s):

1. Fundamentals of Structural Steel Design by M.L.Gambhir, TMH publications.
2. Structural Design and Drawing by N.Krishna Raju, University Press, Hyderabad.
3. Structural design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi
4. Design of Steel Structures by Edwin Gaylord, Charles Gaylord, James Stallmeyer, Tata Mc.Graw- Hill, New Delhi.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce57/preview
2. <https://www.youtube.com/watch?v=Lc-TT0mPNDI>

Web References:

1. <https://www.youtube.com/watch?v=JkSsDzdM7W0>
2. <https://www.accessengineeringlibrary.com/content/book/9780071550055/chapter/chapter2>
3. https://www.youtube.com/watch?v=4-v_tODgfVY

NARAYANA ENGINEERING COLLEGE:NELLORE														
	<u>ESTIMATION AND QUANTITY SURVEYING</u>							R2022						
Semester	Hours / Week			Total hrs	Credit C	Max Marks								
	L	T	P			CIE	SEE	TOTAL						
	3	0	0	48	3	40	60	100						
Pre-requisite: 1.Knowledge of civil engineering materials and structural components of building 2.Basic concepts of material properties														
Course Objectives: 1. To understand. estimating of quantities of items of works involved in buildings, 2. To know water supply and sanitary works, road works and irrigation works 3. To learn plastering, painting, mosaic flooring, form work, Painting and wood works 4. To know brick masonry, white wash 2 coats, painting one coat over a coat of priming. 5. To understand price, valuation; purpose of valuation, gross income														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	To understand knowledge of quantity surveying and will become familiar with modes of measurement and utility of various types of estimates. estimation of Buildings, Roads and Canals													
CO 2	To understand the use of current schedule of rates and quantitative resource allocation for the rate analysis													
CO 3	To extend the knowledge of detailed estimate preparation for various civil engineering works													
CO 4	To calculate cost of works acknowledging overhead charges, contingencies, work charge establishment and percentage of various services.													
CO 5	To understand utility, purpose and concepts involved in the building valuation .													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	-	1	1	-	-	-	-	-	2	-	2
CO2	3	3	2	2	2	2	-	-	-	-	-	1	-	2
CO3	3	1	1	-	1	1	2	-	-	-	-	1	-	2
CO4	3	3	3	2	2	1	1	-	-	-	-	1	-	2
CO5	3	1	1	1	2	1	1	-	-	-	-	1	-	2
1: Low, 2-Medium, 3- High														
COURSE CONTENT														
MODULE – 1				PROCEDURE AND METHODS OF ESTIMATING					(10H)					
Procedure of Estimating - Introduction, method of estimating, deduction for openings; degree of accuracy; units of measurement; types of estimates – preliminary estimate, plinth area estimate, cube rate estimate, detailed estimate, revised estimate, supplementary and revised estimate, annual repair or maintenance estimate, contingencies, L.S.Item; methods of building estimates - different items of work in building; Principles of taking out quantities, detailed measurement form; long wall and short wall method of building estimate														
At the end of the Module 1, students will be able to:														
1. Explain the types of estimates – preliminary estimate (BL2)														
2.Ability to long wall and short wall method of building estimate (BL5)														

MODULE -2	ESTIMATES FOR VARIOUS WORKS	(10H)
Estimating the quantities- for different types of steps, masonry water tank, hexagonal room, GI sheet veranda roof; estimate of RCC works - standard hooks and cranks, estimate of RCC slab, RCC beam, RCC T– beam slab, RCC column with foundation and RCC retaining wall; detailed estimate of highway road.		
At the end of the Module 2, students will be able to: 1. different types of steps (BL3) 2. RCC column with foundation and RCC retaining wall (BL2)		
MODULE-3	SPECIFICATIONS	(9H)
Specifications: Meaning, purpose, types of specifications, general specification, detailed specifications of different items of buildings and other structures-Earth work for foundation, cement concrete, reinforced cement concrete, brick work stone masonry, DPC, plastering, pointing, mosaic flooring, form work, Painting and wood works; Methods of measurement of work (IS 1200)-Introduction, general rules, principle of units, measurements for various civil works.		
At the end of the Module 3, students will be able to: 1. Understand different items of buildings and other structures-Earth work for foundation (BL2) 2. Explain the plastering, pointing, mosaic flooring, form work, Painting and wood works; (BL4)		
MODULE-4	ANALYSIS OF RATES	(10H)
Analysis of Rates: Purpose, Task or out – turn work, requirement of labor and materials for different works, Rates of materials and labor, procedure of rate analysis; Rate analysis for- Earth work for foundations and basement of buildings, Cement Mortar (1:4), Cement Concrete (1:2:4), Reinforced Concrete for Lintels, Slabs, Beams and Columns (1:2:4), Brick work Constructed with first class bricks with C.M.(1:6), R.R.stone Masonry with cement mortar (1:6), Plastering With Cement mortar (1:4) 12mm thick, Pointing With cement mortar (1:3) for brick masonry, white wash 2 coats, painting one coat over a coat of priming, 40mm thick panelled door, W.B.M. road with bituminous carpet 20mm thick; Standard Schedule of Rates.		
At the end of the Module 4, students will be able to: 1. Reinforced Concrete for Lintels (BL3) 2. Ability to Earth work for foundations and basement of buildings (BL3)		
MODULE-5	VALUATION	(09H)
Valuation: value, cost, price, valuation; purpose of valuation, gross income, net income, perpetual income, deferred income; Out goings, types of out goings; Scrap value, salvage value, comparison between scrap value and salvage value; market value, factors affecting value of a property, book value, difference between market and book value, assessed value, distress value, potential value, capitalized value etc.; Annuity, capital cost; Sinking fund, determination of sinking fund; Depreciation, types of depreciation, obsolescence, appreciation, methods of calculating depreciation; Valuation of building, methods of valuation, mortgage, free hold property, leasehold property; Fixation of rent		

At the end of the Module 5, students will be able to:	
1. Discuss the methods of calculating depreciation (BL2)	
2. Understanding of Valuation of building, methods of valuation (BL2)	
3. Discuss difference between market and book value (BL5)	
Total hours:	48 Hours

Term work:

LIST OF TOPICS FOR STUDENT SEMINARS:

6. Types of estimates
7. methods of building estimates
8. estimate of RCC slab
9. Reinforced Concrete for Lintels
10. methods of valuation

Content beyond syllabus:

1. M30 mix design.

Self-Study:

Contents to promote self-Learning:

SN O	Topic	CO	Reference
1	Types of estimates	CO1	https://civiconcepts.com/blog/types-of-estimates
2	masonry water tank	CO2	https://thecivilengineerings.com/how-to-calculate-the-estimate-of-masonry-water-tank/
3	Methods of measurement of work	CO3	https://www.davuniversity.org/images/files/study-material/MEC763-%20Method%20Engineering%20and%20Ergonomics-%20Work%20Measurement.pdf
4	procedure of rate analysis	CO4	https://www.civilconcept.com/rate-analysis-for-concrete/?v=c86ee0d9d7ed
5	methods of valuation	CO5	https://eqvista.com/company-valuation/3-methods-of-company-valuation/

Text books:

1. Estimating & Costing in Civil Engineering by B.N. Dutta; UBS Publishers & Distributors.
2. Estimating, Costing, Specifications and valuation in Civil Engineering by M. Chakraborty, Khanna Publications.
3. Valuation of Real properties by S. C. Rangwala, Charotar Publishing House.

Reference books:

1. A Text Book of Estimating and Costing (Civil) by Kohli, D.D and Kohli, R.C., S.Chand & Company Ltd.
2. Estimating & Costing in Civil Engineering by V.V.Vazirani and S.P.Chandola, Khanna

publishers.

3. Estimation and costing by G.S.Biridie, Dhanpat Rai Publications.

4. A Text Book of Estimating, Costing and Valuation by Gurcharan Singh and Jagdish Singh, Standard Publishers Distributors.

5. Elements of Estimating and Costing by K.

S. Randwala and K.K. Rangwala, Chavotar Publishing.

Online Resources:

1.<https://www.sciencedirect.com/topics/engineering/estimation-procedure>

2.<https://www.researchgate.net/publication>

3.<https://www.sciencedirect.com/topics/engineering/estimation>

4.<https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/SCI1311>

5.<https://kanchiuniv.ac.in/coursematerials/estimation,costingandvaluation>.

Web References:

1.https://archive.nptel.ac.in/content/storage2/courses/downloads_new/105103206/noc21_ce21_assignment_Week_2.pdf

2.<https://theconstructor.org/construction/top-eight-cost-estimates->

3.[construction3/https://theconstructor.org/construction/top-eight-cost-estimates-construction](https://theconstructor.org/construction/top-eight-cost-estimates-construction)

4. <https://kanchiuniv.ac.in/coursematerials/estimation,costingandvaluation>.

NARAYANA ENGINEERING COLLEGE:NELLORE								
20CE2501	CAD LAB							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	0	0	3	48	1.5	40	60	100
Pre-requisite:								
Course Objectives: <ol style="list-style-type: none"> The course will cover all the steps involved in structural analysis & designing of concrete & steel. This course will introduce one to STAAD Pro's state of the art user interface, prevailing analysis and design engines with a sophisticated finite element (FEM), visualization tools, and dynamic analysis capabilities. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Analyze and Design the 2D frame using Staad pro Software .							
CO 2	Analyze and Design the Truss using Staad pro Software .							
CO 3	Analyze and Design the 3D frame and Slabs using Staad pro Software .							
CO 4	Analyze and Design the Rectangular & Circular columns using Staad pro Software .							
CO 5	Analyze and Design the Retaining walls using Staad pro Software .							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	3	2	-	-	-	-	-	-	-	-	-	-	-
1-Low, 2-Medium, 3-High														

COURSE CONTENT
TASK -1: Analysis & Design of 2D Frame under pure Vertical loading using Staad Pro Software.
Objective: To analyze and Design the 2D Frame.
TASK -2: Analysis & Design of 2D Frame under both Vertical & Horizontal loading using Staad Pro.
Objective: To analyze and Design the 2D Frame.
TASK -3: Analysis & Design of 2D Truss using Staad Pro Software.
Objective: To analyze and Design the 2D Truss.
TASK -4: Analysis & Design of 3D Frames using Staad Pro Software
To analyze and Design the 3D Frames
TASK -5: Analysis & Design of Different types of Beams Using Staad Pro Software
To analyze and Design the Different types of Beams
TASK -6: Analysis & Design of Rectangular & Circular Columns Using Staad Pro Software.

To analyze and Design the Rectangular & Circular Columns
TASK -7: Analysis & Design of Isolated Footings Using Staad Pro Software
To analyze and Design the Isolated Footings
TASK -8 Analysis & Design of Retaining Walls Using Staad Pro Software
To analyze and Design the Retaining walls
TASK -9: Analysis & Design of One Way and Two Way Slabs Using Staad Pro Software
To analyze and Design the one way and two way Truss
TASK -10: Analysis & Design of Simple Tower by Using Staad Pro Software.
To analyze and Design the simple tower Truss
Virtual Labs: <ol style="list-style-type: none"> 1. http://www.aust.edu/civil/lab_manual/ce_100.pdf. 2. https://www.wiziq.com/tutorials/civil-engineering-drawing. 3. http://civilengineering-notes.weebly.com/building-drawing.html.
Text Book(s): <ol style="list-style-type: none"> 1. Staad Pro V8i for Beginners:With Indian Examples by T.S.Sarma, Notion Press Media Pvt Ltd
Reference Book(s): <ol style="list-style-type: none"> 1. Using STAAD Pro 2005 Tutorial with Indian Design codes

NARAYANA ENGINEERING COLLEGE : NELLORE								
	ESTIMATION AND QUANTITY SURVEYING PRACTICE							
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VII	0	0	2	32	1	40	60	100
Pre-requisite:								
Course Objectives: To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	To understand knowledge of quantity surveying and will become familiar with modes of measurement and utility of various types of estimates. estimation of Buildings, Roads and Canals							
CO 2	To understand the use of current schedule of rates and quantitative resource allocation for the rate analysis							
CO 3	To extend the knowledge of detailed estimate preparation for various civil engineering works							
CO 4	To calculate cost of works acknowledging overhead charges, contingencies, work charge establishment and percentage of various services.							
CO 5	To understand utility, purpose and concepts involved in the building valuation .							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	2	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	2	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	3	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	3	-	-
CO5	2	-	-	-	2	-	-	-	-	-	-	2	-	-
1-Low, 2-Medium, 3-High														

COURSE CONTENT
TASK -1: Preparation of Detailed estimate for a single story residential building using center line method for Earthwork, foundations, Super structure, Fittings including sanitary and electrical fittings & Paintings. Objective: To Understand Detailed estimate for a single story residential building using center line method for Earthwork
TASK -2: Preparation of Detailed estimate for a two story residential building using center line method for Earthwork, foundations, Super structure, Fittings including sanitary and electrical fittings & Paintings Objective: To Understand Detailed estimate for a two story residential building using center line method for Earthwork
TASK -3: Preparation of Abstract Estimate for the detailed estimate in Exercise No.2. Objective: To find Abstract Estimate for the detailed estimate in Exercise No.2.
TASK -4: Preparation of Abstract Estimate for the detailed estimate in Exercise No.3 Objective: To find Abstract Estimate for the detailed estimate in Exercise No.3.
TASK -5: Preparation of Detailed estimate with abstract sheet of R.C.C Column with footing and R.C.C beam (work out for: cement, coarse aggregate and sand for cement concrete; % of volume of reinforcement; bar bending schedule) Objective: Detailed estimate with abstract sheet of R.C.C Column with footing and R.C.C beam
TASK -6: Preparation of detailed estimate with abstract sheet for 10m long retaining wall. (Work out

for: cement, coarse aggregate and sand for cement concrete; % of volume of reinforcement; bar bending schedule, cost of retaining wall per meter length)

Objective: To Understand Preparation of detailed estimate with abstract sheet for 10m long retaining wall.

TASK -7: Preparation of estimate for slab culvert

Objective: To ability Preparation of estimate for slab culvert

TASK -8: Preparation of estimate for pipe culvert

Objective: To ability Preparation of estimate for pipe culvert

TASK -9: Preparation of estimate for well foundation

Objective:.. To Understand Preparation of estimate for well foundation

TASK -10: Preparation of estimate for septic tank

Objective: To Understand Preparation of estimate for septic tank

Virtual Labs:

1. <https://www.youtube.com/watch?v=yyc36NZG0WA>
2. <https://www.youtube.com/watch?v=zHyEEqOg7yY>
3. <https://www.youtube.com/watch?v=EI6SHzdIVHM>
4. <https://www.youtube.com/watch?v=tuw0OXL5uhQ>

Text Book(s):

1. Estimating & Costing in Civil Engineering by B.N. Dutta; UBS Publishers & Distributors.
2. Estimating, Costing, Specifications and valuation in Civil Engineering by M. Chakraborty, Khanna Publications.
3. Valuation of Real properties by S. C. Rangwala, Charotar Publishing House

Reference Book(s):

1. A Text Book of Estimating and Costing (Civil) by Kohli, D.D and Kohli, R.C., S.Chand& Company Ltd.
2. Estimating & Costing in Civil Engineering by V.V.Vazirani and S.P.Chandola, Khanna publishers.

DEPARTMENT OF CIVIL ENGINEERING

List of R - 20 - Open Electives

S.No	Subjects from department of CIVIL	Category
1	Disaster Management and Mitigation	OE
2	Green Buildings	OE
3	Air And Noise Pollution	OE
4	Watershed Management	OE
5	Environmental Impact Assessment	OE
6	Solid Waste Management	OE
7	Waste Water Engineering	OE
8	Water Supply Engineering	OE
9	Cost Effective Housing Techniques	OE

NARAYANA ENGINEERING COLLEGE: NELLORE								
OE	DISASTER MANAGEMENT AND MITIGATION							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
III	3	0	0	45	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> To explain Environmental hazards/Disasters To Differentiate Environmental Hazards/Disasters To Explain Endogenous hazard effects and mitigation To Explain Exogenous hazard effects and mitigation To explain Emerging approaches in disaster Management 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Summarize the disasters and their effects on environment							
CO 2	Explain the types of Environmental hazards and disasters							
CO 3	Describe the Endogenous hazards							
CO 4	Explain the Exogenous hazards and its effects							
CO 5	Disaster management through engineering applications							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO3	3	-	3	-	-	2	3	-	-	-	-	2	-	-
CO4	3	-	3	-	-	2	3	-	-	-	-	2	-	-
CO5	3	-	3	-	-	3	3	-	-	-	-	3	-	-
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	ENVIRONMENTAL HAZARDS & DISASTERS	9H
Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> Understand about Environmental Disasters and Environmental stress. Summarize the Concept of Environmental Hazards. Demonstrate different approaches & relation with human Ecology. 		
MODULE -2	TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS	9H
Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters – Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards – Exogenous Hazards.		
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> Understand Man induced hazards & Disasters. 		

5. Demonstrate Extra Planetary Hazards/ disasters. 3. Explain difference between Endogenous Hazards and Exogenous Hazards.		
MODULE-3	ENDOGENOUS HAZARDS	9H
Volcanic Eruption – Earthquakes – Landslides – Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions – Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.		
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 4. Explain different types of Endogenous hazards. 5. Understand effect of Endogenous hazards. 3 Apply mitigation methods to reduce risk against Endogenous hazards. 		
MODULE-4	EXOGENOUS HAZARDS/ DISASTERS	9H
Infrequent events- Cumulative atmospheric hazards/disasters Infrequent events: Cyclones – Lightning – Hailstorms Cyclones: - Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters: - Floods- Droughts- Cold waves- Heat waves. Floods: - Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation). Droughts: - Impacts of droughts- Drought hazards in India Drought control measures- Extra Planetary Hazards/ Disasters- Man induced Hazards /Disasters Physical hazards/ Disasters.		
At the end of the Module 5, students will be able to: <ol style="list-style-type: none"> 4. Explain different types of Exogenous hazards. 5. Understand effects of Exogenous hazards. 6. Apply remedial measures against Exogenous hazards. 		
MODULE-5	SOIL EROSION&EMERGING APPROACHES IN DISASTER MANAGEMENT	9H
Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion-Conservation measures of Soil Erosion. Chemical hazards/ disasters: Release of toxic chemicals, nuclear explosion, Sedimentation processes. Sedimentation processes: -Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters: - Population Explosion. Emerging approaches in disaster management- three stages1. Pre- disaster stage (preparedness) 2. Emergency Stage 3. Post Disaster Stage-Rehabilitation		
At the end of the Module 5, students will be able to: <ol style="list-style-type: none"> 6. Explain Mechanics & forms of Soil Erosion. 7. Understand effects of Chemical hazards 8. Apply Emerging approaches in disaster management. 		
Total Hours: 48		

Term work:
1. Study and understand effects of floods 2. Study and understand effects of cyclones
Content beyond syllabus: Case studies regarding hazards

Contents to promote self-Learning:

S.No	Topic	Reference
1.	Environmental Hazards & Disasters	https://en.wikipedia.org/wiki/List_of_earthquakes_in_India
2.	Types Of Environmental Hazards & Disasters	https://en.wikipedia.org/wiki/Vulnerability_management
3.	Endogenous Hazards	https://www.usgs.gov/faqs/what-a-landslide-and-what-causes-one?qt-news_science_products=0#qt-news_science_products
4.	Exogenous Hazards/ Disasters	https://edugeneral.org/blog/geography/flood-and-drought-affected-areas-in-india/
5.	Soil Erosion & Emerging Approaches in Disaster Management	https://www.gktoday.in/gk/disaster-management-pre-disaster-and-post-disaster-phases/

Text Book(s):

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Disaster Mitigation: Experiences and Reflections by Pardeep Sahni.

Reference Book(s):

1. The Environment as Hazards by Kates, B.I & White, G.F, Oxford Publishers, New York, 1978.
2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000.
3. Disaster Management by H.K. Gupta (Ed), Universities Press, India, 2003.
4. Space Technology for Disaster Mitigation in India by R.B. Singh, University of Tokyo, 1994.

Online Resources:

1. <https://nptel.ac.in/courses/105/104/105104183/#>
2. <https://nptel.ac.in/courses/124/107/124107010/>

Web References:

1. <https://www.worldwildlife.org/threats/soil-erosion-and-degradation>
2. <https://en.ni.is/geology/naturalhazards#:~:text=Endogenous%20forces%20originate%20with%20the,gases%20emitted%20during%20volcanic%20eruptions.>

NARAYANA ENGINEERING COLLEGE: GUDUR								
OE	GREEN BUILDINGS							R2020
Semester	Hours / Week			Total hrs.	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV	3	0	0	48	4	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. To present different concepts of green building technologies. 2. To identify sustainable materials, methods and their applications. 3. To understand the planning and commissioning of green buildings. 4. To impart the global standards and assessments techniques of green building systems. 5. To understand the economic aspects, environmental benefits and case studies of green buildings. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand the concept of green building systems.							
CO 2	Identify the sustainable materials and design aids.							
CO 3	Explain the planning and commissioning of green buildings							
CO 4	Illustrate the standards and building assessment systems.							
CO 5	Assess the economic aspects of green building systems.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2		2			3	2	1						
CO2	2		2		1	3	2	1						1
CO3	2		2		1	3	2	1						1
CO4	2		2		1	3	2	1						
CO5	2		2			3	1	1						
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	HISTORICAL PERSPECTIVE OF GREEN BUILDINGS	10H
Conventional versus Green Buildings – Comparison. Minor and major aspects of Green Buildings – The Integrated Design Process. Green Building Documentation Requirements. Conventional - Contemporary and Future Ecological Design – Green Design to Regenerative Design.		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Differentiate b/w Conventional and Green buildings. 2. Familiarize with the concepts, requirements and design processes. 3. Understand the design concepts. 		
MODULE -2	GREEN BUILDING SYSTEMS	10H
Sustainable sites and landscaping – Enhancing ecosystems. Building envelopes – selection		

of green materials, products and applications. Passive design strategies. Internal load reduction – Indoor environment quality Building water and waste water management. Use of LEED / IGBC standards		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the green materials, products and applications. 2. Understand the design strategies of green buildings. 6. Enumerate the Building water and waste water systems. 		
MODULE-3	GREEN BUILDING IMPLEMENTATION	10H
Site Planning, Health and Safety Planning, Construction and Demolition. Waste Management – Reducing the Footprint of Construction Operations – Maximizing the Value of Building Commissioning. HVAC Systems, Lighting and cleaning systems for green buildings. Costs and Benefits of Building Commissioning– use of LEED/ IGBC standards.		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Explain the Planning of green buildings. 2. State the Lighting and cleaning systems for green buildings 6. Illustrate the benefits of Building Commissioning. 		
MODULE-4	GREEN BUILDING ASSESSMENT	9H
International Building Assessment Systems – The USGBC/ LEED Building Assessment Standard – The LEED Certification Process – The Green Globes Building Assessment Protocol- Example of a Platinum / Gold / Silver Building. Comparison of present Building Rating Systems – Code compilation requirements – Leed Griha		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the standards and building assessment systems. 2. Understand the global causes and standards, 3. Comparison of present Building Rating Systems 		
MODULE-5	ECONOMICS OF GREEN BUILDINGS	9H
Economic aspects of Green Buildings – Quantifying Green Building Benefits Managing Costs and Barriers Short- and long-term environment benefits. Some typical case studies of Green Buildings.		
At the end of the Module 6, students will be able to:		
<ol style="list-style-type: none"> 1. Know the Economic aspects of Green Buildings. 2. Estimate the costs and benefits. 3. Determine Short- and long-term environment benefits. Know the case studies of green buildings. 		
Total Hours: 48 Hours		

Content beyond syllabus:

Pollution Prevention and Cleaner Production Awareness Plan, Waste Audit, Zero target, Indian Green Building Council (IGBC).

S.No	Topic	Reference
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1.	Historical Perspective of Green Buildings	https://www.slideshare.net/rachitmunjal/green-buildings-30251891
2.	Green Building System	https://www.slideshare.net/UtkarshGupta3/green-building-73261943
3.	Green Building Implementation	https://slideplayer.com/slide/10265623/
4.	Green Building Assessment	https://slideplayer.com/slide/13219021/
5.	Economics Of Green Buildings	https://www.learnpick.in/prime/documents/ppts/details/228/green-building-construction

Text Book(s):

1. “Green Buildings A to Z”, Understanding the buildings, by Jerry Yudelson 2008.
2. “Green Buildings through Integrated Design”, by Jerry Yudelson , Tata McGraw Hill..3.
3. “Green building guidelines: Meeting the demand for low-energy, resource-efficient homes”, Sustainable Buildings Industry Council.

Reference Book(s):

1. “Green Building Products: The Green Spec guide to residential building materials” by Alex Wilson and Mark Peipkorn , 2nd Edition., Gabriola Island.
2. “The Green guide to specification: An Environmental Profiling system for building materials and components”, by Jane Anderson, David E. Shiers, and Mike Sinclair , 3rd Edition, Oxford;Malden..
3. “Sustainable Construction: Green Building Design and Delivery”, by Charles J. Kibert , 2nd Edition, Wiley.

Online Resources:

1. <https://nptel.ac.in/courses/105/102/105102195/>
2. <https://nptel.ac.in/courses/124/107/124107011/>

Web References:

1. www.newsociety.com,
2. <https://igbc.in/igbc/redirectHtml.htm?redVal=showratingSysnosign>

NARAYANA ENGINEERING COLLEGE: NELLORE														
OE	AIR AND NOISE POLLUTION							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
IV	3	0	0	47	3	40	60	100						
Pre-requisite: Nil														
Course Objectives: 1. To study the current scenario of Air pollution from industries in India and their studies. 2. To know the differences between prevention and control of Air pollution. 3. To get the knowledge on noise pollution. 4. To classify the control methods of noise pollution. 5. To understand the laws and acts of noise control.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Understand deferent types of air pollutants, their effects and meteorological parameters													
CO 2	Explain various types of air pollution controlling equipment's													
CO 3	Identify sources and characterization of Noise pollution													
CO 4	Demonstrate various control methods of Noise pollution													
CO 5	List Legislation Noise and the Administrative Function													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	3	2	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	2	-	-	-	-	-	-	2
CO3	3	-	3	-	-	-	-	-	-	-	-	-	1	3
CO4	2	-	-	-	3	2	1	-	-	-	-	-	3	-
CO5	2	-	2	-	3	2	1	-	-	-	-	-	2	3
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION & METEOROLOGY	9H
Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility - Quality and Emission standards. Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the Properties of Air pollutants. 2. Summarize the effects of Air pollution. 3. Demonstrate Effects of meteorology on Air Pollution. 		
MODULE -2	CONTROL OF PARTICULATE & GASEOUS CONTAMINANTS	9H

Factors affecting Selection of Control Equipment – Gas Particle Interaction –Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, and Electrostatic Precipitator. Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters– Process control and Monitoring - Operational Considerations.		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the Factors affecting on the Control Equipment. 2. Demonstrate the Working principle, Design and performance equations. 3. Explain the Process control, Monitoring and Operational Considerations. 		
MODULE-3	SOURCES & CHARACTERIZATION OF NOISE POLLUTION	
12H		
Sources of noise – Units and Measurements of Noise – Noise Power level, Intensity level, Pressure level – Relationship, Noise level meter – Weighted networks – Decibel addition – Octave Band – Noise spectrum, Equivalent Noise – Day and night time –Standards, Equations and Application, Characterization of Noise from Construction, Mining, Transportation and Industrial Activities.		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Explain the Sources of noise 2. Illustrate the Measurements of Noise. 3. Demonstrate the Characterization of Noise. 		
MODULE-4	PREVENTION & CONTROL OF NOISE POLLUTION	8H
Control of noise at source, control of transmission, protection of exposed person, Control of other types of Noise Sound Absorbent – Noise Pollution Analyzer, Auditorium Designing – Anti Noise Device. Designing out Noise – Industrial Noise Control – effects of noise on workers efficiency, Acoustic quieting – mechanical isolation technique, acoustical absorption, constrained layer damping, OSHA Noise standards– public education – other non- legislative measures		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the Control of noise pollution. 2. Summarize the effects of noise. 3. Explain the various Noise standards 		
MODULE-5	REGULATORY ASPECTS OF NOISE POLLUTION	9H
Legislation Noise and the Administrative Function– Planning against Noise– Noise and the Law – The Rajasthan noise control Act 1963, Railway Act 1890 (Related to noise only), The Aircraft Act 1934 (Related to noise only), Factories Act 1948 (Related to noise only), The Environmental Protection Act 1986 – Noise pollution remedies.		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Explain the Administrative Function– Planning against Noise. 2. Illustrate the Noise and the Law 3. Demonstrate the Environmental Protection Act 1986 – Noise 		
Total Hours: 47		

Term work:

1. Field Trip to Industries.
2. Solve the Design and performance equations by using any Design Software.
3. Determination of Intensity level using any programming language.
4. Application of any software to analyze the Noise standards.
5. Developing the Environmental Protection Acts

Content beyond syllabus:

On-line monitoring for Air and noise pollution.

Contents to promote self-Learning:

SNO	Topic	Reference
1.	Air Pollution, & Meteorology	https://nptel.ac.in/courses/105/104/105104099/ https://drive.google.com/file/d/1XfLKWtBE34M_oZEEyqJV1rX5OUiaQVDd/view
2.	Control of particulate & Gaseous contaminants	https://drive.google.com/file/d/15H-X3yIWOMCid91a9tBsvVPLOBw1J8cn/view
3.	Sources & Characterization of Noise pollution	https://drive.google.com/file/d/1rfX98oA1CJJ_p2nRYu3LlrrkDUzOBlix/view
4.	Prevention & Control of Noise pollution	https://drive.google.com/file/d/14RJfOGYUXOw4FoEnuUL32c5IboFN_kZr/view
5.	Regulatory aspects of Noise pollution	https://drive.google.com/file/d/1khc38yAPE8KV6OAEC8VQP4Uq1ILVHzWC/view

Text Book(s):

1. Anjaneyulu. Y, “Air Pollution and Control Technologies”, Allied Publishers (P) Ltd., India 2002.
2. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press, Inc 2017.
3. Peterson and E. Gross Jr., “Hand Book of Noise Measurement”, 7th Edn, 2003.
4. S.P. Singal. “Noise Pollution and Control”, Narosa Publishing House, 2000.

Reference Book(s):

1. M.N Rao and HVN Rao, “Air Pollution”, Tata McGraw Hill Publishing Company limited, 2007.
2. C.S. Rao, “Environmental Pollution Control Engineering”, New Age International (P) Limited Publishers, 2006.
3. Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 2009

Online Resources:

1. <https://www.airnow.gov/friday-resources/>
2. <https://cpcb.nic.in/noise-pollution/>

Web References:

1. <https://www.europarl.europa.eu/factsheets/en/sheet/75/air-and-noise-pollution>
2. <https://www.britannica.com/science/noise-pollution>

NARAYANA ENGINEERING COLLEGE: NELLORE								
	WATER SHED MANAGEMENT							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV-II	3	1	0	48	4	40	60	100
Pre-requisite: Nil								
1) To enable the student to find out the index properties of the integrated water shed development and classify it.5 2) To impart the concept of effects of erosion on land 3) To enable the student to understand the concept of planning of watershed management activities.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand the Concept of watershed development.							
CO 2	Determine the index properties of erosion for its classification.							
CO 3	Understand the importance of planning of watershed management activities							
CO 4	Understand the importance of Rainwater Harvesting.							
CO 5	Understand the process of Land use and Land capability classification							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3											
CO2	2		2							2				
CO3		3		2										
CO4	2			2	1							1		
CO5			3											2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	INTRODUCTION TO WATERSHED	10H
INTRODUCTION: INTRODUCTION: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multi-disciplinary approach for watershed management. CHARACTERISTICS OF WATERSHED: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Understand the formation of soil and minerals present in soil. 2. Identify functional relation between volume and weight. 3. Understand the phase diagram of soil. 		
MODULE -2	PRINCIPLES OF EROSION	10H

PRINCIPLES OF EROSION: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. MEASURES TO CONTROL EROSION: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.		
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> 1. Understand the different properties of soil. 2. Determine various characteristics of soil which influence soil strength. 3. Classify the soil. 		
MODULE-3 PLANNING OF WATERSHED MANAGEMENT ACTIVITIES		10H
People's participation, preparation of action plan, administrative requirements. Water Harvesting: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.		
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 1. Determine the permeability of soil. 2. Understand effective stress concept and influence of stress on soil strength. 3. Examine the seepage process in soil. 		
MODULE-4 LAND MANAGEMENT		9H
Land use and Land capability classification, management of forest, agricultural, grassland and wildland. Reclamation of saline and alkaline soils.		
At the end of the Module 4, students will be able to: <ol style="list-style-type: none"> 5. Understand the concept of consolidation. 6. Explain the Terzaghi's 1-D consolidation theory 7. Calculate total settlement and time rate of settlement 		
MODULE-5 ECOSYSTEM MANAGEMENT		9H
Role of Ecosystem, crop husbandry, soil enrichment, Inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvia pasture, horticulture, social forestry and afforestation		
At the end of the Module 5, students will be able to: <ol style="list-style-type: none"> 1. Understand the importance of shear strength. 2. Draw strength envelopes for different drainage conditions. 3. Examine the effect of liquefaction. 		
Total hours:		48 hours
Term work: Develop Software Requirements Specification (SRS) for Social Networking Websites.		
Content beyond syllabus: Reclamation of saline and alkaline soils.		
Self-Study: Contents to promote self-Learning:		
SN O	Topic	Reference
1	INTRODUCTION TO WATERSHED	https://www.slideshare.net/GhassanHadi/watershed-1-42316353

2	PRINCIPLES OF EROSION	https://www.slideserve.com/leann/watershed-management
3	PLANNING OF WATERSHED MANAGEMENT ACTIVITIES	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/watershed-management
4	LAND MANAGEMENT	https://slideplayer.com/slide/10762828/
5	ECOSYSTEM MANAGEMENT	https://www.powershow.com/view/3c5869-ODZlZ/What_is_Watershed_powerpoint_ppt_presentation

Text Book(s):

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers.

Reference Book(s):

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India.

Online Resources:

1. http://www.acadmix.com/eBooks_Download
2. <http://www.freetechbook.com/software-engineering-f15.html>

Web Resources:

1. http://agritech.tnau.ac.in/agriculture/agri_majorareas_watershed_watershedmgt.html
2. <http://www.maxtalsa.com/webroot/blog/the-4-principles-of-erosion-control/>
3. <https://water.unl.edu/watershed/planning>

NARAYANA ENGINEERING COLLEGE : NELLORE								
	ENVIRONMENTAL IMPACT ASSESSMENT							R2020
Semester	Hours / Week			Total hrs.	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. To introduce students to environmental impact assessment and to provide theoretical and practical education in this field. 2. Appreciate the purpose and role of EIA in the decision-making process; Understand strengths & limitations of environmental management. 3. Interpret options for evaluating environmental and social impacts; Know formats of EIA Report (Environmental Impact Statement, or Environmental Statement). 4. The focus is on the rationale and methodology of integrated environmental impact assessment (EIA), including consideration of the relevant bio-physical, social, cultural, economic and human health aspects of development proposals, programs and policies. 5. Included are aspects of tendering for and budgeting of, EIA projects. Case studies will illustrate aspects of EIA in practice. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to understand the Environmental impact assessment and its methodologies							
CO 2	Students able to describe methodology for the assessment of impacts on surface water environment.							
CO 3	Students able to assess of impact of development activities on vegetation and wildlife.							
CO 4	Students able to evaluate of audit data and preparation of audit report.							
CO 5	Students able discuss about Environmental protection act, the water prevention act, Wild life act etc.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	1	1	2	2	1	1	2	1	3	1	1
CO2	2	1	-	1	1	2	2	1	1	2	1	3	1	1
CO3	2	1	-	1	1	2	2	1	1	2	1	2	1	2
CO4	2	1	-	1	1	2	2	2	1	1	2	2	1	1
CO5	2	2	-	1	1	2	3	2	1	2	2	1	2	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION	13H
Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.		
EIA Methodologies: introduction, Criteria for the selection of EIA Methodology, EIA methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis		
At the end of the Module 1, students will be able to:		

1. Explain the relationship between EIA and EIS (BL3) 2. Explain the main objective of conducting EIA Studies (BL3) 3. List out the methodologies adopted for conducting EIA studies (BL1)		
MODULE -2	IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE	9H
Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities- application of remote sensing and GIS for EIA. EIA with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment.		
At the end of the Module 2, students will be able to:		
1. Explain the importance of Environmental monitoring systems. (BL2) 2. List out the Environmental Information system available for EIA studies. (BL3) 3. Explain Effects Module of Environmental Information system. (BL2)		
MODULE-3	ASSESSMENT OF IMPACT ON VEGETATION AND WILDLIFE	9H
Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, Environmental impact of deforestation and incorporation of mitigation measures		
At the end of the Module 3, students will be able to:		
1. Explain the importance of value function in EIA studies (BL2) 2. Explain the various environmental attributes affected during the operational phase of a construction project (BL2) 3. Explain the various environmental attributes affected during the construction phase of a Industrial project (BL3)		
MODULE-4	ENVIRONMENTAL AUDIT	8H
Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report		
At the end of the Module 4, students will be able to:		
1. Evaluation of audit data and preparation of audit report. (BL5) 2. List out the environmental legislation objectives of environmental audit. (BL1) 3. Explain the environmental audit and its types. (BL3)		
MODULE-5	ENVIRONMENTAL ACTS & CASE STUDIES	9H
The Environmental protection Act, The water prevention Act, The Air (Prevention & Control of pollution Act.), Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.		
At the end of the Module 5, students will be able to:		
1. Brief out the case study of human impact on Himalayan ecosystems (BL2) 2. Brief out the case study of urbanization impact due to urban solid waste management with reference to Hyderabad City (BL2) 3. Discuss the mitigation measures taken to prevent irrigation impact due to UTP at Shimoga (BL2)		
		Total: 48 Hours
Term work:		
1. Develop an approach in disaster management, to get rid of that situation with less damage. 2. Improve preventions on flood control measures to save the life of people.		

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Introduction	CO1	https://youtu.be/P2pL5VThrZ0 https://youtu.be/0apmnXhWG
2	Impact of developmental activities and land use	CO2	https://youtu.be/kZ7Oa7iMiCs
3	Assessment of impact on vegetation and wildlife	CO3	https://youtu.be/bJPuy0OZ-tE https://youtu.be/btOCUmJkrrg
4	Environmental audit	CO4	https://youtu.be/0apMXhWG_W8 https://youtu.be/aqfSOOiO2kI
5	Environmental acts & case studies	CO5	https://youtu.be/kZ7Oa7iMiCs https://youtu.be/P7gVp333B6M

Text Book(s):

1. Environmental Impact Assessment for developing countries, by Asit k. Biswas, S. B. C Agarwal, Elsevier Publication(2013).
2. Teaching Environmental Impact Assessment, by Angus Morrison-saunders, Jenny pope, Edward Elgar publishing(2021).
3. Methods of Environmental & Social Impact Assessment, by Riki Therivel, Graham Wood, Routledge publication 2017.

Reference Book(s):

1. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey 2003.
2. Jain, R.K. Urban L.V. Stracy, G.S. "Environmental Impact Analysis", 2nd edition, Van Nostrand Reinhold Co, New York.
3. UNESCO, 1987, "Methodologies, Guidelines for the Integrated Environmental Evaluation of Water Resources Development", UNESCO/UNEP, Paris..

Online Resources:

1. https://easyengineering.net/engineering-environmental-books-collection_18/
2. <https://bookauthority.org/books/best-environmental-impact-.com->
3. <https://theconstructor.org/assessment/> in environmental-methods

Web References:

1. <https://shradhalandenvironmental.com/blog/2018/12/08/EIA-methods-maps-and-uses/>
2. <https://www.britannica.com/technology/theodolite> <http://www.mathworld.wolfram.com/>

NARAYANA ENGINEERING COLLEGE: NELLORE								
OE	SOLID WASTE MANAGEMENT							R2020
Semester	Hours / Week			Total hrs.	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
IV	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. Learn basic concepts of solid waste management, beginning from source generation to waste disposal in a system of municipality organization structure. 2. Develop understanding on various technological applications for processing of waste and their disposal in various ways. 3. Examine the technical points that are required to set up a solid waste management system. 4. Plan a solid waste management system for decision makers, collect required data for a solid waste management. 5. Plan a recycling program. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students able to understand the solid waste management.							
CO 2	Students able to study of comparative assessment of waste generation and composition of developing and developed nations.							
CO 3	Students able to understand the transportation and disposal of solid waste (waste disposal).							
CO 4	Students able to study of product recovery and recycling of solid waste.							
CO 5	Students able to discuss about environmental effect.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	1	-	1	2	-	-	-	-	-	-	1
CO2	2	2	-	2	-	-	1	-	-	-	-	-	-	-
CO3	3	2	1	2	-	1	1	-	-	-	1	1	-	1
CO4	3	2	1	1	1	-	1	-	-	-	1	1	2	1
CO5	3	3	2	1	2	2	1	1	-	1	1	2	2	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION TO SOLID WASTE MANAGEMENT	9H
Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Remember the classification of solid waste management. 2. Understand the elements of SWM, ESSWM. 3. Learn about progress in MSW management in India. 		
MODULE -2	WASTE GENERATION ASPECTS	9H

Waste stream assessment (WSA), waste generation and composition, waste characteristics (Physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions.

At the end of the Module 2, students will be able to:

1. Able to understand the health and environmental effect.
2. Know the comparative assessment of waste generation and composition of developing and develop donations.

MODULE-3	COLLECTION, STORAGE, TRANSPORT AND DISPOSAL	12H
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Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system. **Waste Disposal:** key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study

At the end of the Module 3, students will be able to:

1. Able to study about storage-containers/collection vehicles, collection operation.
2. Knowing the implementing collection and transfer system.
3. Learn about the key issues in waste disposal.

MODULE-4	WASTE PROCESSING TECHNOLOGIES & 3R PRINCIPLE	9H
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Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling program me, recycling program me elements, commonly recycled materials and processes, a case study.

At the end of the Module 4, students will be able to:

1. Study and learn about the Product Recovery and Recycling.
2. Knowing implementation monitoring and evaluation of source reduction.

MODULE-5	RECOVERY OF BIOLOGICAL CONVERSION PRODUCTS	9H
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Benefits, processes, stages and technologies of composting; bio gasification with anaerobic processing, types of digesters, and biogas plants in India; composting and bio gasification: environmental effects.

At the end of the Module 5, students will be able to:

1. Learning about the bio gasification with anaerobic processing.
2. Study about the types of digesters, and biogas plants in India.

	Total: 48 Hours
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Term work:

1. Make route optimization for a solid waste collection and transport system
2. The sources are from Website and text book reference

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Introduction to solid waste management	CO1	Solid Waste Technology & Management, by Thomas Christensen, John & Wiley & sons 2011.

NARAYANA ENGINEERING COLLEGE: NELLORE

2	Waste generation aspects	CO2	Solid Waste management, by Ramesha Chandrappa, Dignta Bhusan Das, Springer science & Business Media, 2012
3	Collection, storage transport and disposal.	CO3	Solid Waste management, by Ramesha Chandrappa, Dignta Bhusan Das.
4	Waste processing technologies & 3R principal.	CO4	Sustainable Solid Waste Management, by Ni-Bin Chang, Ana Pires, John Willy & Sons Publications, 2015
5	Recovery of biological conversion products.	CO5	Sustainable Solid Waste Management, by Ni-Bin Chang, Ana Pires, John Willy & Sons Publications, 2015

Text Book(s):

4. Solid Waste Technology & Management, by Thomas Christensen, John & Wiley & sons 2011.
5. Solid Waste management, by Ramesha Chandrappa, Dignta Bhusan Das, Springer science & Business Media, 2012.
6. Sustainable Solid Waste Management, by Ni-Bin Chang, Ana Pires, John Willy & Sons Publications, 2015.

Reference Book(s):

4. Solid waste Engineering by Vesilind P.A., Worsel, W.A., and Reinhart, D. R., Thomson Brooks/code, 1st Ed 2002.
5. Hazardous Waste Management by Lagrerer, M.D., Buckingham, P.L and Evans, J.C, 2nd Edn, McGrawhill, 2011.

Online Resources:

1. <https://nptel.ac.in/courses/120/108/120108005/>
2. <https://nptel.ac.in/courses/105/103/105103205/>

Web References:

1. <https://www.thebalancesmb.com/an-introduction-to-solid-waste-management-2878102>
2. <https://www.adelaide.edu.au/research-services/system/files/media/documents/2019-10/transport-storage-gmos-guidelines.pdf>

OE	WASTE WATER ENGINEERING							R2020						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
IV	3	0	0	48	3	40	60	100						
Pre-requisite: Nil														
Course Objectives:														
<div><div>1.</div>The components of collection systems, water needs, composition of wastewater, process theory for wastewater, and selected methods for treatment of wastewater.</div> <div><div>2.</div>To know the characteristics of wastewater, primary, secondary & tertiary treatment processes.</div> <div><div>3.</div>To know the sludge disposal and design of wastewater treatment plants.</div> <div><div>4.</div>To provide basic knowledge about processes and methods for design and operation of treatment systems for wastewater, waste water collection systems, including storm water</div> <div><div>5.</div>At the end of the course the students will have a working knowledge of the wastewater industry and have the skills to perform a preliminary design of a treatment plant.</div>														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Students able to explain about source of waste water collection systems.													
CO 2	Students able to required understanding the characteristics and composition of sewage.													
CO 3	Students able to perform basic design of the unit operations and processes that are used in sewage treatment.													
CO 4	Students able to design the secondary treatment operation units used in sewage treatment.													
CO 5	Students able to understand the tertiary treatment process in sewage treatment.													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	-	1	1	-	3	2	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	-
CO3	2	2	-	-		-	-	-	-	2	-	2	2	-
CO4	3	2	-	2	2	-	-	-	-	2	-	2	3	-
CO5	3	3	2	2	3	-	1	2	2	3	2	3	3	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION & WASTE WATER COLLECTION	9H
Introduction: Introduction to sanitary engineering, historical developments, flowchart-outlines of sanitary engineering, classification of sanitary works, criteria for waste water management system; systems of sanitation, relative merits & demerits; sewerage-classification of sewerage systems; Sanitary sewage: sources of sanitary sewage, factors affecting sanitary sewage, quantity of sanitary sewage and variation; Storm water sewage: Factors affecting storm water sewage, quantity of storm water sewage.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Remember the sources of sanitary sewage. (BL-1) 2. Explain the classification of sanitary works. (BL-3) 3. Demonstrate what factors affecting storm water sewage. (BL-2) 		
MODULE -2	SEWERS & SEWER APPURTENANCES	9H

Sewers: introduction, types of sewers, sewer sections, sewer materials, sewer joints, storm water drains- sections, classification; Design of sewers: estimate of sanitary sewage, estimate of storm runoff, hydraulics of sewers, method of design of sewer; Construction of sewers: steps involved in the layout and construction of sewers, Testing of sewer lines; Sewer appurtenances: inlets, catch basins, man holes, drop man holes, lamp holes, flushing tanks, grease traps, inverted siphons, storm regulators and ventilation of sewers.		
At the end of the Module 2, students will be able to: 1. Define sewers, list out the types of sewers. (BL-1) 2. Design of sewers for sanitary sewage. (BL-5) 3. Explain the steps involved in the layout and construction of sewers. (BL-2)		
MODULE-3	SEWAGE CHARACTERISTICS AND PRIMARY TREATMENT	10H
Sewage, Sewage Characteristics, cycles of decomposition of sewage, Sampling and analysis of wastewater, Physical, Chemical and Biological Examination; Oxygen demand - dissolved oxygen determination, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Measurement of BOD; Primary treatment: introduction, screening and skimming-purpose of screening, screens, grit chambers, grease traps, floatation, skimming tanks; sedimentation - introduction, theory of sedimentation, classification of sedimentation tanks, design of sedimentation tanks.		
At the end of the Module 3, students will be able to: 1. Prepare sampling and analysis of wastewater. (BL-3) 2. Illustrate oxygen demand, BOD, COD. (BL-2) 3. Explain the primary treatment for sewage water. (BL-2) 4. Classify the sedimentations tanks and design of sedimentation tanks. (BL-4)		
MODULE-4	SECONDARY TREATMENT	10H
Secondary treatment: introduction, principle of biological treatment, attached and suspended growth processes; Attached Growth Process - intermittent sand filters, contact beds, trickling filters-types, mechanism of impurities removal, design, operation and maintenance; Suspended growth process - Activated sludge process, Principle of action, Activated sludge process vs Trickling filter process, Features of operation, Organic loading parameters, Methods of aeration, Diffused air system, Mechanical aeration, Combined system, Sludge bulking, Sludge volume index.		
At the end of the Module 4, students will be able to: 4. Define the intermittent sand filters. (BL-1) 5. Explain trickling filter types and mechanism of impurities removal. (BL-2) 6. Explain the activated sludge process. (BL-2)		
MODULE-5	SLUDGE AND TERTIARY SEWAGE TREATMENT	10H
Sludge treatment: Characteristics of sewage sludge, Anaerobic sludge digestion process, Stages of sludge digestion, Factors affecting sludge digestion, Sludge digestion tank, High-rate digestion, Sludge thickening, Sludge conditioning, Methods of dewatering the sludge, Methods of sludge disposal. Tertiary sewage treatment: Removal of nitrogen and phosphorus, Refractory organic, Heavy metals, Suspended solids and pathogenic bacteria.		
At the end of the Module 5, students will be able to: 1. Understand the anaerobic sludge digestion process. (BL-3) 2. Explain the methods of dewatering the sludge. (BL-2) 3. Define sludge thickening. (BL-2)		
		Total: 48 Hours

Term work:

- 1.Design a sewage water tank for wastewater treatment plant with more efficient use of land space.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	Introduction & wastewater collection	CO1	Water Supply and Sewerage by E.W. Steel and Terence J. Mc Ghee; McGraw-Hill
2	Sewers & sewer appurtenances	CO2	Environmental Engineering vol. II – Sewage disposal and air pollution engineering by S. K. Garg; Khanna Publishers.
3	Sewage characteristics and primary treatment	CO3	Environmental Engineering vol. II – Sewage disposal and air pollution engineering by S. K. Garg; Khanna Publishers.
4	Secondary treatment	CO4	Waste Water Engineering by DrB,C.Punmia, A.K.Jain and DrArun K. Jain; Lakshmi Publications
5	Sludge and tertiary sewage treatment	CO5	Waste Water Engineering by DrB,C.Punmia, A.K.Jain and DrArun K. Jain; Lakshmi Publications

Text Book(s):

1. Water and wastewater engineering by Mackenzie L. Davis, McGraw-Hill Education publications, 2010.
2. wastewater engineering by Parker R., CBS publications, 2018.

Reference Book(s):

- 1.Waste Water Engineering by Dr.B,C.Punmia, A.K.Jain and DrArun K. Jain; Lakshmi Publications, 2016.
2. Water supply and wastewater engineering by D. Lal, A.K Upadhyay, S.K. Kataria & Sons publications, 2013.

Online Resources:

1. <https://nptel.ac.in/courses/105/106/105106119/>
2. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/>
3. <https://nptel.ac.in/courses/105/105/105105178/>

Web References:

1. https://link.springer.com/chapter/10.1007/978-1-349-06927-9_4
2. <https://www.britannica.com/technology/wastewater-treatment>
3. <https://learnengineering.in/en8592-wastewater-engineering/>

NARAYANA ENGINEERING COLLEGE: NELLORE								
	WATER SUPPLY ENGINEERING						R2020	
Semester	Hours / Week			Total	Credits	Max Marks		
	L	T	P	hrs	C	CIE	SEE	TOTAL
	3	0	0	48	3	40	60	100

Pre-requisite: Basic knowledge of Water Supply Engineering at UG Level.

Course Objectives:

11. To know importance and per capita demand of water.
12. To learn about origin, collection and haulage of water.
13. To study the water standards.
14. To learn about treatment of water in divergent process.
15. To learn about methods of disinfection in water treatment.

Course Outcomes: At the end of the course, student will be able to:

CO 1	Know about historical and proportionately demand of water. (BL-2)
CO 2	Know about the sources, compilation and transference of water. (BL-2)
CO 3	Evaluate and Recommend quality of water. (BL-5)
CO 4	Analyze the treatment of water through sedimentation, coagulation and filtration techniques. (BL-4)
CO 5	Know about theory of disinfection, desalination and chlorination process. (BL-2)

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	2	-	-	1	1	-	-	1	1	1	-	1
CO2	-	2	2	1	1	-	1	-	1	1	1	1	-	1
CO3	1	1	-	-	1	1	-	-	-	-	1	2	-	2
CO4	1	2	1	1	1	-	2	-	-	-	1	1	1	1
CO5	1	2	1	1	1	-	2	-	-	-	-	1	1	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	INTRODUCTION AND WATER DEMAND	9 H
<p>Introduction: Historical development, importance and necessity of protected water supply systems, water borne diseases, objectives of protected water supply system, Flowchart of public water supply system, Role of environmental engineer, agency activities.</p> <p>Water Demand: Introduction, types of water demand, estimation of water demand for a town or city; Per capita Demand and factors affecting per capita demand; variation in demand of water; design Period, factors affecting the Design period; population forecasting studies.</p> <p>At the end of the Module 1, students will be able to:</p> <ol style="list-style-type: none"> 1. Study the Historical development and importance of water supply systems.(BL-2) 2. Illustrate knowledge on water demand in the daily life. (BL-2) 3. 		
MODULE -2	SOURCES OF WATER AND COLLECTION & CONVEYANCE OF WATER	09 Hours
Sources of Water: Lakes, Rivers, Impounding Reservoirs; comparison of sources with reference to		

quality, quantity and other considerations; Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

Collection and Conveyance of Water: Intakes, Factors governing the selection of site for the intake structure, Types of Intakes; Conveyance of Water- Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Laying and Jointing of pipes, Leakages and testing of pipeline; Classification of pumps; Choice of pumps.

At the end of the Module 2, students will be able to:

1. Study the classification of water resources.
2. Discuss the ground water sources
3. Study how to collect water in form of intake structures.
4. Study the conveyance of water through pipes and pumps. (BL-2)

MODULE-3	QUALITY OF WATER	13 H
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quality of water: Introduction, whole some water, potable water, polluted water, contaminated water, requirements of water for domestic use; impurities in water, quality of source, Comparison of sources with reference to quality; Characteristics of water–Physical, Chemical and Biological characteristics; Water analysis, collection of water samples, Physical, Chemical and Biological tests for water analysis, waterborne disease and their control; B.I.S. Drinking water quality standards and WHO guidelines for drinking water.

At the end of the Module 3, students will be able to:

1. Illustrate the different types of water. (BL-2)
2. Explain the different tests conducted for water analysis. (BL-3)
3. Identify the basic concept water quality and quality standards of drinking water. (BL-2)

MODULE-4	TREATMENT OF WATER I	08 H
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Treatment of Water I : Introduction, Flowchart of water treatment plant, Treatment methods; Sedimentation: Theory of sedimentation, Stokes law, Sedimentation tanks, Design aspects, Coagulation: Principle of coagulation, Chemicals used for coagulation, Units of coagulation plant, Optimum Dose of Coagulant. Filtration of Water: Theory of filtration; Filter materials; Slow sand and rapid sand filters; Construction operation and design; Slow sand filters verses rapid sand filters; Under drainage system design in rapid sand filters; Troubles in rapid sand filters; Pressure filters.

At the end of the Module 4, students will be able to:

1. Discuss the different process of water treatment plant. (BL-2)
2. Analyze the theory of sedimentation (BL-4)
3. Illustrate the importance coagulation technique. (BL-2)
4. Identify the basic concept of filtration of water. (BL-2)

MODULE-5	TREATMENT OF WATER II	09 Hours
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Treatment of Water II: Theory of disinfection, requirements of good disinfectants, methods of disinfection ,minor methods of disinfection; Chlorination, forms of application of chlorine, application of chlorine, forms of chlorination; Softening of Water: introduction, necessity, removal of temporary and permanent hardness, Removal of-Iron and manganese, colors, odors and taste; Desalination-Importance, methods; fluoridation and defluoridation

At the end of the Module 5, students will be able to:

1. Study the theory of disinfection. (BL-2)
2. Illustrate the importance of chlorination in water treatment plant. (BL-2)
3. Study the process of softening and desalination of water. (BL-2)

Total hours:	48 Hours
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Teamwork:

- 1) water distribution system with advanced technologies using solar, wind -various applications implemented in automation control in water supply systems – economic and water pricing scarcity value due to per capita demand.

Self-Study:

Contents to promote self-Learning:

SNO	Topic	CO	Reference
1	INTRODUCTION AND WATER DEMAND	CO1	WaterSupplyand Sanitary Engineering Vol.1byGurucharan Singh; StandardPublishersDistributors.
2	SOURCES OF WATER AND COLLECTION& CONVEYANCE OF WATER	CO2	WaterSupplyEngineeringby S.K.Garg;KhannaPublisher
3	QUALITY OF WATER	CO3	WaterSupplyand Sanitary Engineering Vol.1byGurucharan Singh; StandardPublishersDistributors.
4	TREATMENTOFWATER I	CO4	WaterSupplyEngineeringby S.K.Garg;KhannaPublisher .
5	TREATMENTOFWATER II	CO5	WaterSupplyEngineeringbyDrB,C.Punmia,A.K.Jainand DrArunK.Jain;LakshmiPublications.

Text Book(s):

1. Environmental Engineering by GerardKiely; Tata McgrawHillPublishingCoLtd,.(2012).
2. Water supply and sanitary Engineering byG.S.BirdieandJ.S.Birdie;Dhanpat Rai & Sons Publishers.(2012)

Reference Book(s):

1. Water Supply Engineering by DrB,C.Punmia, A.K.Jainand, DrArunK.Jain ;LakshmiPublications, (2016).
2. Water Supply and Sanitary Engineering Vol.1 by Gurucharan Singh; Standard Publishers Distributors, (2013).

Online Resources:

1. <https://nptel.ac.in/courses/105/105/105105201/>

Web Resources:

4. <https://nptel.ac.in/content/storage2/courses/105104102/Lecture%203.htm>
5. https://www.cdc.gov/healthywater/drinking/public/water_treatment.html
6. <https://www.shortcoursesportal.com/studies/21399/water-quality-assessment-and-monitoring.html>

NARAYANA ENGINEERING COLLEGE: NELLORE								
COST EFFECTIVE HOUSING TECHNIQUES								
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
	3	0	0	48	4	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 1. The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of house projects. 2. The course focuses on cost effective construction materials and methods. 3. Emphasis is given on the principles of sustainable housing policies and programmes. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Students will have a comprehensive knowledge of National housing policies objectives, strategies and principles.							
CO 2	Students will have a comprehensive knowledge of planning, design, evaluation, Construction and financing of housing projects with cost effective housing techniques.							
CO 3	Student adopt to find the alternative solution for low-cost housing for buildings.							
CO 4	Student can be in a position to adopt the suitable techniques in rural areas by using locally available materials.							
CO 5	Student can be in a position to adopt the suitable techniques in disaster prone areas.							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	2	-	-	-	-	-	-	1	-
CO2	3	-	-	-	-	2	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	2	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	2	-	-	-	-	-	-	2	1
CO5	3	1	-	-	-	3	2	-	-	-	-	-	1	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION TO HOUSING & HOUSING PROGRAMMES	10H
<p>Basic Terms, 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.</p> <p>Contents and Standards for Housing Programs - Sites and Services, Slum Housing Programs– 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.</p>		
<p>At the end of the Module 1, students will be able to:</p> <ol style="list-style-type: none"> 1. Remember the objectives and strategies of NHP. (BL1) 2. Explain all basic infrastructure considerations. (BL2) 		

3.Understand the standards for housing programmer. (BL2)		
MODULE -2	DEVELOPMENT AND ADOPTION OF LOW-COST HOUSING TECHNOLOGY	10H
Introduction -Adoption of innovative cost-effective construction techniques - Adoption of precast elements- Adopting of total prefabrication of mass housing in India- General remarks on precast roofing/flooring systems -Economical wall system - Single Brick thick load bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall- Fly ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building		
At the end of the Module 2, students will be able to: 1.Understand the adoption of precast elements. (BL2) 2.Know about adopting of total prefabrication of mass housing in India. (BL2) 3.Explain the adoption of precast R.C. (BL3)		
MODULE-3	ALTERNATIVE BUILDING MATERIALS FOR LOW-COST HOUSING	10H
Substitute for scarce materials – Ferro cement - Gypsum boards– Timber substitutions - Industrial wastes - Agricultural wastes- Low-cost Infrastructure services. Introduce- Present status - Technological options- Low-cost sanitation- Domestic wall, Water supply, energy.		
At the end of the Module 3, students will be able to: 1.Classify the substitute for scarce for materials. (BL2) 2.Know about low-cost infrastructure services. (BL2) 3.Explain the low-cost sanitation. (BL3)		
MODULE-4	INFRASTRUCTURE SERVICES IN RURAL HOUSES	9H
Rural Housing Introduction traditional practice of rural housing continuous - Mud Housing technology- Mud roofs - Characteristics of mud – Fire treatment for thatch roof - Soil stabilization - Rural Housing programs		
At the end of the Module 4, students will be able to: 1.Understand the traditional practice of rural housing. (BL2) 2.Explain about mud housing technology. (BL3) 3.Classify the soil stabilization techniques. (BL2)		
MODULE-5	HOUSING IN DISASTER PRONE AREAS	9H
Earthquake- Damages to houses - Traditional prone areas -Type of Damages and Railways of non-engineered buildings. Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirements of structural safety of thin pre-cost roofing units against earthquake forces-Status of R& D in earthquake strengthening measures- Floods, cyclone, future safety.		
At the end of the Module 5, students will be able to: 1.Understand damages to houses from earthquake. (BL2) 2.Explain the repair and restore of building. (BL4) 3.Explain the strengthening methods. (BL2)		
		Total: 48 Hours
Term work:		

Self-Study:

Contents to promote self-Learning:

S.NO	Topic	CO	Reference
1	Introduction to housing & housing programmes	CO1	Hand book of Low Cost Housing by A.K.Lal – New Age International publishers.
2	Development and adoption of low-cost housing technology	CO2	Hand book of Low Cost Housing by A.K.Lal – New Age International publishers.
3	Alternative building materials for low-cost housing	CO3	Building Materials for Low –Income Houses – International Council For Building Research Studies and Documentation.
4	Infrastructure services in rural houses	CO4	Low-Cost Housing – G.C. Mathur, IBH Publishers.
5	Housing in disaster prone areas	CO5	Low-Cost Housing – G.C. Mathur, IBH Publishers.

Text Book(s):

1. Hand book of Low Cost Housing by A.K.Lal – New Age International publishers.
2. Low-Cost Housing – G.C. Mathur, IBH Publishers.

Reference Book(s):

1. Building Materials for Low –Income Houses – International Council For Building Research Studies and Documentation.
2. Modern Trends In Housing In Developing Countries by A.G. Madhava Rao, D.S.Ramachandra Murthy & G.Annamalai.
3. Properties of Concrete by Neville A.M. Pitman Publishing Limited, London.

Online Resources:

1. <http://www.gpcet.ac.in/wp-content/uploads/2017/02/CEHT-UNIT-1.pptx>
2. <https://www.slideshare.net/sayalidarakh/cost-effective-construction-techniques>
3. <https://www.slideshare.net/nischayn1/cost-effective-construction-tech-ppt>

Web References:

1. <https://gosmartbricks.com/10-low-cost-house-construction-techniques-that-never-fail/>
2. <https://www.irbnet.de/daten/iconda/CIB8959.pdf>
3. <https://www.ijsr.net/archive/v4i2/SUB151760.pdf>

PROFESSIONAL ELECTIVES (PE)

Elective Track/Group	Professional Elective-1	Professional Elective-2	Professional Elective-3	Professional Elective-4	Professional Elective-5
Structural Engineering	Green Buildings (20CE4001)	Advanced Concrete Technology (20CE4006)	Pre Stressed Concrete (20CE4011)	Bridge Engineering (20CE4016)	Finite Element Methods In Civil Engineering (20CE4021)
Transportation Engineering	Pavement Materials (20CE4002)	Air Port And Harbor Engineering (20CE4007)	Railway Engineering (20CE4012)	Advanced Transportation Engineering (20CE4017)	Urban Transportation Planning (20CE4022)
Environmental Engineering	Ecological Engineering (20CE4003)	Air And Noise Pollution (20CE4008)	Solid Waste management (20CE4013)	Industrial Waste water Treatment (20CE4018)	Environmental Impact Assessment (20CE4023)
Water Resources Engineering	River Engineering (20CE4004)	Irrigation Engineering (20CE4009)	Hydraulic Structures (20CE4014)	Ground Water Engineering (20CE4019)	Water Shed Management (20CE4024)
Geotechnical Engineering	Geotechnical Explorations (20CE4005)	Earthquake Engineering (20CE4010)	Ground Improvement Techniques (20CE4015)	Advanced Foundation Engineering (20CE4020)	Instrumentation & Sensor Technologies For Civil Engineering Applications (20CE4025)

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4001	GREEN BUILDINGS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			C	CIE	SEE
V	3	0	0	48	4	40	60	100
Pre-requisite: Nil								
Course Objectives:								
<div>1. To present different concepts of green building technologies. .</div> <div>2. To identify sustainable materials, methods and their applications.</div> <div>3. To understand the planning and commissioning of green buildings. .</div> <div>4. To impart the global standards and assessments techniques of green building systems.</div> <div>5. To understand the economic aspects, environmental benefits and case studies of Green buildings.</div>								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand the concept of Green building systems. BL-2							
CO 2	Identify the sustainable materials and design aids. BL-3							
CO 3	Explain the planning and commissioning of green buildings BL-2							
CO 4	Illustrate the standards and building assessment systems . BL-2							
CO 5	Assess the economical aspects of green building systems. BL-5							

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

1: Low, 2-Medium, 3- High

COURSE CONTENT

MODULE -1	HISTORICAL PERSPECTIVE OF GREEN BUILDINGS	10H
Conventional versus Green Buildings – Comparison. Minor and major aspects of Green Buildings – The Integrated Design Process. Green Building Documentation Requirements. Conventional - Contemporary and Future Ecological Design – Green Design to Regenerative Design.		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Differentiate b/w Conventional and Green buildings. 2. Familiarize with the concepts, requirements and design processes. 3. Understand the design concepts. 		
MODULE -2	GREEN BUILDING SYSTEMS	10H
Sustainable sites and landscaping – Enhancing ecosystems. Building envelopes – selection of green materials, products and applications. Passive design strategies. Internal load reduction – Indoor environment quality Building water and waste water management. Use of LEED / IGBC standards		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the green materials, products and applications. 2. Understand the design strategies of green buildings. 3. Enumerate the Building water and waste water systems. 		
MODULE-3	GREEN BUILDING IMPLEMENTATION	10H
Site Planning, Health and Safety Planning, Construction and Demolition. Waste Management – Reducing the Footprint of Construction Operations – Maximizing the Value of		

Building Commissioning. HVAC Systems, Lighting and cleaning systems for green buildings. Costs and Benefits of Building Commissioning– use of LEED/ IGBC standards.		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Explain the Planning of green buildings. 2. State the Lighting and cleaning systems for green buildings 3. Illustrate the benefits of Building Commissioning. 		
MODULE-4	GREEN BUILDING ASSESSMENT	9H
International Building Assessment Systems – The USGBC/ LEED Building Assessment Standard – The LEED Certification Process – The Green Globes Building Assessment Protocol- Example of a Platinum / Gold / Silver Building. Comparison of present Building Rating Systems – Code compilation requirements – Leed Griha		
At the end of the Module 4, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the standards and building assessment systems.. 2. Understand the global causes and standards, 3. Comparison of present Building Rating Systems 		
MODULE-5	ECONOMICS OF GREEN BUILDINGS	9H
Economic aspects of Green Buildings – Quantifying Green Building Benefits Managing Costs and Barriers Short and long term environment benefits. Some typical case studies of Green Buildings.		
At the end of the Module 6, students will be able to:		
<ol style="list-style-type: none"> 1. Know the Economic aspects of Green Buildings. 2. Estimate the costs and benefits. 3. Determine Short and long term environment benefits. 4. Know the case studies of green buildings.. 		
Total Hours: 48 Hours		
Content beyond syllabus:		
Pollution Prevention and Cleaner Production Awareness Plan, Waste Audit, Zero target, Indian Green Building Council (IGBC).		
Text Book(s):		
<ol style="list-style-type: none"> 1. “Green Buildings A to Z”, Understanding the buildings, by Jerry Yudelson 2008. 2. “Green Buildings through Integrated Design”, by Jerry Yudelson , Tata McGraw Hill..3. 3. “Green building guidelines: Meeting the demand for low-energy, resource-efficient homes”, Sustainable Buildings Industry Council. 		
Reference Book(s):		
<ol style="list-style-type: none"> 1. “Green Building Products: The Green Spec guide to residential building materials” by Alex Wilson and Mark Peipkorn , 2nd Edition., Gabriola Island. 2. “The Green guide to specification: An Environmental Profiling system for building materials and components”, by Jane Anderson, David E. Shiers, and Mike Sinclair , 3rd Edition, Oxford;Malden.. 3. “Sustainable Construction: Green Building Design and Delivery”, by Charles J. Kibert , 2nd Edition, Wiley. 		
Online Resources:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105/102/105102195/ 2. https://nptel.ac.in/courses/124/107/124107011/ 		
Web References:		
<ol style="list-style-type: none"> 1. www.newsociety.com, 2. https://igbc.in/igbc/redirectHtml.htm?redVal=showratingSysnesign 		

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4002	PAVEMENT MATERIALS							R20
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100
Course Objectives: <ol style="list-style-type: none"> To introduce the need for Pavement materials. To familiarize with the Properties & failures of different materials under various loading conditions 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand the importance, functions & properties of different soils as a paving material. BL-2							
CO 2	Illustrate the importance & properties of aggregates in pavement design. BL-2							
CO 3	Familiarize the importance & properties of Bitumen, Modified bitumen, Bitumen emulsion and Cutback bitumen. BL-1							
CO 4	Design the Bitumen Mixtures required for pavement design. BL-6							
CO 5	Familiarize the properties of cement & design the Concrete mix required. BL-1							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO3	3	2										1		
CO4	3	2										1		
CO5	3	2										1		
CO6	3	2										1		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	9 H
Soil: Introduction to soil as a highway material; Classification of soils; Consistency Limits; Soil compaction and role of moisture; Mechanical properties of soil (Shear strength, Unconfined compressive strength, Resilient modulus, California bearing ratio, Modulus of subgrade reaction etc.); Introduction to expansive soils, relevant tests, and soil stabilization techniques.	
MODULE – 2	9 H
Aggregates: Aggregate origin, types, production, and quarrying operation; Classification of aggregates; Aggregate gradation and gradation parameters; Theories of aggregate blending; Mineralogy of aggregates and its importance; Aggregate shape and texture: quantification and importance; Aggregate strength properties, and relevant tests.	
MODULE – 3	10 H
Bitumen, Modified bitumen, Bitumen emulsion and Cutback bitumen: Bitumen as a binding agent; Production of bitumen; Physical and rheological properties of bitumen; Introduction to viscoelasticity; Chemistry of bitumen; Ageing of bitumen; Grading of bitumen, and relevant tests: Penetration grade, Viscosity grade, Performance grade; Bitumen modification: Need, Types and Importance; Introduction of bitumen emulsion: Theory of emulsification, Uses, Grading of emulsions, and Relevant tests; Introduction to cutback bitumen: Types, Uses, and relevant tests.	
MODULE – 4	10 H
Bituminous Mixtures: Production of bituminous mixtures: Laboratory and Plant; Role of bituminous mixture and desirable properties; Volumetrics of bituminous mixture; Mix design of bituminous mixture: Marshall and Superpave methods; Mechanical tests and characterization of bituminous mixtures; Introduction to performance based mix design concepts; Mix design of cold bituminous mixtures; Mix design of hot recycled mixtures	

MODULE-5		10 H
Cement: Production of cement; Theory of hydration and importance of different hydration products; Physical and chemical properties of cement; Types of cement; Pozzolanic and geopolymer materials as alternate cement. Concrete Mix Design: Concrete proportioning and importance of various constituents; Introduction and mix design of pavement quality concrete, Dry lean concrete and Pervious concrete		
Total hours:		48 hours

Content beyond syllabus:

Alternative Pavement Materials: State of the art on various alternative materials for construction of flexible and rigid pavements

Text Books:

1. Highway Engineering- Khanna, S.K., and Justo, C.E.G.: Nem Chand and Bros. Roorkee.
2. Construction Equipment and its Management- Sharma, S.C.:Khanna Publishers.
3. Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, Kandhal, P.S: University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

Reference Books:

1. Ralphs Hass and Hudson, W.R. "Pavement Management System" Mc-Graw Hill Book Company.
2. Guidelines for the use of Interlocking concrete block Pavement, IRC:SP:63-2004
3. IRC codes of practice.
4. Principles of Transportation Engineering, Partha Chakraborty and Animesh Das, PHI Learning.

Web References:

1. <https://wiki.metakgp.org/w/CE60011: Pavement Materials>
2. https://onlinecourses.nptel.ac.in/noc22_ce93/preview
3. <https://www.sciencedirect.com/topics/engineering/bituminous-mixture#:~:text=Bituminous%20mixtures%2C%20sometimes%20called%20asphalt,of%20different%20grades%20and%20quantities.>
4. [https://pavementinteractive.org/reference-desk/materials/aggregate/#:~:text=Aggregate%E2%80%9D%20is%20a%20collective%20term,concrete%20and%20portland%20cement%20concrete\).](https://pavementinteractive.org/reference-desk/materials/aggregate/#:~:text=Aggregate%E2%80%9D%20is%20a%20collective%20term,concrete%20and%20portland%20cement%20concrete).)

NARAYANA ENGINEERING COLLEGE: NELLORE								
20CE4003	ECOLOGICAL ENGINEERING							NECR-2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives:								
1	To understand about multi-disciplinary nature of environmental BL-2							
2	To survey the natural resources BL-4							
3	To Study the environmental pollution BL-1							
4	To understand about biodiversity and its conservation BL-2							
5	To Know aboutpollution management BL-1							
Course Outcomes: After successful completion of the course, the student will be able:								
CO 1	To understand about multi-disciplinary nature of environmental BL-2							
CO 2	To survey the natural resources BL-4							
CO 3	To Study the environmental pollution BL-1							
CO 4	To understand about biodiversity and its conservation BL-2							
CO 5	To Know aboutpollution management BL-1							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	-	1	1	-	3	2	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	-
CO3	2	2	-	-	-	-	-	-	-	2	-	2	2	-
CO4	3	2	-	2	2	-	-	-	-	2	-	2	3	-
CO5	3	3	2	2	3	-	1	2	2	3	2	3	3	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE-1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	(10H)
Scope, importance, Need for public awareness, Institutions and people in Environment. Structure and function of an ecosystem, Energy flow, ecological pyramids, Types of ecosystem, Ecological succession.	
At the end of the Module 1, students will be able to know about public awareness. (BL1)	

MODULE -2		NATURAL RESOURCES: FOREST RESOURCES	(13H)
Forest distribution, importance of forests, causes, effects and control of deforestation. Water resources: Nature of water resources, floods, drought, conflicts over water, dams- benefits and problems, Water conservation, rain water harvesting, watershed management. Mineral resources: Environmental effects of mining. Food resources: World food problems, effects of modern agriculture, water logging, salinity. Energy resources: Growing energy needs, Renewable and non-renewable energy sources. Land resources: land degradation, Soil erosion and d ication. Case studies, Role of an individual in conservation of natural resources.			
<i>At the end of the Module 2, students will be able to know natural resources (BL2)</i>			
MODULE-3		ENVIRONMENTAL POLLUTION	(9H)
Air Pollution - Primary and Secondary Pollutants - Sulphur dioxide, Nitrous oxide, Particulates, aerosols, carbon monoxide and noise , Water pollution - pollutants - pesticide, industrial effluents, sewage, heavy metals, radio - active substances ,Land pollution - Fertilizers, pesticides & Solid waste, Preventive measures of Environmental pollution , Wild life conservation ,Legislation on environment protection with reference to Indian context.			
<i>At the end of the Module 3, students will be able to memorize environmental pollution.(BL1)</i>			
MODULE-4		BIODIVERSITY AND ITS CONSERVATION	(8H)
Levels and Values of biodiversity, India as a mega diversity nation, Hotspots, threats and conservation of biodiversity, Assessment of Biodiversity and its impact on Environment, Case studies.			
<i>At the end of the Module 4, students will be able to knowabout biodiversity (BL2)</i>			
MODULE-5		ENVIRONNEMENTAL POLLUTION	(8H)
Pollution Causes, effects and control of pollutions, Soil waste management, Role of an individual in prevention of pollution - Pollution case studies. Disaster management: Floods cyclones, Earth quacks, landslides, disaster reduction management.			
<i>At the end of the Module 5, students will be able to know about pollution management.(BL2)</i>			
Total hours:			48 hours
Term work: <i>Site visit and report preparation.</i>			
Content beyond syllabus: <i>Pollution study of water bodies</i>			
Self-Study:			
Topic	CO	Reference	
Multi-disciplinary nature	CO1	https://www.digimat.in/nptel/courses/video/105104103/L01.html	
Natural resources	CO2	https://www.digimat.in/nptel/courses/video/105104103/L01.html	
Environmental pollution	CO3	https://www.digimat.in/nptel/courses/video/105104103/L01.html	
Biodiversity	CO4	https://www.digimat.in/nptel/courses/video/105104103/L01.html	
Pollution management	CO5	https://www.digimat.in/nptel/courses/video/105104103/L01.html	
Text Book(s):			
1. Ecological Engineering and Ecosystem Restoration by William J.Mistch			

2. Waste Water Treatment, Rao Mn Oxford & Ibh Publishing Ltd

Reference Book(s):

1. Ecological Engineering and Ecosystem by John wiley&Sons,INC
2. Theory and Practice of Water and Wastewater Treatment, Ronald L Doraste, Wiley publisher.

Online Resources:

<https://www.digimat.in/nptel/courses/video/105104103/L01.html>

<https://www.digimat.in/nptel/courses/video/105104103/L01.html>

<https://www.digimat.in/nptel/courses/video/105104103/L01.html>

Web References:

<https://www.digimat.in/nptel/courses/video/105104103/L01.html>

<https://www.digimat.in/nptel/courses/video/105104103/L01.html>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4004	RIVER ENGINEERING							R-20
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100
Pre-requisite: FLUID MECHANICS								
Course Objectives: <ol style="list-style-type: none"> To explain the River flow kinematics To Summarize the Steady river flow- Steady-non uniform river flow To Differentiate the Equilibrium in river bends To analyze the Riverbank protection To explain the Navigation waterways 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Explain river Hydraulic and energy grade lines (BL-2)							
CO 2	Explain hydraulic Steady river flow- Steady-non uniform river flow (BL-2)							
CO 3	Explain River confluences and branches (BL-2)							
CO 4	Analyze flow and Riverbank stability, Riverbank. (BL-4)							
CO 5	Identify guide Multidimensional river models (BL-3)							

CO-PO Mapping														
CO	PO												PSO	
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	P O10	P O11	P O12	PS O1	PS O2
CO1	1	1												2
CO2	1	2												2
CO3	1	2												2
CO4	1	2												2
CO5	1	2												2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	PHYSICAL PROPERTIES AND EQUATIONS IN RIVERS	9H
Introduction of Dimensions and units - Properties of water and sediment ,River flow kinematics ,Conservation of mass Equations of motion ,Hydraulic and energy grade lines		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. Illustrate the Dimensions and units of rivers 2. Summarize the Properties of water and sediment 		
MODULE – 2	STEADY FLOW IN RIVERS AND UNSTEADY FLOW IN RIVERS	10H
Steady river flow- Steady-non uniform river flow , Sediment transport in river ,River continuity equation River momentum equations ,River flood waves ,Loop-rating curves ,River flood routing River flow and sediment-duration curves		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 4. Differentiate Steady-non uniform river flow 		

5. characteristics and shapes River flood routing		
MODULE – 3		
VER EQUILIBRIUM RIVER DYNAMICS		9H
Introduction of Particle stability - Channel stability ,Regime relationships ,Equilibrium in river bends Downstream hydraulic geometry , Bars in alluvial rivers ,River meandering ,Lateral river migration River dynamics ,Riverbed degradation ,Riverbed aggradations ,River confluences and branches River databases		
At the end of the Module 3, students will be able to: 4. Explain the River meandering ,Lateral river migration 2. Explain the River confluences and branches River databases		
MODULE – 4 RIVER STABILIZATION AND RIVER TRAINING WORK		
Introduction of Riverbank stability, Riverbank riprap revetment, Riverbank protection, River flow-control structures ,River training along braided rivers.		
At the end of the Module 5, students will be able to: 3. Summarize the Riverbank protection 4. Explain the River flow-control structures		
MODULE – 5 RIVER ENGINEERING AND RIVER MODELLING		12H
Introduction of River flood control, River closure Canal head works ,Bridge scour ,Navigation waterways Rigid-bed model ,Mobile-bed river models ,Finite-difference approximations ,One-dimensional river models Multidimensional river models		
At the end of the Module 6, students will be able to: 5. Explain the River flood control, River closure 6. Classification of Navigation waterways Rigid-bed model		
Total Hours:		

Term work:		
1. Illustrate the Dimensions and units of rivers 2. Differentiate Steady-non uniform river flow 3. Explain the River meandering ,Lateral river migration 4. Explain the River flow-control structures 5. Classification of Navigation waterways Rigid-bed model		
Content beyond syllabus: Development of classifications of rivers		
Contents to promote self-Learning:		
SN O	Topic	Reference

1.	PHYSICAL PROPERTIES AND EQUATIONS IN RIVER	https://www.youtube.com/watch?v=vvOsLNDgjqs	
2.	STEADY FLOW IN RIVERS and UNSTEADY FLOW IN RIVERS	https://www.youtube.com/watch?v=QYEGan4fOnk	
3.	RIVER EQUILIBRIUM and RIVER DYNAMICS	https://www.youtube.com/watch?v=_qfszFYzfVg	
4.	RIVER STABILIZATION AND RIVER TRAINING WORK	https://www.youtube.com/watch?v=kexSKEfqhMA	
5.	RIVER ENGINEERING and RIVER MODELLING	https://www.youtube.com/watch?v=aZ7lwqQoEZE&t=43s	

Text Book(s):

1. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
2. River Engineering by Margeret Peterson
3. Principles of River Engineering by (the non tidel alluvial) PH Jameen

Reference Book(s):

1. River Engineering by Margeret Peterson
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal..

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ce70/preview
2. https://www.youtube.com/watch?v=B9lyGZzb_6M&list=PLIhUrsYr8yHzft7ygw5THZo4aDcsxEadP
3. https://onlinecourses.nptel.ac.in/noc22_ce79/preview
4. <https://alison.com/course/river-equilibrium-in-river-engineering>

Web References:

<https://www.youtube.com/watch?v=KvOsSojDBWA>

<https://www.youtube.com/watch?v=GkHI4uAIMdo>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4005	GEOTECHNICAL EXPLORATION							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
V	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 11. To know the formation of soil. 12. To know different methods of soil exploration. 13. To understand different samples and sampling methods. 14. To know about borehole logging. 15. To know suitability of field methods. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Classify the soil based on physical properties of soil. BL-2							
CO 2	To enable the student to understand soil exploration methods. BL-2							
CO 3	Understand types of samplers specifications for testing. BL-2							
CO 4	Understand Borehole logging methods. BL-2							
CO 5	To enable the student to prepare soil exploration Reports. BL-6							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2									1	2	
CO2	3	2	2										2	
CO3	3	2	1										2	
CO4	3	1	2									1	2	
CO5	3	2	2										2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	INTRODUCTION	10H
Introduction: Soil Formation, types of soils, physical and biological weathering, soil transport, deposition and stratification phenomena and Soil Classification.		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1. To learn different types of soils. 2. To understand classification of soil. 		
MODULE -2	SOIL EXPOLARATION	10H
Soil Exploration: Soil Exploration Programme for different Civil Engineering Projects Exploration Methods: Methods of Boring, Augering and Drilling. Machinery used for drilling, types of augers and their usage for various projects.		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. To learn different types boring methods. 		

2. To understand depth and location of soil exploration.		
MODULE-3	SOIL SAMPLING	10H
Soil Sampling: sampling methods, types of samples, storage of samples and their transport. Sample preparation, sample sizes, types of samplers specifications for testing.		
At the end of the Module 3, students will be able to:		
1. To types of samplers specifications for testing.		
MODULE-4	BOREHOLE LOGGING	9H
Borehole Logging: Logging of Boreholes-logging methods- Ground water observations – water table fluctuations and effects - Preparation of soil profiles – calculations		
At the end of the Module 4, students will be able to:		
5. To learn about borehole logging methods.		
6. To understand about water table fluctuations and effects.		
MODULE-5	FIELD TESTING OF SOILS	9H
Field testing of soils: methods and specifications – visual identification tests, vane shear test, penetration tests, analysis of test results.		
Report writing: Soil exploration Reports- identification, calculations and preparation.		
At the end of the Module 5, students will be able to:		
7. To understand different field tests.		
8. To Prepare Soil exploration Reports.		
Total Hours: 48		

Term work:		
Preparation of soil exploration reports for different soil profiles.		
Content beyond syllabus: Design factors affecting sample disturbance.		
Contents to promote self-Learning:		
S N O	Topic	Reference
6	Introduction	https://www.constructioncivil.com/soil-exploration-for-construction/
7	Soil Expolaration	https://theconstructor.org/geotechnical/boring-methods-soil-sampling/31869/
8	Soil Sampling	https://civilblog.org/2016/02/10/how-to-classify-soil-samples-based-on-sampling-method/
9	Borehole Logging	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/borehole-logging
1	Field Testing of	https://helptheengineer.com/field-indentification-tests-for-soils/

		Soils	
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Text Book(s):

1. J. E. Bowles, “Foundation Analysis and Design”, McGraw Hill Companies, 1997.
2. M. D., Desai, “Ground Property Characterization from In-Situ Testing”, Published by IGS-Surat Chapter, 2005.

Reference Book(s):

1. M. J., Hvorslev, “Sub-Surface Exploration and Sampling of Soils for Civil Engineering Purposes”, US Waterways Experiment Station, Vicksburg, 1949.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce81/preview

Web References:

1. <https://nptel.ac.in/courses/105101083>

NARAYANA ENGINEERING COLLEGE:GUDUR														
20CE 4006		ADVANCED CONCRETE TECHNOLOGY											R2020	
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P			C	CIE	SEE	TOTAL					
VI	3	1	0	48	4	40	60	100						
Pre-requisite: Required sound knowledge in mathematics and science														
Course Objectives: 1. To Learn the microstructure characterization of concrete. 2. To Design high strength concrete mix and various special concretes. 3. To Study the different factors influencing durability of concrete.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1		Understand the concept of micro structure of concrete. BL-2												
CO 2		Discuss durability acceptance criteria as per BIS code and need and importance of NDT tests. BL-6												
CO 3		Design high strength and High performance concretes. BL-6												
CO 4		Understand the various properties of special concretes and its uses. BL-2												
CO 5		Understand need and importance of formwork systems. BL-2												
CO-PO Mapping														
CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2	1					1	1	
CO2	2					2	1					1	1	
CO3	2					2	1					1	1	
CO4	2					2	1					1	1	
CO5	2					2	1					1	1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	
CONCRETE MATERIALS: Concrete Materials: Cement – Bogus Compounds – Hydration Process – Types of Cement– Aggregates – Gradation Charts – Combined Aggregate – Alkali Silica Reaction –Admixtures – Chemical and Mineral Admixtures. (9h)	
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> Understand the Hydration Process of concrete. Develop the Gradation Charts of aggregates. Learn about Chemical and Mineral Admixtures. 	
MODULE -2	
FRESH AND HARDENED CONCRETE: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding. Hardened Concrete: Abrams Law, Gel space ratios, Maturity concept – Stress strain behavior – Creep and Shrinkage – Durability Tests on Concrete – Non-Destructive Testing of Concrete. (10h)	
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> Understand the Fresh and hardened properties of concrete. Discuss the Stress strain behaviour of hardened concrete. Learn about Non-Destructive Testing of Concrete. 	
MODULE-3	
HIGH STRENGTH CONCRETE: High Strength Concrete –Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete. High Performance Concrete – Requirements and Properties of High-Performance Concrete – Design Considerations (10h)	

Reference Book(s):

1. Concrete: Micro Structure by P.K.Mehta, ICI, Chennai.
2. Properties of Concrete by A.M.Neville, ELBS publications Oct 1996.
3. Concrete Technology by A.R. Santha kumar, Oxford University Press Oct 2006.
4. Concrete Technology by M.S.Shetty, S.Chand& Co 2009.

Online Resources:

1. <https://archive.nptel.ac.in/courses/105/102/105102012/>
2. <https://nptel.ac.in/courses/105/106/105106176/>
3. <http://kec.edu.np/wp-content/uploads/2017/06/Advanced-Concrete-Technology.pdf>

Web Resources:

1. https://mycourses.aalto.fi/pluginfile.php/272892/course/section/60458/Lec05_Concrete.pdf
2. <http://onlinepubs.trb.org/onlinepubs/circulars/ec171.pdf>
3. https://mycourses.aalto.fi/pluginfile.php/142946/mod_label/intro/2015-11-09_Special_concrete_Part02_Fahim03.pdf
4. http://www.sginstitute.in/Downloads/Civil_Downloads/LectureNo_17.pdf
5. <http://freeit.free.fr/The%20Civil%20Engineering%20Handbook,2003/0958%20ch04.pdf>
6. <http://www.iitk.ac.in/ce/test/IS-codes/is.13311.1.1992.pdf>

NARAYANA ENGINEERING COLLEGE::NELLORE														
20CE4007	AIRPORT & HARBOUR ENGINEERING												R20	
Semester	Hours / Week				Total hrs	Credit		Max Marks						
	L	T	P	C		CIE	SEE	TOTAL						
VI	3	0	0		48	3	40	60	100					
Pre-requisite: Required basic knowledge in Modes of transport (Transportation Engineering).														
Course Objectives:														
1. To know the basic terms & characteristics of Airport Planning.														
2. To design the various elements of an airport.														
3. To design the pavement and know the drainage conditions required for an airport.														
4. To know the history, importance & classification of Harbour engineering.														
5. To know the function & classification of various elements in Ports, Docks & Harbours.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Interpret the importance, terms & characteristics of Airport planning. (BL-2)													
CO 2	Design the various elements involved in the Airport planning. (BL-6)													
CO 3	Understand & design the pavement and drainage characteristics for an airport runway. (BL-2)													
CO 4	Illustrate the history, importance & classification of Harbour engineering. (BL-2)													
CO 5	Familiarize with the function & classification of various elements in Ports, Docks & Harbours.(BL-2)													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2			1							1	1	
CO2	3	3	2	1	1							1	1	
CO3	3	3			1							1	1	
CO4	3	2			1							1		
CO5	3	2			1							1	1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	AIRPORT PLANNING	(9H)
Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Are		
MODULE 2	AIRPORT DESIGN	(10 H)
Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.		
MODULE- 3	AIRPORT PAVEMENT DESIGN	(10 H)
Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.		
MODULE- 4	HARBOURS ENGINEERING	(9H)
History, Advantages and disadvantages of water transportation, Modern trends in water transportation, Elements of water transportation, Historical development in India, Classification of harbours, Ports development in India, Port authorities ,Bodies and association		
MODULE- 5	DOCKS AND HARBOURS	(10 H)
Classification of ports – Requirement of a good port – classification of Harbours – Docks – Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides – Tidal data and Analysis – Break waters – Dredging –		

Maintenance of Ports and Harbours – Navigational aids.		
Total hours:		48 hours

Text Book(s): <ol style="list-style-type: none"> 1. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, Scitech Publications (India), Chennai, 2010 2. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015 3. Vazirani.V.N and Chandola.S.P, “Transportation Engineering-Vol.II”, Khanna Publishers, New Delhi, 2015. 4. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013. 	
Reference Book(s): <ol style="list-style-type: none"> 1. Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015. 2. Mundrey J S, Railway Track Engineering, McGraw Hill Education (India) Private Ltd, New Delhi, 2013 3. Oza.H.P. and Oza.G.H., “A course in Docks & Harbour Engineering”. Charotar Publishing Co., 2013. 4. Rangwala, “Airport Engineering”, Charotar Publishing House, 2013. 5. Rangwala, “Harbor Engineering”, Charotar Publishing House, 2013. 6. Srinivasan R. Harbour, “Dock and Tunnel Engineering”, 26th Edition 2013 	
Web Resources: <ol style="list-style-type: none"> 1. https://archive.nptel.ac.in/courses/105/107/105107123/ 2. https://www.faa.gov/airports/central/planning_capacity/overview#:~:text=Airport%20planning%20is%20a%20systematic,layout%2C%20master%20and%20system%20planning. 3. https://unacademy.com/content/railway-exam/study-material/general-awareness/an-overview-of-the-classification-of-ports/ 4. https://nptel.ac.in/courses/114106025 	

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4008	AIR POLLUTION AND CONTROL							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: 1. To study the current scenario of Air pollution from industries in India and their studies. 2. To know the differences between prevention and control of Air pollution. 3. To get the knowledge on Control of particulate pollution. 4. To classify the control methods of gaseous pollutants. 5. To understand the Vehicular pollution and indoor air quality.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand deferent types of air pollutants, their effects, and Quality standards. (BL-2)							
CO 2	Identify Factors influencing air pollution and Plume behavior. (BL-3)							
CO 3	Explain various types of air pollution controlling equipments. (BL-2)							
CO 4	Demonstrate various control methods of Gaseous pollution. (BL-2)							
CO 5	List the Vehicular pollution . BL-1							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						3	2							
CO2	3	3					2							2
CO3	3		3										1	3
CO4	2				3	2	1						3	
CO5	2		2		3	2	1						2	3
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	AIR POLLUTION	(10H)
Definition of Air Pollution – Sources & Classification of Air Pollutants – Effects of air pollution – Global effects – Ambient Air Quality and standards – Monitoring air pollution, Sampling and analysis of Pollutants in ambient air – Stack sampling.		
At the end of the Module 1, students will be able to:		
<ol style="list-style-type: none"> 1 .List out the Properties of Air pollutants. (BL1) 2. Find the effects of Air pollution. (BL1) 		
MODULE -2	METEOROLOGY AND AIR POLLUTION	(10H)

Factors influencing air pollution, Wind rose, Mixing Depths, Lapse rates and dispersion – Atmospheric stability, Plume behavior, Plume rise and dispersion, Prediction of air quality, Box model – Gaussian model – Dispersion coefficient – Application of tall chimney for Pollutant dispersion.		
<p>At the end of the Module 2, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the Effects of meteorology on Air Pollution. (BL2) 2. Know the Plume behavior. (BL1) 3. Label the Application of tall chimney. (BL1) 		
MODULE-3	CONTROL OF PARTICULATE POLLUTANTS	(10H)
Properties of particulate pollution – Particle size distribution – Control mechanism – Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.		
<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 1. Define the Properties of particulate pollution. (BL1) 2. Demonstrate the control mechanism and working principle of equipments. (BL2) 		
MODULE -4	CONTROL OF GASEOUS POLLUTANTS	(9H)
Process and equipment for the removal by chemical methods – Working principles and operation of absorption and adsorption equipment – Combustion and condensation equipment.		
<p>At the end of the Module 4, students will be able to:</p> <ol style="list-style-type: none"> 1. Choose various chemical methods. (BL3) 2. Explain the Working principles and operation of equipments. (BL2) 		
MODULE -5	AUTOMOBILE AND INDOOR POLLUTION	(9H)
Vehicular pollution – Sources and types of emission – Effect of operating conditions-Alternate fuels and emissions- Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and air cleaning systems-indoor air quality		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 1. Explain the Vehicular pollution. (BL2) 2. Illustrate the Causes of indoor air pollution. (BL2) 3. Find the indoor air quality standards. (BL1) 		
Total Hours:		48 H

Term work:
<ol style="list-style-type: none"> 1. Field Trip to Industries. 2. Solve the Design and performance equations by using any Design Software. 3. Determination of Intensity level using any programming language. 4. Application of any software to analyze the Noise standards. 5. Developing the Environmental Protection Acts

Content beyond syllabus:

On-line monitoring for Air pollution.

Contents to promote self-Learning:

S N O	Topic	Reference
1	Air Pollution.	https://nptel.ac.in/courses/105/104/105104099/ https://slideplayer.com/slide/1639375/
2	Meteorology and Air pollution	https://drive.google.com/file/d/1XfLKWtBE34M_oZEEvqJV1rX5OUiaQVDd/view
3	Control of particulate pollutants	https://drive.google.com/file/d/15H-X3yIWOMCid91a9tBsvVPLOBw1J8cn/view
4	Control of Gaseous pollutants	https://drive.google.com/file/d/15H-X3yIWOMCid91a9tBsvVPLOBw1J8cn/view
5	Automobile and Indoor pollution	file:///G:/2019-20/APQC/automobile-pollution.pdf

Text Book(s):

1. M.N Rao and HVN Rao, "Air Pollution", TataMcgraw Hill Publishing Company imited,2007.
2. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.
3. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.

Reference Book(s):

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.
3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynard publisher Academic Press
4. C.S. Rao, "Environmental Pollution Control Engineering", NewAge International(P) Limited Publishers,2006.

Online Resources:

1. <https://www.airnow.gov/friday-resources/>
2. <https://cpcb.nic.in/noise-pollution/>

Web References:

1. <https://www.europarl.europa.eu/factsheets/en/sheet/75/air-and-noise-pollution>
- 2 <https://www.britannica.com/science/noise-pollution>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4009	IRRIGATION ENGINEERING							R-20
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 16. To explain the planning for irrigation projects 17. To Summarize the Soil-water-plant relationship 18. To Differentiate Silt theories–Kennedy’s theory, Kennedy’s method of channel design 19. To analyze the ill effects of water logging 20. To explain the Modernization techniques 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Explain the Necessity and Importance of Irrigation(BL-2)							
CO 2	Explain Indian agricultural soils(BL-2)							
CO 3	Explain classification of irrigation canals(BL-2)							
CO 4	Analyze the Lining of irrigation channels – necessity(BL-4)							
CO 5	Identify objectives and criteria of good canal irrigation management(BL-3)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2
CO1	2											1		
CO2	2											1		
CO3	2											1		
CO4	2											1		
CO5	2											1		
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	INTRODUCTION	9H
Irrigation: Introduction, Necessity and Importance of Irrigation; advantages and ill effects of Irrigation, History of irrigation development in India, classification of irrigation projects, planning for irrigation projects, economic evaluation of irrigation projects. (2h) Irrigation systems: Types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty. (5h)		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the planning for irrigation projects 2. Summarize the factors affecting duty 		
MODULE – 2	IRRIGATION WATER REQUIREMENT OF CROPS	10H
Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil-water-plant relationship; vertical distribution of soil moisture, soil moisture tension, soil moisture stress,various soil moisture constants, Limiting soil moisture conditions; Depth and frequency of irrigation; Gross command area, Culturable command area, Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation; Irrigation efficiencies;		

Determination of irrigation requirements of crops; Assessment of Irrigation water; Consumptive use of water-factors affecting consumptive use, direct measurement and determination by use of equations (theory only). (8h)		
At the end of the Module 2, students will be able to:		
<ol style="list-style-type: none"> 1. Differentiate Types of soils 2. characteristics and Determination of irrigation requirements of crops 		
MODULE – 3	CANAL IRRIGATION	9H
<p>Canals: Introduction, classification of irrigation canals, alignment of canals, distribution system for canal irrigation, canal regulation, water courses, Inundation canals. (3h)</p> <p>Silt theories: Cross-section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories– Kennedy’s theory, Kennedy’s method of channel design; Drawbacks in Kennedy’s theory; Lacey’s regime theory- Lacey’s theory applied to channel design, Defects in Lacey’s theory; Comparison of Kennedy’s and Lacey’s theory. (5h)</p>		
At the end of the Module 3, students will be able to:		
<ol style="list-style-type: none"> 1. Explain the water courses, Inundation canals 2. Explain the Lacey’s regime theory- Lacey’s theory applied to channel design 		
MODULE – 4	LINED CANALS & DRAINAGE ENGINEERING	8H
<p>Lined Canals: introduction, Lining of irrigation channels – necessity, advantages and disadvantages, selection of suitable type of lining, Types of lining, drainage behind lining, construction of lined canal, operation and maintenance of lined canals; Design of lined canal. (4h)</p> <p>Drainage Engineering: Introduction, Water logging, ill effects of water logging, causes of water logging, anti-water logging measures; Saline and alkaline soils; land reclamation- process, methods; Land drainage-classification, benefits; Essential requirements of a drain, classification of drains. (4h)</p>		
At the end of the Module 5, students will be able to:		
<ol style="list-style-type: none"> 1. Summarize the Lining of irrigation channels 2. Explain the land reclamation- process 		
MODULE – 5	MANAGEMENT OF CANAL IRRIGATION	12H
<p>Need for canal irrigation management, inadequacies of canal irrigation management, objectives and criteria of good canal irrigation management, methods for improving canal irrigation management, operation and maintenance of canal irrigation systems, evaluation of performance of canal irrigation systems. (3h)</p> <p>Modernization techniques; Rehabilitation - Optimization of water use; water losses - minimization, On farm development works - Participatory irrigation management, water resources associations - Changing paradigms in water management; Methods of pricing irrigation water-flat rate pricing, volumetric method of pricing; Economic aspects of irrigation. (3h)</p>		
At the end of the Module 6, students will be able to:		
<ol style="list-style-type: none"> 1. Explain the evaluation of performance of canal irrigation systems 2. Classification of Optimization of water use; water losses - minimization 		
Total Hours:		

Term work:
<ol style="list-style-type: none"> 1. Illustrate the planning for irrigation projects 2. Differentiate Types of soils 3. Explain the Lacey’s regime theory- Lacey’s theory applied to channel design 4. Summarize the Lining of irrigation channels 5. Classification of Optimization of water use; water losses - minimization

Content beyond syllabus:

Development of classifications of irrigation crops

Contents to promote self-Learning:

S N O	Topic	Reference
1	INTRODUCTION	https://www.youtube.com/watch?v=Q4PLgEL3itA
1	IRRIGATION WATER REQUIREMENT OF CROPS	https://www.youtube.com/watch?v=tNqQrnwtyyM
1	CANAL IRRIGATION	https://www.youtube.com/watch?v=aBVqBzhjgRo
1	LINED CANALS & DRINAGE ENGINEERING	https://www.youtube.com/watch?v=jomaOECqQck
1	MANAGEMENT OF CANAL IRRIGATION	https://www.youtube.com/watch?v=Du98K96aIfQ

Text Book(s):

- 1.Irrigation Engineering by Asawa, G.L; New Age International Publishers.
- 2.Irrigation Engineering by Sharma R.K., and Sharma T.K; S. Chand and company, New Delhi.
- 3.Irrigation and water power engineering by Punmia B.C; Laxmi Publications, New Delhi.

Reference Book(s):

- 1.Irrigation Water Management (Principles & Practices) by Dilip Kumar Majumdar; Prentice Hall of India (P), Ltd.
- 2.Irrigation Engineering by Basak, N.N; Tata McGraw-Hill Publishing Co, New Delhi
- 3.Irrigation Engineering and Hydraulic Structures by Garg, S.K; Khanna publishers, New Delhi.
4. Irrigation, Water Resources & Water Power Engineering by Dr. P.N.Modi; Standard Book House, New Delhi.

Online Resources:

1. <https://archive.nptel.ac.in/courses/126/105/126105010/>
- 2 <https://archive.nptel.ac.in/courses/105/102/105102159/>
3. <https://www.scribd.com/document/163744110/22-1-Lining-of-Canal-Nptel>

Web References:

- 1.<https://nptel.ac.in/courses/105102159>
- 2.<https://archive.nptel.ac.in/courses/126/105/126105019/>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4010	EARTHQUAKE ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <ol style="list-style-type: none"> 21. To know about Continental drift and plate tectonics. 22. To about Seismic Hazard Analysis. 23. To understand Artificial Ground Motion Generation. 24. To know about Dynamic Soil Properties. 25. To know concept of liquefaction. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand Seismology and Earthquakes. BL-2							
CO 2	To enable the student to understand Seismic Hazard Analysis. BL-2							
CO 3	Understand modification of actual ground motion records. BL-2							
CO 4	Understand dynamic Soil Properties. BL-2							
CO 5	To enable the student to understand the concept of liquefaction. BL-2							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2									1	2	
CO2	3	2	2										2	
CO3	3	2	1										2	
CO4	3	1	2									1	2	
CO5	3	2	2										2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	SEISMOLOGY AND EARTHQUAKES 10H
Introduction, Seismic Hazards, seismic waves, internal structure of earth, Continental drift and plate tectonics, faults, elastics rebound theory, geometric notations, location of earthquakes, size of earthquakes.	
At the end of the Module 1, students will be able to:	
<ol style="list-style-type: none"> 1. To learn Seismic Hazards . 2. To understand location and size of earthquakes . 	
MODULE -2	STRONG GROUND MOTION 10H
Strong ground motion measurement, ground motion parameters, estimation of ground motion parameters. Seismic Hazard Analysis: Identification and Evaluation of Earthquake Sources,	

deterministic seismic hazard analysis, probabilistic seismic hazard analysis.		
At the end of the Module 2, students will be able to:		
1. To Seismic Hazard Analysis.		
2. To understand Identification and Evaluation of Earthquake Sources.		
MODULE-3	WAVE PROPAGATION	10H
Waves in unbounded media, waves in a semi – infinite body, waves in a layered media, attenuation of stress waves. Artificial Ground Motion Generation: Modification of actual ground motion records, time – domain generation, frequency domain generation.		
At the end of the Module 3, students will be able to:		
1. To understand Artificial Ground Motion Generation.		
MODULE-4	DYNAMIC SOIL PROPERTIES	9H
Representation of stress conditions by Mohr circle, measurement of dynamic soil properties using field and laboratory tests, stress strain behavior of cyclically loaded soils, strength of cyclically loaded soils. Ground Response Analysis: One– Dimensional Ground response Analysis – Linear and Non- Linear Approaches. Local Site Effects: Effect of local site conditions on ground motion, design parameters, development of design parameters.		
At the end of the Module 4, students will be able to:		
3. To learn about Dynamic Soil Properties.		
4. To understand about Effect of local site conditions on ground motion.		
MODULE-5	LIQUEFACTION	9H
Flow liquefaction, cyclic mobility, evaluation of liquefaction hazards, liquefaction susceptibility, initiation of liquefaction, effects of liquefaction.		
At the end of the Module 5, students will be able to:		
3. To understand evaluation of liquefaction hazards.		
4. To understand effects of liquefaction.		
Total Hours: 48		

Term work:		
Preparation of models on models on seismic waves.		
Content beyond syllabus: Types of seismic waves .		
Contents to promote self-Learning:		
S N O	Topic	Reference

	1	Seismology and Earthquakes	https://www.ucl.ac.uk/EarthSci/people/lidunka/GEOL2014/Geophysics4%20-%20Seismic%20waves/SEISMOLOGY%20.htm
	1	Strong Ground motion	https://www.strongmotioncenter.org/
	1	Wave Propagation	https://www.elprocus.com/wave-propagation-definition-equation-and-types/
	1	Dynamic Soil Properties	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/focusteam/?cid=nrcseprd1319412
	2	Liquefaction	https://depts.washington.edu/liquefy/html/what/what1.html

Text Book(s):

1. Geotechnical Earthquake Engineering by Steven L. Kramer, prentice Hall
2. S.L. Kramer, Geotechnical Earthquake Engineering, Pentice Hall, international series, Pearson Education (Singapore) Pvt. Ltd., 2004.
3. Ansal, Recent Advances in Earthquake Geotechnical Engineering and Microzonation, Springer, 2006.

Reference Book(s):

1. Geotechnical Earthquake Engineering Handbook by Robert W. Day, McGraw-Hill.
2. Towhata, Geotechnical Earthquake Engineering, Springer , 2008.

Online Resources:

1. <https://archive.nptel.ac.in/courses/105/101/105101134/>

Web References:

1. <https://nptel.ac.in/courses/105101004>

NARAYANA ENGINEERING COLLEGE::NELLORE														
20CE4011	PRESTRESSED CONCRETE							R20						
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P			C	CIE	SEE	TOTAL					
VI	3	1	0	60	4	40	60	100						
Pre-requisite: Required basic knowledge in concrete and R.C.C design														
Course Objectives: 26. To introduce the need for prestressed concrete. 27. To design prestressed concrete structures subjected to flexure and shear.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	To understand the development & methods of prestressing. BL-2													
CO 2	To understand the losses in prestressing. BL-2													
CO 3	To Analyse and design the sections to withstand flexure. BL-4													
CO 4	To design various prestressed concrete structural elements for shear. BL-6													
CO 5	To control deflections in prestressed concrete beams. BL-6													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO3	3	3										1		
CO4	3	3	3									1		
CO5	3	2	3									1		
CO6	3	2	3	1	1							1		
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	8H
INTRODUCTION: Historic development – General principles of Prestressing, Pretensioning And Post Tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. METHODS OF PRESTRESSING: Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System, Freyssinet system and Gifford – Udall System.	
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Understand the historic development of prestressing. 2. Learn about general principles of Prestressing. 3. Understand the Methods and Systems of Prestressing. 4. Analyze the post tensioning. 	
MODULE – 2	8H
LOSSES OF PRESTRESS: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of stress in steel, slip in anchorage ,bending of member and wobble frictional losses.	
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 1. Discuss the loses of prestress in pre-tensioned and post-tensioned members 2. Understand the relaxation of stress in steel 	
MODULE – 3	8H
ANALYSIS & DESIGN OF SECTIONS FOR FLEXURE: Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure – Kern – lines, cable profile.	

At the end of the Module 4, students will be able to:	
<ol style="list-style-type: none"> 1. Describe the elastic analysis of concrete beams prestressed. 2. Design sections for flexure as per I.S.Code. 3. Develop elastic design of simple rectangular and I-section for flexure. 	
MODULE – 4	8H
DESIGN OF SECTION FOR SHEAR: Shear and Principal Stresses – Design for Shear in beams. COMPOSITE SECTION: Introduction – Analysis of stress – Differential shrinkage – General design considerations.	
At the end of the Module 5, students will be able to:	
<ol style="list-style-type: none"> 1. Describe and explain the Shear and Principal Stresses. 2. Design the Shear in beams.. 3. Understand Differential types of shrinkage. 	
MODULE-5	
DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS: Importance of control of deflections – Factors influencing deflection. Methods for deflection calculation & check.	
At the end of the Module 6, students will be able to:	
<ol style="list-style-type: none"> 1. Understand importance of control of deflections in Prestressed concrete beams. 2. Understand the factors influencing deflection. 	
Total hours:	40 hours

Term work: Capacity for analytical and independent critical thinking, ability to apply theory to practice in familiar and unfamiliar situations with collaborative and teamwork skills.			
Content beyond syllabus: <ol style="list-style-type: none"> 1. Circular Prestressing: Analysis and Design of Prestressed Concrete Pipes and Liquid Storage Tanks. 			
Self-Study: Contents to promote self-Learning:			
S N O	Topic	C O	Reference
1	General principles of Prestressing	C O 1	http://staff.fit.ac.cy/eng.ma/Aces480notes/Prestressed_General_Principles.pdf
2	Methods and Systems of Prestressing	C O 2	http://icivil-hu.com/Civil-team/5th/prestressed/Dr.%20Hazim%20Slides/Lecture%202.1%20-%20Methods%20of%20Prestressing.pdf
3	Losses of prestress in pre-tensioned and post-tensioned members	C O 3	https://www.aceec.ac.in/wpcontent/uploads/2019/01/TV-Prestressed-Concrete-Unit-2.pdf
4	Elastic analysis of concrete beams prestressed	C O 4	https://iare.ac.in/sites/default/files/lecture_notes/IARE_PSC_Lecture_Notes.pdf
5	Design for Shear in beams	C O 5	https://hbkoh.jimdo.com/app/download/5951303213/1.Design+for+Shear+for+Prestressed+Concrete.pdf?t=1494475330

Text Book(s):

1. Prestressed Concrete by N. Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by K.U.Muthu, PHI Publications.
3. Prestressed Concrete by Ramamrutham, Dhanpatrai Publications

Reference Book(s):

1. Prestressed Concrete Design By Praveen Nagrajan, Pearson Publications, 2013 Editions.
2. Design Of Prestressed Concrete Structures (Third Edition) By T.Y. Lin & Ned H. Burns, John Wiley & Sons.
3. Prestressed Concrete By Pandit.G.S. And Gupta.S.P., CBS Publishers And Distributors Pvt. Ltd, 2012.
4. Prestressed Concrete By Rajagopalan.N, Narosa Publishing House, 2002.
5. Prestressed Concrete Structures By Dayaratnam.P., Oxford And IBH, 2013

Codes/Tables: Codes:

BIS code on prestressed concrete, IS 1343 to be permitted into the examination Hall.

Online Resources:

1. <https://www.vignanits.ac.in/new/course%20notes/CIVIL/IV/PSC%20Unit%201%20and%202.pdf>
2. <http://www.sasurieengg.com/e-course-material/CIVIL/IV-Year%20Sem%207/CE2404%20Pre%20stressed%20Concrete%20Structures.pdf>

Web Resources:

1. <https://www.scribd.com/doc/84510262/Methods-and-Systems-in-Pre-Stressing>
2. <https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1663&context=jtrp>
3. https://www.pci.org/PCI_Docs/Design_Resources/Guides_and_manuals/references/bridge_design_manual/JL-85-January-February_Prestressed_Loss_and_Deflection_of_Precast_Concrete_Members.pdf

NARAYANA ENGINEERING COLLEGE::NELLORE														
20CE4012	RAILWAY ENGINEERING												R20	
Semester	Hours / Week				Total hrs	Credit		Max Marks						
	L	T	P			C	CIE	SEE	TOTAL					
VI	3	0	0		48	3	40	60	100					
Pre-requisite: Required basic knowledge in Modes of transport (Transportation Engineering).														
Course Objectives:														
To understand the history & importance of railways.														
To design the geometric requirements for a railway track.														
To know the different types of signals & their usage.														
To understand the classification of stations, station yards, terminals & junctions.														
To understand the operational philosophy of various railway control systems.														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Understand the importance, terms and various parameters of railway engineering.(BL-2)													
CO 2	Familiarize with Geometric design of a railway track.(BL-2)													
CO 3	Understand the importance & functions of railway signals.(BL-2)													
CO 4	Illustrate the classifications & requirements of stations, station yards, terminals & junctions.(BL-2)													
CO 5	Compare the operation of various railway control systems.(BL-4)													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										1		
CO2	3	3	2	1								1	1	
CO3	3	3			1							1		
CO4	3	2			1							1		
CO5	3	2	1	1	1							1	1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE- 1	INTRODUCTION TO INDIAN RAILWAYS (10H)
History and Importance of Indian Railways Construction and Maintenance- Permanent Way - Components-Rails, sleepers, ballast-functions and requirements- Gauges, Types, Uniformity of Gauge- Different Gauges in Indian Railways- Associated problems- Ideal Alignment- Standard Rail Sections- Causes and Effects of Creep- Measurement to Reduce Creep- Fixtures and Fastenings.	
MODULE -2	GEOMETRIC DESIGN OF RAILWAY TRACK (10H)
Geometric design of railway track- Horizontal curves-radius and degree of curve-Cant-Cant Deficiency – Negative Cant – Permissible speed on railway tracks – Gradients- Grade Compensation On Curves	
MODULE -3	RAILWAY SIGNALS (10H)
Classification of Railway Signals – Semaphore Signals- Working Philosophy Of Semaphore Signal – Other Types Of Signals – Their Functions.	
MODULE - 4	RAILWAY STATIONS AND YARDS (9H)
Purposes- Facilities Required at Railway Stations- Classification Of Stations - Requirements Of Station Yard- Classification Of Yards – Terminals – Junctions – Layouts.	
MODULE -5	RAILWAY CONTROL SYSTEMS (9H)
Introduction – Different Types Of Control Systems – Absolute Block System – Automatic Block System – Operational Philosophy of these systems.	
Total hours:	
48 hours	

Text Book(s):	<ol style="list-style-type: none"> 1. A Text book on Railway Engineering by S. C. Saxena and S. P. Arora, Dhanpatrai & Sons, Delhi. 2. Transportation Engineering (Vol-II) by C.Venkataramaiah., Universities Press Pvt Ltd, Hyderabad.
Reference Book(s):	<ol style="list-style-type: none"> 1. Railway Engineering by Satish Chandra and M. M. Agarwal, Oxford University Press, New Delhi
Web Resources:	<ol style="list-style-type: none"> 5. https://indianrailways.gov.in/railwayboard/view_section.jsp?lang=0&id=0,1,261#:~:text=The%20first%20railway%20on%20Indian,visit%20to%20Bhandup%20in%201843. 6. https://nptel.ac.in/courses/105107123 7. https://www.brainkart.com/article/Types-of-Railway 8. https://knowledge4civil.wordpress.com/2016/12/12/geometric-design-of-railway/

NARAYANA ENGINEERING COLLEGE::NELLORE														
20CE4013	SOLID WASTE MANAGEMENT							R2020						
Semester	Hours / Week			Total hrs.	Credit	Max Marks								
	L	T	P		C	CIE	SEE	TOTAL						
VI	3	0	0	48	3	40	60	100						
Pre-requisite: Nil														
Course Objectives:														
<div>1. Learn basic concepts of solid waste management, beginning from source generation to waste disposal in a system of municipality organization structure.</div> <div>2. Develop understanding on various technological applications for processing of waste and their disposal in various ways.</div> <div>3. Examine the technical points that are required to set up a solid waste management system.</div> <div>4. Plan a solid waste management system for decision makers, collect required data for a solid waste management.</div> <div>5. Plan a recycling program.</div>														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO 1	Students able to understand the solid waste management. (BL-2)													
CO 2	Students able to study of comparative assessment of waste generation and composition of developing and developed nations. (BL-1)													
CO 3	Students able to understand the transportation and disposal of solid waste (waste disposal). (BL-2)													
CO 4	Students able to study of product recovery and recycling of solid waste. (BL-1)													
CO 5	Students able to discuss about environmental effect. (BL-6)													
CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	1	-	1	2	-	-	-	-	-	-	1
CO2	2	2	-	2	-	-	1	-	-	-	-	-	-	-
CO3	3	2	1	2	-	1	1	-	-	-	1	1	-	1
CO4	3	2	1	1	1	-	1	-	-	-	1	1	2	1
CO5	3	3	2	1	2	2	1	1	-	1	1	2	2	1
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION TO SOLID WASTE MANAGEMENT	9H
Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Remember the classification of solid waste management. (BL-1) 2. Understand the elements of SWM, ESSWM. (BL-2) 3. Learn about progress in MSW management in India. (BL-1) 		
MODULE -2	WASTE GENERATION ASPECTS	9H
Waste stream assessment (WSA), waste generation and composition, waste characteristics (Physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions.		

At the end of the Module 2, students will be able to: 1. understand the health and environmental effect. (BL-2). 2. compare the assessment of waste generation and composition of developing and developed countries. (BL-2).			
MODULE-3		COLLECTION, STORAGE, TRANSPORT AND DISPOSAL	12H
Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system. Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study			
At the end of the Module 3, students will be able to: 1. Able to study about storage-containers/collection vehicles, collection operation.(BL1) 2. Knowing the implementing collection and transfer system. (BL2) 3. Learn about the key issues in waste disposal. (BL1).			
MODULE-4		WASTE PROCESSING TECHNOLOGIES & 3R PRINCIPLE	9H
Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling program me, recycling program me elements, commonly recycled materials and processes, a case study.			
At the end of the Module 4, students will be able to: 1. Study and learn about the Product Recovery and Recycling. (BL1) 2. Implementing monitoring and evaluation of source reduction. (BL3)			
MODULE-5		RECOVERY OF BIOLOGICAL CONVERSION PRODUCTS	9H
Benefits, processes, stages and technologies of composting; bio gasification with anaerobic processing,types of digesters, and biogas plants in India; composting and bio gasification: environmental effects.			
At the end of the Module 5, students will be able to: 1. Learning about the bio gasification with anaerobic processing. (BL1) 2. Study about the types of digesters, and biogas plants in India. (BL1)			
			Total: 48 Hours
Term work: 1.Make route optimization for a solid waste collection and transport system 2.The sources are from Website and text book reference			
Content beyond syllabus: 1. Identify and design waste disposal systems			
Self-Study: Contents to promote self-Learning:			
S N O	Topic	CO	Reference
1	Introduction to solid waste management	CO 1	https://nptel.ac.in/courses/105103205
2	Waste generation aspects	CO 2	https://nptel.ac.in/courses/105103205
3	Collection, storage transport and disposal.	CO 3	https://web.iitd.ac.in/~arunku/files/CEL212_Y14/Soild-Waste-

			Management Alappat.pdf
4	Waste processing technologies & 3R principal.	CO 4	https://www.slideshare.net/pallabipriyadarini25/solid-waste-management-ppt
5	Recovery of biological conversion products.	CO 5	https://www.slideshare.net/bibhabasumohanty/solid-waste-management-12495228

Text Book(s):

1. Solid Waste Technology & Management, by Thomas Christensen, John & Wiley & sons 2011.
2. Solid Waste management, by Ramesha Chandrappa, DigntaBhusan Das, Springer science & Business Media, 2012.
3. Sustainable Solid Waste Management, by Ni-Bin Chang, Ana Pires, John Willy & Sons Publications, 2015.

Reference Book(s):

1. Solid waste Engineering by Vesilind P.A., Worsel, W.A., and Reinhart, D. R., Thomson Brooks/code, 1st Ed 2002.
2. Hazardous Waste Management by Lagrerer, M.D., Buckingham, P.L and Evans, J.C, 2nd Edn, McGrawhill, 2011.

Online Resources:

1. <https://nptel.ac.in/courses/120/108/120108005/>
2. <https://nptel.ac.in/courses/105/103/105103205/>

Web References:

1. <https://www.thebalancesmb.com/an-introduction-to-solid-waste-management-2878102>
2. <https://www.adelaide.edu.au/research-services/system/files/media/documents/2019-10/transport-storage-gmos-guidelines.pdf>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4014	HYDRAULIC STRUCTURES						R-20	
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100
Pre-requisite: HYDRAULICS ENGINEERING								
Course Objectives: <ol style="list-style-type: none">1. Demonstrate and understanding of advanced fluid mechanics principles.2. Implementation of geotechnical engineering principles.3. To get a knowledge of various types of dam4. Understand the different elements of dam.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand hydraulic structural elements. (BL-2)							
CO 2	.Evaluate the surface water dam. (BL-5)							
CO 3	Analysis integrate relevant concept and methodologies in the area of hydraulics(BL-4)							
CO 4	Understand the type of dam, design and to construction(BL-2)							
CO 5	Understand the different elements of dams (BL-2)							

CO-PO Mapping														
CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					2		3							2
CO2					2									2
CO3	3			2										2
CO4														2
CO5														2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	ELEMENTS OF DAM ENGINEERING	9H
Introductory perspectives, Embankment types and Characteristics- Concrete dams and characteristics- Spillways and ancillary works – site assessment and selection of type of dam		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Illustrate the Embankment types and Characteristics 2. Summarize the – site assessment and selection 		
MODULE – 2	EMBANKMENT DAM ENGINEERING	10H
Nature and classification of soil- engineering characteristics of soil, principles of design – Material and construction- Internal seepage – Stability and stresses, Settlement and deformation in rock fill embankments		

At the end of the Module 2, students will be able to:			
<div>1. Differentiate Types o Nature and classification of soil- engineering</div> <div>2. Characteristics and types of embankments</div>			
MODULE – 3	CONCRETE	DAM	ENGINEERING
9H			
Loading -Concepts and criteria, Gravity dam analysis design features and stability elementary profile of gravity dam- Concrete for dams – roller compacted concrete gravity dams			
At the end of the Module 3, students will be able to:			
<div>1. Explain the Gravity dam analysis</div> <div>2. Explain the concrete gravity dams</div>			
MODULE – 4	DAM OUTLET WORKS		
Introduction of Spillways – Ogee spillway - cavitations on spillway – design feature- design principles and design of spillways – Chute spillways –Energy dissipation – stilling basins – plunge pools			
At the end of the Module 5, students will be able to:			
<div>1. Summarize the Spillways</div> <div>2. Explain the cavitations on spillway</div>			
MODULE – 5	DROP	STRUCTURES	
12H			
Introduction of Drop Structures Sarda fall – Glacis fall –Design principles- Cross regulator, head regulator and functions.			
At the end of the Module 6, students will be able to:			
<div>1. Explain the Drop Structures</div> <div>2. Classification of Sarda fall – Glacis fall</div>			
			Total Hours:48

Term work:		
<ol style="list-style-type: none"> 1. Summarize the – site assessment and selection 2. Characteristics and types of embankments 3. Explain the Gravity dam analysis 4. Explain the cavitations on spillway 5. Classification of Sarda fall – Glacis fall 		
Content beyond syllabus:		
Development of classifications and elements of dams		
Contents to promote self-Learning:		
S N O	Topic	Reference
1	Elements of dam engineering	https://www.youtube.com/watch?v=WnVvfyEe6HE
2	Embankment dam engineering	https://www.youtube.com/watch?v=mIm13hrBoMs

3	Concrete dam engineering	http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/New_index1.html
4	Dam outlet works	http://nptel.iitm.ac.in/courses/Webcourse
5	Drop Structures	http://nptel.iitm.ac.in/courses/Webcourse

Text Book(s):

1. Arora, K.R., Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors, Delhi
2. Modi, P.N., Introduction To Water Resources And Waterpower Engineering, Standard Publication, Delhi

Reference Book(s):

1. Arora, K.R., Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors, Delhi
2. Modi, P.N., Introduction To Water Resources And Waterpower Engineering, Standard Publication, Delhi
3. Garg, S.K., Irrigation Engineering and Hydraulic Structures Khanna Publishers
4. Asawa, G, L Irrigation And Water Resources Engineering, New Age Int. Ltd.

Online Resources:

1. <http://nptel.iitm.ac.in/video.php?courseId=1029&v=XmO2pltg7YBz>
2. <http://nptel.iitm.ac.in/video.php?courseId=1029&v=SO0suW7TLiCs>

3. <https://www.youtube.com/watch?v=CuNigj4nPZc>

Web References:

1. <http://nptel.iitm.ac.in/courses/Webcourse>

2. <https://www.slideshare.net/virajain/dam-outlet-works-lecture-2>

3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/New_index1.html

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4015	GROUND IMPROVEMENT TECHNIQUES							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VI	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: 28. To know the necessity ground Improvement. 29. To know Principles and methods of soil compaction. 30. To Design of dewatering systems. 31. To know different types of soil stabilizing admixtures. 32. To know necessity of grouting.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand the necessity ground Improvement Techniques . BL-2							
CO 2	To enable the student to understand Dynamic compaction . BL-2							
CO 3	Understand Ground Improvement by dewatering methods. BL-2							
CO 4	Understand different types admixtures and their suitability conditions. BL-2							
CO 5	To enable the student to understand about grouting and soil nailing. BL-2							

CO-PO Mapping														
CO	PO												PSO	
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2
CO1	3	2	2									1	2	
CO2	3	2	2										2	
CO3	3	2	1										2	
CO4	3	1	2									1	2	
CO5	3	2	2										2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	INTRODUCTION	10H
Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement. Geotextiles: Introduction, types of geotextiles, functions and their applications, tests for geotextiles, geogrids and its functions.		
At the end of the Module 1, students will be able to:		
1. To learn different types of problematic soils. 2. To learn Emerging trends in ground Improvement..		
MODULE -2	MECHANICAL STABILIZATION	10H
Shallow and deep compaction requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods Dynamic compaction.		
At the end of the Module 2, students will be able to:		

1. To learn Principles and methods of soil compaction. 2. To understand Properties of compacted soil and compaction control.		
MODULE-3 10H	HYDRAULIC MODIFICATION	
Ground Improvement by drainage, Dewatering methods. Design of dewatering systems, Preloading, Vertical drains, vacuum consolidation, Electro-kinetic dewatering, design and construction methods. At the end of the Module 3, students will be able to: 1. To Design of dewatering systems.		
MODULE-4	MODIFICATION BY ADMIXTURES	9H
Cement stabilization and cement columns, Lime stabilization and lime columns. Stabilization using bitumen and emulsions, Stabilization using industrial wastes Construction techniques and applications. At the end of the Module 5, students will be able to: 1. To learn about various types of soil stabilizing admixtures. 2. To understand about industrial wastes Construction techniques and applications.		
MODULE-5	GROUTING AND IN SITU SOIL TREATMENT METHODS	7H
Permeation grouting, compaction grouting, jet grouting, different varieties of grout materials, grouting under difficult conditions. Soil nailing, rock anchoring, micro-piles, design methods, construction techniques. Case studies of ground improvement projects. At the end of the Module 5, students will be able to: 1. To understand different varieties of grout materials. 2. To learn about Soil nailing, rock anchoring and micro-piles.		
Total Hours: 48		

Term work:		
Case studies on ground Improvement Projects.		
Content beyond syllabus: Stabilization of soil by Biological methods.		
Contents to promote self-Learning:		
S N O	Topic	Reference
1	Introduction	https://www.youtube.com/watch?v=HVzGKUIG2ek&list=P_Lm_MSClsnwm_qbL_4nH8UJjwR0-pejHp
2	Mechanical Stabilization	https://www.youtube.com/watch?v=fasWizJpMVI
3	Hydraulic Modification	https://www.youtube.com/watch?v=H5BxqzYn0a8
4	Modification By Admixtures	https://www.youtube.com/watch?v=u6GpaWesN5Q
5	Grouting And In Situ Soil Treatment	https://www.youtube.com/watch?v=g9OE5SXCqyA

		Methods	
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Text Book(s):

1. Engineering Principles of Ground Modification, Haussmann M.R. (1990), McGraw-Hill International Edition.
2. Ground Improvement Techniques by Dr.P.Purushotham Raj, Laxmi Publications, New Delhi / University Science Press, New Delhi
3. Ground Improvement Techniques by Nihar Ranajan Patra. Vikas Publications, New Delhi.

Reference Book(s):

1. Ground Improvement, Blackie Academic and Professional by Moseley M.P. (1993), Boca Taton, Florida, USA.
2. Ground Control and Improvement by Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994), John Wiley and Sons, New York, USA.
3. Designing with Geosynthetics by Robert M. Koerner, Prentice Hall New Jercy, USA.

Online Resources:

1. <https://archive.nptel.ac.in/courses/105/108/105108075/>

Web References:

1. <https://nptel.ac.in/courses/105105210>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4016	BRIDGE ENGINEERING						R-20	
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100
Pre-requisite: --								
Course Objectives: To design the box culvert and bearings To design the deck slab bridges To design the slab bridge and T-beam bridge To analyze the plate girder bridge and composite bridges To explain the piers and abutments								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Design the basic components of bridge structures like bridge deck slabs, longitudinal girders, transverse girders, piers and well foundations. BL-6							
CO 2	Understand the IRC classes of loading and railway bridge rules for detailed Calculation of loadings and design of various components. BL-2							
CO 3	Know the methods of design of structural components of different types of Bridges BL-1							
CO 4	Understand the plate girder bridge and composite bridges BL-2							
CO 5	Design the basic components of bridge structures like piers and abutments BL-6							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2
CO1		1												3
CO2				2										2
CO3	3						2							
CO4	2				2									
CO5														
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1 INTRODUCTION	9H
INTRODUCTION: Importance of site investigation in Bridge design. Highway Bridge loading standards. Impact factor. Railway Bridge loading standards (B.G. ML Bridge) various loads in bridges. BRIDGE BEARINGS : General features – Types of Bearings – Design principles of steel Rocker & Roller Bearings – Design of a steel Rocker Bearing – Design of Elastomeric pad Bearing.	
At the end of the Module 1, students will be able to: 1. Understand different types of I.R.C loads on the bridges. 2. Understand the different types of bridge bearings and their suitability.	
MODULE – 2 DECK SLAB BRIDGE & BOX CULVERT	10H
DECK SLAB BRIDGE: Introduction – Effective width method of Analysis Design of deck slab bridge (Simply supported) subjected to class AA Tracked Vehicle only. BOX CULVERT: General aspects. Design loads, Design of Box culvert subjected to IRC class AA	

tracked vehicle only.		
<p>At the end of the Module 2, students will be able to:</p> <ol style="list-style-type: none"> 1. Know the effective width method of analysis of bridge decks 2. Know the design of the deck slab bridges 3. Understand the different forces acting on the box culverts and its design 		
MODULE – 3		
AM & SLAB BRIDGE (T-BEAM BRIDGE)		9H
BEAM & SLAB BRIDGE (T-BEAM BRIDGE) General features – Design of interior panel of slab – Pigeauds method – Design of a T-beam bridge subjected to class AA tracked vehicle only		
<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 1. Know the pigeauds method of analysis of deck slabs of T beam bridges 2. Design the T beam bridges 		
MODULE – 4		PLATE GIRDER BRIDGE
PLATE GIRDER BRIDGE: Introduction – elements of a plate girder and their design. Design of a Deck type welded plate girder – Bridge of single line B.G.		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 1. Know the forces acting on the plate girder bridge 2. Understand the design of plate girder bridge 		
MODULE – 5		PIERS & ABUTMENTS
PIERS & ABUTMENTS: General features – Bed Block – Materials piers & Abutments Types of piers – Forces acting on piers – Stability analysis of piers – General features of Abutments – forces acting on abutments – Stability analysis of abutments – Types of wing walls – Approaches – Types of Bridge foundations (excluding Design).		
<p>At the end of the Module 6, students will be able to:</p> <ol style="list-style-type: none"> 1. Know the forces acting on the piers and abutments and their stability analysis 2. Know the different types of wings walls 		
Total Hours:		

Term work:		
<ol style="list-style-type: none"> 1. Understand different types of I.R.C loads on the bridges 2. Know the design of the deck slab bridges 3. Design the T beam bridges 4. Understand the design of plate girder bridge 5. Know the forces acting on the piers and abutments and their stability analysis 		
<p>Content beyond syllabus: Development of classifications of rivers</p>		
Contents to promote self-Learning:		
S N O	Topic	Reference

1.	Introduction & Bridge Bearings	https://www.youtube.com/watch?v=xIRmwsBiOE
2.	Deck Slab Bridge & Box Culvert	https://www.youtube.com/watch?v=NUyOSPVyqIA
3.	Beam & Slab Bridge (T-Beam Bridge)	https://www.youtube.com/watch?v=6FsRd2r3VBQ
4.	Plate Girder Bridge	https://www.youtube.com/watch?v=4-v_tODgfVY
5.	Piers & Abutments	https://www.youtube.com/watch?v=8SLKJI7wSNk

Text Book(s):

1. Ponnu Swamy, "Bridge Engineering", TATA Mcgraw Hill Company, New Delhi.
2. N.Krishnam Raju, "Design of Bridges", Oxford & IBH, Publishing Company Pvt.ltd., Delhi.
3. D.J.Victor, "Design of Bridges Structure"
4. Relevant, "IRC & Railway bridge Codes".

Reference Book(s):

1. B.C. Punmia, "Design of Steel structures", Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
2. Ramachandra. "Design of Steel structures",
3. B.C. Punmia, "Design of R.C.C. structures", Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi.
4. T.R.Jagadish & M.A.Jayaram "Design of Bridges Structure", Prentice Hall of India

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce63/preview
2. <https://nptel.ac.in/courses/105105165>
3. <https://www.youtube.com/watch?v=Ch2vAzvXbKI>

Web References:

<https://www.youtube.com/watch?v=4mZ88U7Jbwo>

https://www.youtube.com/watch?v=7nTdkPV_AAE

<http://www.nitttrc.edu.in/nptel/courses/video/105105165/lec9.pdf>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4017	ADVANCED TRAFFIC ENGINEERING							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VII	3	1	0	48	4	40	60	100
Pre-requisite: Required sound knowledge in mathematics and science								
Course Objectives: 1. To understand the traffic Stream Characteristics . 2. To understand the importance of traffic stream models in traffic studies. 3. To familiarize the Queuing Theory.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	To understand the traffic Stream Characteristics (BL-2)							
CO 2	To understand the importance of Traffic Stream models.(BL-2)							
CO 3	To develop the Queuing Theory . (BL-5)							
CO 4	To analyse Pedestrian Delays (BL-5)							
CO 5	To apply ITS and Technology to traffic studies.(BL-3)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2
CO1	2	1	1										2	
CO2	2	1	1										2	
CO3	2	2	3										2	
CO4	2	2	3		2								2	
CO5	2	2	1		2								2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	
Traffic Flow Description: Traffic Stream Characteristics and Description Using Distributions: Measurement, Microscopic and Macroscopic Study of Traffic Stream Characteristics - Flow, Speed and Concentration; Use of Counting and Interval Distributions for Describing Vehicle Arrivals, Headways, Speeds-Fitting of Distributions, Goodness of Fit Tests (10H)	
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Understand Traffic Stream Characteristics. 2. Use of Counting and Interval Distributions. 3. Learn Headways, Speeds-Fitting of Distributions 	
MODULE -2	
Traffic Stream Models: Fundamental Equation of Traffic Flow, Speed-Flow-Concentration Relationships, Normalized Relationship, Fluid Flow Analogy Approach, Shock Wave Theory - Flow-Density diagram use in Shockwave analysis; Use of Time-space diagram for shockwave description; Bottleneck situations and shockwaves; traffic signal and shockwave theory; numerical Examples for application of shockwave theory (10h)	
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> 10. Understand the Traffic Stream Models. 11. Learn about Shock Wave Theory. 12. Use of Time-space diagram for shockwave description. 	
MODULE-3	

Queuing Analysis: Fundamentals of Queuing Theory, Demand Service Characteristics, Deterministic Queuing Models, Analysis of M/M/1 system; Assumptions and Derivation of System State Equations; Application of M/M/1 analysis for parking Garages and Toll Plazas-numerical Examples; Analysis of D/D/1 system for delay characteristics; Traffic Signal analysis as D/D/1 system; Computation of delays and queue dissipation Time – Numerical Examples. (10H)	
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> Understand about Queuing Theory. Learn about Traffic Signal analysis Derive System State Equations. 	
MODULE-4	
Pedestrian Delays And Gaps: Pedestrian Gap acceptance and delays; Concept of Blocks, Antiblocks, Gaps and Non-Gaps; Underwood's analysis for Pedestrian Delays; Warrants for Pedestrian Crossing Facilities – Minimum Vehicular Volume Warrant, Minimum Pedestrian Volume Warrant, Maximum Pedestrian Volume Warrant. (9h)	
At the end of the Module 4, students will be able to: <ol style="list-style-type: none"> Describe Pedestrian Gap. Learn about Warrants for Pedestrian Crossing Facilities. Understand about Maximum Pedestrian Volume Warrant 	
MODULE-5	
Simulation of Traffic: Introduction, Advantages of Simulation techniques, Steps in Simulation-Examples of Simulation Logic for Delays at a Four-legged Signalised Intersection- Pedestrian Gap Acceptance Simulation-Scanning techniques- Time Scanning and Event Scanning- Numerical Examples. (9h)	
At the end of the Module 6, students will be able to: <ol style="list-style-type: none"> Understand Simulation techniques. Learn about Simulation-Scanning techniques. 	
Total hours:	48 hours

Term work: Traffic Study at one region			
Content beyond syllabus: <ol style="list-style-type: none"> Sensors usage in automated highway systems 			
Self-Study: Contents to promote self-Learning:			
S N O	Topic	C O	Reference
1	Traffic Studies	C O 1	https://nptel.ac.in/courses/105101008
2	Traffic Stream Models	C O 2	https://archive.nptel.ac.in/courses/105/105/105105215/
3	Queuing Analysis	C O 3	https://onlinecourses.nptel.ac.in/noc22_ma17/preview#:~:text=Queueing%20theory%20is%20a%20branch,help%20to%20design%20better%20systems.
4	Pedestrian Delays And Gaps	C O 4	https://archive.nptel.ac.in/content/storage2/courses/downloads_new/105105204/noc20_ce53_assignment_Week_6.pdf

5	ITS and Technology	C O 5	https://www.civil.iitb.ac.in/tvm/nptel/591 ITS 1/web/web.html
Text Book(s): 1. Advanced Transportation Engineering by S.S Kolapkar and P.R Mindhe Nirali, Prakashan Publishers. 2. Intelligent transportation system by Pradip kumar sarkar and Amit kumar jain PHI learning, Publishers.			
Reference Book(s): 1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018. 2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.			
Online Resources: 1. https://nptel.ac.in/courses/105101008 2. https://archive.nptel.ac.in/courses/105/101/105101008/			
Web Resources: 1. https://onlinecourses.nptel.ac.in/noc22_ma17/preview#:~:text=Queueing%20theory%20is%20a%20branch,help%20to%20design%20better%20systems. 2. https://archive.nptel.ac.in/content/storage2/courses/downloads_new/105105204/noc20_ce53_assignment_Week_6.pdf 3. https://www.civil.iitb.ac.in/tvm/nptel/591 ITS 1/web/web.html			

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4018	INDUSTRIAL WASTE WATER TREATMENT							R-2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives:								
1	To understand about quality requirement of water.							
2	To survey the Industrial waste							
3	To Study the disposal management.							
4	To understand effects and treatment methods-I							
5	To Know theeffects and treatment methods-II							
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Define the quality requirement of water. BL-1							
CO 2	Understand the effects of Industrial waste . BL-2							
CO 3	Know the disposal management . BL-1							
CO 4	Identify theground water sources. BL-3							
CO 5	Understand the effects and treatment methods. BL-2							

CO-PO Mapping														
CO	PO												PSO	
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	P O10	P O11	P O12	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	-	1	1	-	3	2	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	-
CO3	2	2	-	-	-	-	-	-	-	2	-	2	2	-
CO4	3	2	-	2	2	-	-	-	-	2	-	2	3	-
CO5	3	3	2	2	3	-	1	2	2	3	2	3	3	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE-1 INDUSTRIAL WATER QUALITY AND QUANTITY REQUIREMENTS (10H)	
Boiler and cooling waters–Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills Selection of source based on quality, quantity and economics. Use of Municipal wastewater in Industries – Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, Elutriation, Removal of Colour, Odour and Taste.	
<i>At the end of the Module 1, students will be able to know about quality requirement of water. (BL1)</i>	
MODULE -2 BASIC THEORIES OF INDUSTRIAL WASTE WATER (10H)	
Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis -Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction – Neutralization and Equalization, Segregation and	

proportioning- recycling, reuse and resources recovery		
<i>At the end of the Module 2, students will be able to know the Survey the Industrial waste (BL2)</i>		
MODULE-3 INDUSTRIAL WASTE WATER DISPOSAL MANAGEMENT (9H)		
Industrial wastewater disposal management: Discharges into Streams, Lakes and oceans and associated problems, Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastes- Effluent Disposal Method		
<i>At the end of the Module 3, students will be able to memorize Disposal management.(BL1)</i>		
MODULE-4 PROCESS AND TREATMENT OF SPECIFIC INDUSTRIES-1 (9H)		
Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants		
<i>At the end of the Module 4, students will be able to Treatment methods-II(BL2)</i>		
MODULE-5 PROCESS AND TREATMENT OF SPECIFIC INDUSTRIES-2 (10H)		
Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Pharmaceutical Plants.		
<i>At the end of the Module 5, students will be able to understand the Role of Treatment methods-II.(BL2)</i>		
Total hours:		48 hours
Term work: Site visit and report preparation.		
Content beyond syllabus: Flood Routing, Irrigation Engineering		
Self-Study:		
Topic	C O	Reference
Quality requirement of water	C O 1	https://www.digimat.in/nptel/courses/video/105104103/L01.html
Survey the Industrial waste	C O 2	https://www.digimat.in/nptel/courses/video/105104103/L01.html
Disposal management	C O 3	https://www.digimat.in/nptel/courses/video/105104103/L01.html
Treatment methods-I	C O 4	https://www.digimat.in/nptel/courses/video/105104103/L01.html
Treatment methods-II	C O 5	https://www.digimat.in/nptel/courses/video/105104103/L01.html

Text Book(s):

1. Industrial Waste Water Treatment, Patawardhan Ad, Prentice Hall India Learning Private Ltd
2. Waste Water Treatment, Rao Mn Oxford & Ibh Publishing Ltd

Reference Book(s):

3. Wastewater Treatment Plants : Planning Design And Operation, Quasim SR
4. Theory and Practice of Water and Wastewater Treatment, Ronald L Doraste, Wiley publisher.

Online Resources:

<https://www.digimat.in/nptel/courses/video/105104103/L01.html>
<https://www.digimat.in/nptel/courses/video/105104103/L01.html>
<https://www.digimat.in/nptel/courses/video/105104103/L01.html>

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	-	1	1	-	3	2	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	-
CO3	2	2	-	-		-	-	-	-	2	-	2	2	-
CO4	3	2	-	2	2	-	-	-	-	2	-	2	3	-
CO5	3	3	2	2	3	-	1	2	2	3	2	3	3	2
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE -1	INTRODUCTION	(10H)
Characteristic of ground water, Global distribution of water, Role of groundwater in water resources system and their management, groundwater column, aquifers, classification of aquifers. Hydrogeological cycle, water level fluctuations, Groundwater balance		
<i>At the end of the Module 1, students will be able to remember the concepts of hydrologic cycle parameter. (BL1)</i>		
MODULE -2	MOVEMENT OF GROUND WATER	(10H)
Darcy's Law, Hydraulic conductivity, Aquifer transmissivity and storativity, Dupuit assumptions Storage coefficient - Specific yield Heterogeneity and Anisotropy, Direct and indirect methods for estimation of aquifer parameters. Governing equation for flow through porous medium - Steady and unsteady state flow - Initial and boundary conditions, solution of flow equations.		
<i>At the end of the Module 2, students will be able to know the Types of hydrologic wells (BL2)</i>		
MODULE-3	WELL HYDRAULICS	(9H)
Steady and unsteady flow to a well in a confined and unconfined aquifer - Partially penetrating wells - Wells in a leaky confined aquifer - Multiple well systems – Wells near aquifer boundaries - Hydraulics of recharge wells.		
<i>At the end of the Module 3, students will be able to memorize Different Types hydrographs.(BL1)</i>		
MODULE-4	GROUND WATER MANAGEMENT	(9H)
Dynamic equilibrium in natural aquifers, groundwater budgets, management potential of aquifers, safe yield, seepage from surface water, stream-aquifer interaction, artificial		

recharge.		
<i>At the end of the Module 4, students will be able to distinguish Between ground water and surface water quality (BL2)</i>		
MODULE-5	GROUND WATER TRANSPORT PROCESS	(10H)
Hydrodynamic dispersion - occurrence of dispersion phenomena, coefficient of dispersion - Aquifer advection dispersion equation and parameters - initial and boundary conditions - method of solutions, solution of advection dispersion equation.		
<i>At the end of the Module 5, students will be able to understand the Role of reservoir planning.(BL2)</i>		
		Total: 48 Hours
Term work: Site visit and report preparation.		
Content beyond syllabus: Reservoir Planning		
Self-Study:		
Topic	C O	Reference
Hydrogeological Parameters	C O1	https://archive.nptel.ac.in/courses/105/101/105101214/
Well Hydraulics	C O2	https://archive.nptel.ac.in/courses/105/101/105101214/
Groundwater Management	C O3	https://archive.nptel.ac.in/courses/105/101/105101214/
Groundwater Quality	C O4	https://archive.nptel.ac.in/courses/105/101/105101214/
Groundwater Conservation	C O5	https://archive.nptel.ac.in/courses/105/101/105101214/
Text Book(s):		
<ol style="list-style-type: none"> 1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010. 2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000. 		
ReferenceBok(s):		
<ol style="list-style-type: none"> 1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002. 2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998. 		
Online Resources:		
https://archive.nptel.ac.in/courses/105/101/105101214/ https://archive.nptel.ac.in/courses/105/101/105101214/ https://archive.nptel.ac.in/courses/105/101/105101214/		
Web References:		
https://archive.nptel.ac.in/courses/105/101/105101214/ https://archive.nptel.ac.in/courses/105/101/105101214/ https://archive.nptel.ac.in/courses/105/101/105101214/		

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4020	ADVANCED FOUNDATION ENGINEERING						R2020	
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: <div>4. To enable the student to appreciate how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.</div> <div>5. To enable the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.</div> <div>6. To enable the student to understand the advanced concepts of design of pile foundations.</div> <div>7. To understand the advanced concepts of design of well foundations.</div> <div>8. To enable the student to understand the advanced concepts of design of foundations for special cases.</div>								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Compute the safe bearing capacity of footings subjected to vertical and inclined loads. BL-5							
CO 2	Demonstrate the problems posed by expansive soils and the different foundation practices devised. BL-2							
CO 3	Demonstrate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays. BL-2							
CO 4	Understand the design of well foundations. BL-2							
CO 5	Design the foundations for special cases. BL-6							

CO-PO Mapping														
CO	PO											PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									1	2	
CO2	3	2	2										2	
CO3	3	2	1										2	
CO4	3	1	2									1	2	
CO5	3	2	2										2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	SHALLOW FOUNDATIONS	10H
Shallow foundations- estimating bearing capacity- Meyerhof's, Hansen's and I.S code methods- Effect of water table, eccentricity, and inclination of load on Bearing Capacity – Numerical problems using IS method Elastic settlement –Effect of size of footing on settlement. Steinbrenner's method of calculating settlement– Numerical problems.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. Explain different methods to calculate bearing capacity. 2. Understand Effect of water table on bearing capacity. 3. Explain Effect of size of footing on settlement 		

MODULE -2	FOUNDATION ON EXPANSIVE SOIL	
10H		
<p>Introduction to expansive soil - Clay mineralogy and mechanism of swelling - Identification of expansive soils - Swelling potential, swelling pressure, free swell - Free swell index - Classification of expansive soil - Tests for swell pressure (IS code method) - Prediction of swell pressure from index properties - Damages in buildings on expansive soils - Elimination of swelling - Environmental solutions such as soil replacement techniques and lime columns - Principles of design of foundations in expansive soil deposits - Structural solutions such as provision of rigid foundation, under reamed piles, T Beams as strip footing for walls etc. (basic aspects).</p>		
<p>At the end of the Module 2, students will be able to:</p> <ol style="list-style-type: none"> 13. Understand behavior of expansive soil. 14. Demonstrate Classification of expansive soil. 3. Apply Principles of design of foundations in expansive soil deposits. 		
MODULE-3	PILE FOUNDATIONS	9H
<p>Deep foundations –need. Types. Classification of piles. Static equation – Single piles – Critical depth concept. Pile capacity in clay and sand by the I.S. code method. Piles in layered soils. Piles with enlarged base in clays (under reamed piles). Problems. Pile capacity from SPT and CPT values. Problems.</p>		
<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 5. Explain Classification of piles 6. Contrast Pile capacity in clay and sand by the I.S. code method. 7. Understand Pile capacity from SPT and CPT values. 		
MODULE-4	WELL FOUNDATIONS	9H
<p>Well foundations– Components of a well foundation–Procedure for construction and sinking of wells– Thickness of well steining for sinking under self-weight - Grip length- Problems encountered in well sinking–Tilts and Shifts– Causes – Permissible tilts and shifts - Methods to rectify tilts and shifts – Forces acting on a well foundation –Allowable bearing pressure – Lateral stability of well foundations - Terzaghi's analysis</p>		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 7. Understand Components of a well foundation. 8. Explain Lateral stability of well foundations. 		
MODULE-5	SPECIAL FOUNDATIONS	10H
<p>Special foundations: Introduction to shell foundations - Structural form and efficiency - Different types of shell foundations - General principles of geotechnical design of shell foundations and soil-structure interaction. Special features of the foundations for water tanks, silos, chimneys and transmission line towers. Foundations for marine structures - Design principles.</p>		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 14. Explain General principles of geotechnical design of shell foundations. 15. Understand Different types of shell foundations. 		
Total Hours: 48		

Term work:

Study the design principles of mat foundation.

Content beyond syllabus: Negative skin friction of pile foundation.

Contents to promote self-Learning:

S N O	Topic	Reference
2	Shallow Foundations	https://theconstructor.org/geotechnical/shallow-foundations-types/5308/
2	Foundation on Expansive Soils	https://www.earthlok.com/blog/how-to-design-a-foundation-on-expansive-soil/
2	Pile Foundations	https://www.designingbuildings.co.uk/wiki/Pile_foundations
2	Well foundations	https://www.yourarticlelibrary.com/soil/well-foundation-meaning-shapes-forces-and-description/
2	Special Foundations	https://www.blsurveyors.com/special-foundations-not-so-special-anymore/

Text Book(s):

1. **Foundation Analysis and Design** by Joseph Bowles, McGraw-Hill Book Company.
2. **Foundation Engineering** by Varghese P. C., Prentice-Hall of India Private Ltd, 2009.

Reference Book(s):

1. **Geotechnical Engineering** by Gulhati, S. K. and Datta, M. Tata McGraw Hill Education, 2005
2. **Foundation Design and Construction** by Tomlinson, M. J. and Booman, R, Prentice Hall Publishing, 2001.
3. **Pile Design and Construction Practice** by Tomlinson, M. J. and Woodward, J, CRS Press, 2015.
4. **Design of foundation systems: principles and practices**, Kurien, N. P. Alpha Science International, 2005

Online Resources:

1. <https://nptel.ac.in/courses/105/108/105108069/>
2. <https://nptel.ac.in/courses/105/105/105105207/>
3. <https://www.youtube.com/watch?v=eh3VSqsHicE&list=PLk7ptZcI9vmjkgCPUvp6IqhC52lxKEwK>

Web References:

1. https://www.designingbuildings.co.uk/wiki/Pile_foundations
2. <https://notes.specworld.in/advanced-foundation-engineering-pdf-notes-afe/>
3. <https://studymaterialz.in/tag/advanced-foundation-engineering-ktu-notes-pdf/>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4021	FINITE ELEMENT METHODS							R2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VII	3	1	0	48	4	40	60	100
Pre-requisite: Required sound knowledge in mathematics and science								
Course Objectives: 9. To understand the fundamental concepts of the theory of the finite element method. 10. To understand the importance of finite element methods in Civil Engineering. 11. To familiarize the student with the latest developments in analysis for Civil Engineering problems using Finite Element Methods. 12. To develop proficiency in the application of the finite element method.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	To understand the fundamental theory of the FEA method and principles of elasticity (BL-2)							
CO 2	To Analyse the one dimensional elements for structural applications (BL-4)							
CO 3	To develop element stiffness matrix for 2D elements(BL-6)							
CO 4	To Analyse the isoparametric elements and axisymmetric elements for 2D analysis. (BL-4)							
CO 5	To Solve structural Integral functions using Numerical Solution Techniques.(BL-3)							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3											1	
CO2	2	3	1										1	
CO3	2	3	2										1	
CO4	2	3	1										1	
CO5	2	3											1	
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	
INTRODUCTION: Concepts of FEM – Steps involved – Merits & Demerits – Energy Principles – Discretization – Rayleigh – Ritz method of functional approximation. PRINCIPLES OF ELASTICITY: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading. (10H)	
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> Discuss the different concepts and steps involved in FEM Analyze the beams and bars by Rayleigh – Ritz method. Understand principles of elasticity. 	
MODULE -2	
ONE DIMENSIONAL ELEMENTS: Stiffness matrix for bar element – shape functions for one dimensional elements – one dimensional problems .Two Dimensional Elements - Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates. (10h)	

At the end of the Module 2, students will be able to:	
15. Understand the concept and importance of shape functions in FEM. 16. Analyze the one dimensional problems. 17. Develop stiffness matrix for one dimensional elements with different nodes.	
MODULE-3	
GENERATION OF ELEMENT : Generation of element stiffness and nodal load matrices for 3-node triangular element and four noded rectangular elements. (9h)	
At the end of the Module 3, students will be able to:	
7. Analyze the two dimensional problems. 8. Develop stiffness matrix for two dimensional elements with different nodes. 9. Generate element stiffness and nodal load matrices for 3 and 4-noded elements.	
MODULE-4	
ISOPARAMETRIC FORMULATION: Concepts of, isoparametric elements for 2D analysis – formulation of CST element, 4 –Noded and 8-noded iso-parametric quadrilateral elements – Lagrangian and Serendipity elements. Axi-Symmetric Analysis: Basic principles- Formulation of 4-noded iso-parametric axi-symmetric element. (10h)	
At the end of the Module 4, students will be able to:	
7. Describe and explain the Isoparametric concept 8. Analyze the isoparametric elements for 2D analysis. 9. Formulate CST, 4 –Noded and 8-noded iso-parametric quadrilateral elements.	
MODULE-5	
SOLUTION TECHNIQUES: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads. (9h)	
At the end of the Module 6, students will be able to:	
16. Understand Numerical Integration & Solution Techniques. 17. Analyse the elements by solution techniques for static loads.	
Total hours:	
48 hours	

Term work: Open book examination.			
Content beyond syllabus: 3. 3D elements analysis using FEM			
Self-Study: Contents to promote self-Learning:			
S N O	Topic	CO	Reference
1	Rayleigh-Ritz Method	CO 1	https://www.math.usm.edu/lambers/mat461/spr10/lecture27.pdf
2	Stiffness matrix for 1d bar element	CO 2	http://www.chalapathiengg.ac.in/ME%20MATRIAL/FINITE%20ELEMENT%20METHODS.pdf
3	Generation of element stiffness and nodal load matrices for 3-node triangular element	CO 3	http://www.fkm.utm.my/~taminmn/pdf-files/FEM%20Elasticity-1.2.pdf

4	Concepts of, isoparametric elements for 2D	CO 4	http://home.cc.umanitoba.ca/~labossip/4510/notes/ch6.pdf
	Constitutive relationships for Axisymmetric bodies of revolution with axisymmetric loading		http://site.iugaza.edu.ps/marafa/files/FEM-Chapter-9-2017-18.pdf
5	Static condensation	CO 5	https://ocw.mit.edu/resources/res-2-002-finite-element-procedures-for-solids-and-structures-spring-2010/linear/lecture-9/MITRES2_002S10_lec09.pdf

Text Book(s):

1. Finite Element Analysis for Engineering and Technology, Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad. 2003.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers
3. Finite Element Methods by R.Dhanaraj& K.Prabhakar Nair, Oxford Publishers.

Reference Book(s):

1. Finite Element Methods in Civil Engineering by M.Rama Narasimha Reddy, Dr.K.Sreenivasu Reddy, D.Srinivasulu Reddy, Sci-Tech Publications Pvt.Ltd.
2. Finite Element Analysis And Procedures In Engineering by H.V.Lakshminaryana, 3rd Edition, Universities Press, Hyderabad.
3. A First Course in the Finite Element Methods by Daryl Logan, Cengage Publishers.
4. Finite Element Analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, New Delhi.
5. Finite Element Analysis By S.S. Bhavakatti-New Age International Publishers

Online Resources:

- 1.<https://nptel.ac.in/courses/105/105/105105041/>
- 2.<https://homepages.cae.wisc.edu/~suresh/ME964Website/M964Notes/Notes/introfem.pdf>
- 3.<http://www.chalapathiengg.ac.in/ME%20MATERIAL/FINITE%20ELEMENT%20METHODS.pdf>

Web Resources:

- 1.<http://www.fkm.utm.my/~taminmn/pdf-files/FEM%20Elasticity-1.2.pdf>
2. http://www.ce.memphis.edu/7117/notes/presentations/chapter_03b.pdf
- 3.<http://www.fkm.utm.my/~taminmn/pdf-files/FEM%20Elasticity-1.2.pdf>
4. http://www.ce.memphis.edu/7117/notes/presentations/chapter_10.pdf
- 5.http://www.ce.memphis.edu/7117/notes/presentations/chapter_09.pdf
- 6.<http://www.mate.tue.nl/~piet/inf/plx/pdf/infcm3DfemL.pdf>

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4022	URBAN TRANSPORT PLANNING							R-20
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100
Pre-requisite: --								
Course Objectives: <ol style="list-style-type: none"> 1. To make the student to know the travel characteristics. 2. To make the student to know the transportation planning process. 3. To make the students understand, trip generation models 4. To introduce the concept of Traffic assignment and Mode Split. 5. To make the students to understand the concept of Economic Evaluation of Transportation plans. 								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand the economic evaluation of transportation projects. BL-2							
CO 2	Understand the concept of travel demand. BL-2							
CO 3	Understand the different types of transportation planning processes. BL-2							
CO 4	Understand the different types of trip generation models. BL-2							
CO 5	Understand necessity of traffic assignment and mode split. BL-2							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2
CO1			1				2							2
CO2					2									2
CO3											2	2		2
CO4	2				2									2
CO5					2									2
1: Low, 2-Medium, 3- High														

COURSE CONTENT	
MODULE – 1	Concept Of Travel Demand 9H
Concept Of Travel Demand; Travel Characteristics - Origin, Destination, Route, Mode, Purpose; Travel Demand As A Function Of Independent Variables; Assumptions In Demand Estimation Relation Between Land Use And Travel; Four Step Process Of Transportation Planning.	
At the end of the Module 1, students will be able to: 1.To know about the travel characteristics.	
MODULE – 2	Transportation Planning Process 10H
Transportation Planning Process; General Concept Of Trip; Trip Generation; Trip Distribution, Traffic Assignment And Mode Split, Aggregate And Disaggregate Models. Date Collection And Sequential And Sequential Recursive Models. Date Collection And Inverntories; Definition Of Study Area; Zoning Principles; Types And Sources Of Date, Home Interview Surveys; Road Side Interview Surveys; Goods. Taxi, IPT Surveys; Sampling Techniques; Expansion Factors And Accuracy Check; Desire Line Diagram And Use.	
At the end of the Module 2, students will be able to:	

1. Identify the principles of transportation planning. 2. Know about the sampling techniques.				
MODULE – 3				
ip Generation Models			9H	
Trip Generation Models; Factors Governing Trip Generation And Attraction; Multiple Linear Regression Models, Category Analysis, Trip Distribution Models Methods Of Trip Distribution; Growth Factor Models Uniform Growth Factor Method; Average Growth Factor Method; Factor Method; Furnes Method; Limitation Of Growth Factor Models Concept Of Gravity Model.				
At the end of the Module 3, students will be able to: 1.Know about the steps involved in different trip generation models				
MODULE – 4		Traffic assignment and Mode Split		
Traffic assignment and Mode Split; Purpose of Assignment and General Principles; Assignment Techniques - All - or- nothing. Assignment; Multiple route assignment, Capacity restraint method. Minimum path trees; Diversion Curves. Factors affecting mode split; probit, logit and discriminant Analysis.				
At the end of the Module 5, students will be able to: 1. Know traffic assignment and mode split in the traffic analysis. 2. Know about the factors affecting the mode split.				
MODULE – 5		Economic	Evaluation	of Transportation plans
12H				
Economic Evaluation of Transportation plans; Costs And Benefits Of Transportation Projects; Vehicle Operating Cost; Timesaving Accident Costs. Methods Of Economic Evaluation - Benefit Cost Ratio Method; Net Present Value Method; Internal Rate Of Return Method.				
At the end of the Module 6, students will be able to: 1. Know cost and benefits of transportation projects 2. Know different methods of economic evaluation of transportation projects.				
Total Hours:				

Term work:		
1. To know about the travel characteristics 2. Know about the sampling techniques 3. Know about the steps involved in different trip generation models 4. Know traffic assignment and mode split in the traffic analysis 5. Classification of different methods of economic evaluation of transportation projects		
Content beyond syllabus: Development of classifications of plans		
Contents to promote self-Learning:		
S N O	Topic	Reference

1.	Concept Of Travel Demand	https://www.youtube.com/watch?v=7HW9o1R_m1M
2.	Transportation Planning Process	https://www.youtube.com/watch?v=p0ieSZs6Png
3.	Trip Generation Models	https://www.youtube.com/watch?v=awdBjiExNRs
4.	Traffic assignment and Mode Split	https://www.youtube.com/watch?v=iFebPrxJQbk
5.	Economic Evaluation of Transportation plans	https://www.youtube.com/watch?v=P0xuTgXVqF8

Text Book(s):

- 1. Urban Transportation Planning in the United States History, Policy, and Practice
- Edward Weiner, Springer New York, NY
- 2. Urban Transportation: Planning, Operation and Management” by S Ponnuswamy and Johnson Victor
- 3. Transportation Engineering, Vol. 2: Railways, Airports, Docks and Harbours, Bridges and Tunnels” by C Venkatramaiah

Reference Book(s):

1. L.R.Kadiyalli; “Traffic Engineering and Transportation Planning”, Khanna Publishers, Delhi.
2. Papa Costas C.S.; “Fundamentals of Transportation Engineering”, Prentice Hall, India.
3. Khistry C.J.”Transportation Engineering”, An Introduction Prentice Hall

Online Resources:

1. <https://nptel.ac.in/courses/105107067>
- 2 <https://nptel.ac.in/courses/105105208>

Web References:

<https://archive.nptel.ac.in/courses/105/107/105107067/>

https://onlinecourses.nptel.ac.in/noc21_ce35/preview

NARAYANA ENGINEERING COLLEGE::NELLORE														
20CE4023	ENVIRONMENTAL IMPACT ASSESMENT												R2020	
Semester	Hours / Week			Total hrs	Credit	Max Marks								
	L	T	P			C	CIE	SEE	TOTAL					
VII	3	0	0	48	3	40	60	100						
Pre-requisite: NIL														
Course Objectives: <div>1. To impart knowledge on different concepts of Environmental Impact Assessment.</div> <div>2. To know procedures of risk assessment.</div> <div>3. To learn the EIA methodologies and the criterion for selection of EIA methods.</div> <div>4. To know the procedures for environmental clearances and audit.</div> <div>5. To appreciate the importance of stakeholder participation in EIA</div>														
Course Outcomes: After successful completion of the course, the student will be able to:														
CO1	Perform a critical quality review of an EIA and EIS; (BL2)													
CO2	Structure the EIA working process considering the need for interdisciplinarity (BL1)													
CO3	Perform the screening and scoping of an EIA, based on existing requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA; (BL1)													
CO4	Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process (BL2)													
CO5	Interpret an EIA, present its conclusions and translate its conclusions into actions (BL2)													
CO-PO Mapping														
CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	2	-	-	2	3	-	3	3	3	2
CO2	3	3	1	2	3	1	-	-	3	-	-	-	3	1
CO3	1	-	2	2	3	1	-	-	3	-	2	3	3	-
CO4	2	-	1	1	1	-	-	3	3	-	-	-	3	-
CO5	1	-	2	-	-	-	-	3	3	3	1	3	2	2
1: Low, 2-Medium, 3- High														
COURSE CONTENT														
MODULE – 1		INTRODUCTION & EIA METHODOLOGIES											(10H)	
<p>Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map</p> <p>Classification of environmental parameters.</p> <p>E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis..</p>														
<p>At the end of the Module 1, students will be able to:</p> <div>1. Find the elements in the EIA. (BL1)</div> <div>2. Plan how to prepare the EBM. (BL3)</div> <div>3. Prepare the draft report. (BL3)</div> <div>4. select the method for different projects. (BL1)</div> <div>5. Understand the complexities of different methods. (BL2)</div>														

MODULE -2	ENVIRONMENTAL ASSESMENT	(10H)
Assessment of Impact of development Activities on Vegetation and wildlife, Environmental Impact of Deforestation. Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment.		
At the end of the Module 2, students will be able to: <ol style="list-style-type: none"> 1. Identify the problems associated in the projects related to vegetation and wild life. (BL3) 2. Having the Knowledge on procedure of studying the projects related to vegetation and wildlife. (BL1) 3. Develop the mitigation measures. (BL3) 		
MODULE-3	IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE	(9H)
Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA. E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment.		
At the end of the Module 3, students will be able to: <ol style="list-style-type: none"> 1. Identify the problems associated in the projects related to land use. (BL3) 2. Applicability of RS & GIS applications in studying the projects related to developmental activities and land use. (BL3) 		
MODULE-4	ENVIRONMENTAL AUDIT	(9H)
Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.		
At the end of the Module 4, students will be able to: <ol style="list-style-type: none"> 1. Extend the Knowledge on procedures to follow in the time of auditing. (BL2) 2. Learn about the rules and legislations for approach industries. (BL1) 3. Prepare the auditing reports in prescribed manner. (BL3) 		
MODULE-5	ENVIRONMENTAL ACTS AND CASE STUDIES	(10H)
Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Pharmaceutical Plants.		
At the end of the Module 5, students will be able to: <ol style="list-style-type: none"> 1. Extend the Knowledge on environmental acts. (BL2) 2. Prepare the EIA reports in prescribed manner referred by State & Central Government. (BL3) 		
Total hours:		48 Hours

Term work:
1. Field visit for steel structures buildings like industries , railway stations , factories and steel buildings
Content beyond syllabus:
1. Get the knowledge on problems and impact causing areas in different types of projects
Self-Study:

Contents to promote self-Learning:

S N O	Topic	C O	Reference
1	INTRODUCTION & EIA METHODOLOGIES	C O 1	https://2cl405uud.files.wordpress.com/2013/06/connection-design-e28093-design-requirements.pdf
2	ENVIRONMENTAL ASSESSMENT	C O 2	https://www.youtube.com/watch?v=nSHj-IrFFjU https://www.youtube.com/watch?v=Jr6HNm1XYDI
3	IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE	C O 3	https://destructural.com/wp-content/uploads/2020/09/TFEC-4-2020-Design-Guide-for-Timber-Roof-Trusses.pdf
4	ENVIRONMENTAL AUDIT	C O 4	https://www.youtube.com/watch?v=Cgu1ZripS5U
5	ENVIRONMENTAL ACTS AND CASE STUDIES	C O 5	https://www.structuralguide.com/plate-girder/

Text Book(s):

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications

Reference Book(s):

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, PublishersRutledge, London, 1992.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce57/preview
2. <https://www.youtube.com/watch?v=Lc-TT0mPNDI>

Web References:

1. <https://www.youtube.com/watch?v=JkSsDzdM7W0>
2. <https://www.accessengineeringlibrary.com/content/book/9780071550055/chapter/chapter2>
3. https://www.youtube.com/watch?v=4-v_tODgfVY

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE40 24	WATERSHEDMANAGEMENT							R- 2020
Semester	Hours / Week			Total hrs	Credit	Max Marks		
	L	T	P		C	CIE	SEE	TOT AL
VII	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives:								
1.	To understand different watershed behavior.							
2.	To interpret runoff data and quantify erosion by using various modelling methods.							
3.	To Study the planning activities of watershed management and Harvesting methods.							
4.	To understand land use classification and impact of land use changes on hydrological cycle parameters.							
5.	To Know the ecosystem management and Different types of cropping techniques.							
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Define the objectives, need for watershed development. BL-1							
CO 2	Determine universal soil loss equation and Control techniques to overcome Erosion. BL-4							
CO 3	Understand the different types of harvesting ,dams and ponds BL-2							
CO 4	Identify the land use and land capability for Agriculture.BL-3							
CO 5	Understand the role of ecosystem and cropping techniques.BL-2							

CO-PO Mapping														
CO	PO												PSO	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	-	1	1	-	3	2	-
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	-
CO3	2	2	-	-	-	-	-	-	-	2	-	2	2	-
CO4	3	2	-	2	2	-	-	-	-	2	-	2	3	-
CO5	3	3	2	2	3	-	1	2	2	3	2	3	3	2
1: Low, 2-Medium, 3- High														

MODULE – 1	INTRODUCTION AND BASIC CONCEPTS	(10H)
Concept of watershed, introduction to watershed management, different stakeholders and their relative importance, watershed management policies and decision making.		
MODULE -2	SUSTAINABLE WATERSHED APPROACH	(10H)
Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation; Watershed Management Practices in Arid and Semiarid Regions, Case studies, short term and long term strategic planning.		
MODULE-3	INTEGRATED WATERSHED MANAGEMENT	(9H)

Introduction to integrated approach, Integrated water resources management, conjunctive use of water resources, rainwater harvesting; roof catchment system.			
MODULE-4		WATERSHED MODELING	
(9H)			
Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow.			
MODULE-5		STORM WATER FLOOD MANAGEMENT	
(10H)			
Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation, case studies on flood damage.			
Total hours:			48 hours
Term work: <i>Site visit and report preparation.</i>			
Content beyond syllabus: Udder ground water shed			
Self-Study:			
Sl.N O	Topic	C O	Reference
1	Introduction to watershed	C O1	https://books.google.com/books/about/Introduction_to_Watershed_Development.html?id=aMF7hAQGy3QC
2	Principles of erosion	C O2	http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2091
3	Planning of watershed management	C O3	https://link.springer.com/chapter/10.1007/978-3-319-44234-1_1
4	Land management	C O4	https://en.wikipedia.org/wiki/Land_management
5	Ecosystem management	C O5	https://en.wikipedia.org/wiki/Ecosystem_management

Text Book(s):	
1. WaterShedManagement by Madan Mohandas (2012) Prentice Hall India Learning Private Limited.	
2. WaterShedManagement by Jvs Murthy (2017) New Age Publishers.	
3. WaterShedPlanningAndManagement by Dr. R Suresh (2017) Standard Publishers.	
Reference Book(s):	
1. WaterResources&Watermanagement by Sharma V.K. (1989) Himalaya Publishing Bombay	
2. Water resource systems planning and management by Chaturvedi M.C. (1987) Tata McGraw Publishing Co. Ltd., New Delhi. Pp 43-48	
3. Research in Geography by Singh R.B. (1996) Vol. II, APH Publishing corporation, New Delhi	
Online Resources:	
1. https://water.unl.edu/article/watersheds/introduction-watersheds	
2. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2091	
3. https://water.unl.edu/watershed/planning	
4. http://www.ciesin.org/lw-kmn/slm/slm.html	
5. https://www.unep.org/explore-topics/ecosystem	
Web References:	
1. https://portal.ct.gov/DEEP/Water/Watershed-Management/Watershed-Management---Overview	
2. https://dep.wv.gov/wwe/watershed/pages/watershed_management.aspx	
3. https://www.classmate4u.com/watershed-management/	

NARAYANA ENGINEERING COLLEGE::NELLORE								
20CE4025	INSTRUMENTATION & SENSOR TECHNOLOGIES FOR CIVIL ENGINEERING APPLICATIONS							R2020
Semester	Hours / Week			Total hrs	Credit C	Max Marks		
	L	T	P			CIE	SEE	TOTAL
VII	3	0	0	48	3	40	60	100
Pre-requisite: Nil								
Course Objectives: 13. To know about classification of sensors/transducers. 14. To about Principle of change of self inductance . 15. To understand Piezoelectric Transducers. 16. To know about Photo conductive cell and its characteristics. 17. To know concept of digital displacement transducers.								
Course Outcomes: After successful completion of the course, the student will be able to:								
CO 1	Understand static characteristics and Errors in measurement of sensors. BL-2							
CO 2	To enable the student to understand Principle of change of self inductance . BL-2							
CO 3	Understand advantages & disadvantages of Capacitive transducers. BL-2							
CO 4	Understand semi conductor photo electric transducer. BL-2							
CO 5	To enable the student to understand the concept Smart Sensors. BL-2							

CO-PO Mapping														
CO	PO												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									1	2	
CO2	3	2	2										2	
CO3	3	2	1										2	
CO4	3	1	2									1	2	
CO5	3	2	2										2	
1: Low, 2-Medium, 3- High														

COURSE CONTENT		
MODULE – 1	INTRODUCTION	10H
Definition of sensor/transducer-Block Diagram-elements of measurement system-classification of sensors/transducers-static characteristics-accuracy, precision, resolution, linearity, sensitivity, range, loading effect, threshold, dead time, dead zone, span. Errors in measurement: True value, static error, static correction, scale range and scale span, error calibration curve, readability, repeatability & reproducibility, drift and noise.		
At the end of the Module 1, students will be able to: <ol style="list-style-type: none"> 1. To learn about classification of sensors/transducers. 2. To understand Errors in measurement. 		

MODULE -2	RESISTIVE TRANSDUCERS	
10H		
<p>Potentiometers-Linear POT, Rotary POT, characteristics of POT. Thermistors- Construction and its Resistance- Temperature characteristics. Thermocouples- Construction and its Resistance-emf characteristics Inductive Transducers: Principle of change of self inductance, Principle of change of mutual inductance, Linear variable differential transformer(LVDT), Rotary variable differential transformer(RVDT)..</p>		
<p>At the end of the Module 2, students will be able to:</p> <ol style="list-style-type: none"> 1. To understand about characteristics of POT. 2. To understand Principle of change of mutual inductance. 		
MODULE-3	CAPACITIVE TRANSDUCERS	10H
<p>Introduction-Variable area type-variable air gap type- differential arrangement in capacitive transducers, variation of dielectric constant for measurement of liquid level, , variation of dielectric constant for measurement of displacement, advantages & disadvantages of Capacitive transducers . PiezoelectricTransducers: Measurement of Force, Modes of operation of Piezoelectric crystals, properties of Piezoelectric crystals, use of Piezoelectric Transducers.</p>		
<p>At the end of the Module 3, students will be able to:</p> <ol style="list-style-type: none"> 1. To understand Modes of operation of Piezoelectric crystals. 2. To understand use of Piezoelectric Transducers. 		
MODULE-4	HALL EFFECT TRANSDUCERS	9H
<p>Hall effect element, Measurement of displacement, current and power. Optical Transducers: Vacuum photo emissive cell and its characteristics, semi conductor photo electric transducer- Photo conductive cell and its characteristics, photo diode and its characteristics, photo voltaic cell and its characteristics.</p>		
<p>At the end of the Module 4, students will be able to:</p> <ol style="list-style-type: none"> 9. To learn about Optical Transducers. 10. To understand about semi conductor photo electric transducer. 		
MODULE-5	DIGITAL AND SMART SENSORS	9H
<p>Introduction to digital encoding transducer- digital displacement transducers- shaft encoder-optical encoder, Introduction to Smart Sensors, Overview in Applications of sensors in Civil Engineering..</p>		
<p>At the end of the Module 5, students will be able to:</p> <ol style="list-style-type: none"> 18. To understand digital displacement transducers. 19. To understand Applications of sensors in Civil Engineering. 		
Total Hours: 48		

Term work:
Case study about building instrumentation with sensors.

Content beyond syllabus: Types of sensors .

Contents to promote self-Learning:

S N O	Topic	Reference
2	Introduction	https://www.variohm.com/news-media/technical-blog-archive/introduction-to-sensors-
2	Resistive Transducers	https://www.watelectronics.com/what-is-resistive-transducer-working-its-applications/
2	Capacitive Transducers	https://circuitglobe.com/capacitive-transducer.html
2	Hall Effect Transducers	https://electricalbaba.com/hall-effect-transducer-definition-working-application/
3	Digital and Smart Sensors	https://www.yeastar.com/blog/smart-sensors-link-physical-digital-world/

Text Book(s):

1. A.K.Ghosh, “Introduction to Measurements & Instrumentation”, IIIrded, PHI
2. A.K.Sawhney& Puneet Sawhney, “A Course in Mechanical Measuremnts & Instrumentation”,Dhanapat Rai& Co.
3. D.V.S.Murty, “Transducers & Instrumentation”, PHI.

Reference Book(s):

1. Raman Pallas-Arney& John G.Webster, “Sensors & Signal Conditioning”,2012.
2. D.Patranabis, “Sensors and Transducers” 2nd edition., PHI, 2013.
3. BC Nakra, KK Chaudhry “Instrumentation, Measurement and Analysis”, 2nd Edition,TMH

Online Resources:

- 1.<https://engg.directory/syllabus/kce-056-sensor-and-instrumentation-technologies-for-civil-engineering-applications>

Web References:

1. <https://www.hemakumar.in/istcea>