SCHOOL OF ENGINEERING SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

Vision:

To become a School of Excellence that brings out Civil Engineers with high technical competencies and promotes high-end research to meet the current and future challenges in Civil Engineering.

Mission:

Accomplish excellence in curricular, co-curricular activities with a committed faculty through teaching and research which creates technically competent and dedicated civil engineers to serve their surroundings with pride.

> Programme Educational Objectives: (PEO's):

PEO-01: Practice civil engineering in construction industry, public sector undertaking and as an entrepreneur for successful professional career.

PEO-02: Pursue higher education for professional development

PEO-03: Exhibit leadership qualities with demonstrable attributes in lifelong learning to contribute to the societal needs. And To develop students to use modern techniques, skill and mathematical engineering tools for solving problems in Civil Engineering.

Programme Outcomes (PO's) :

PO-01: Engineering knowledge: a good civil engineer must possess solid knowledge of mathematics and physics and they also need to be able to use special design software packages, and has <u>skills surrounding metal fabrication</u> <u>for Denver</u> projects and other cities requirements.

(Apply laws of physics (eg..Hook's law, etc.,) to compute different types of response (stress and deformation) in the given materials).

PO-02: Problem analysis: Analyze structural elements for different force systems to compute design parameters (BM and SF).

PO-03: Design/development of solutions: demonstrate an ability to Design solutions for complex civil engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.

(Design compression elements using civil engineering principles to resist any given loads).

PO-04: Conduct investigations of complex problems: Problems involve one or more of: design; planning; investigation and problem resolution; improvement of materials, components, systems or processes; engineering operations; project management; research, development and commercialization.

PO-05: Modern tool usage: Creating of models of complex structural engineering activities with an understanding of the limitations by IT tools including prediction and modeling such as AutoCAD, ETABS, and SAP2000.

PO-06: The engineer and society: the field of construction, the building and the built environment have to satisfy some of the important criteria Biodiversity Enhancement, Support to the Community, Effective Use of Resources, Pollution Reduction, Creating Healthy Environment and Process Management etc.

SCHOOL OF ENGINEERING SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES Outcome based Curriculum for Undergraduate Degree Courses in Engineering & Technology Department of Civil Engineering

PO-07: Environment and sustainability: Construction has a direct impact on the environment due to Generation of waste materials, Emissions from vehicles, machineries, Noise pollution due to use of heavy vehicles and construction machineries, Releases of wastes and pollutants into water, ground and atmosphere.

PO-08: Ethics: Apply his/her technical skills to create, improve, and maintain "beautiful national land," "safe and comfortable livelihood," and "prosperous society", thus contributing to society through his/her knowledge and virtue with an emphasis upon his/her dignity and honor.

PO-09: Individual and team work: One of the main duties of a licensed civil engineer is to monitor and evaluate the progress of work completed at a jobsite, and making sure staff are in compliance with design documents, project plans, and other rules and regulations.

PO-10: Communication: The civil engineer is in charge of the entire construction process and supervises the work of everyone involved from Contractors and Architects to technicians and suppliers and handles the communication with government authorities as well, so very strong communication and organizing skills are also indispensable.

PO-11: Project management and finance: Civil Engineers usually work as part of a team or as team leaders, therefore they need advanced soft skills, such as problem solving and planning skills as well. Manage projects in multidisciplinary environments.

PO-12: Life-long learning: Civil Engineers apply the available solutions in physical environments and therefore need to be able to innovate, to find new ways of solving situations in a safe and efficient manner, which involves a great deal of creative thinking.

> PROGRAM SPECIFIC OUTCOMES (PSOs) OF THE PROGRAMME

These outcomes are specific to a program in addition to NBA defined POs **Civil Engineering** can have PSOs as:

- PSO1: Able to analyse and design building structural systems.
- PSO2: Able to provide design solutions to water supply and sewage systems.
- PSO3: Able to identify and analyse transportation engineering problems and provide solutions for the benefit of society.

> COs, POs and PSOs Mapping

Every course leads to some outcomes. All the courses must cover the stated list of PO/PSO outcomes. One way of verifying this to prepare a match matrix as shown below. In the table below * could also be a number- typically in (*) indicating level of attainment.

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Outcome based Curriculum for

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Programme PO's and PSO's Mapping

		È.	PO 1	P02	P03	P04	P05	P06	P07	PO8	P09	P010	P011	P012			
S. No	Program	Courses Catego	Engineering Knowledge	Problem Analysis	Design/Development of Solution	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning	PSO 1	PSO 2	PSO 3
1		Humanities and Social Sciences including Management courses	*	*			*	*		*		*		*			
2		Basic Science courses	*	*	*	*	*		*								
3		Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	*	*	*	*	*							*			
4		Professional core courses	*	*	*	*	*										
5	BE(CE)	Professional Elective courses relevant to chosen specialization/branch	*	*	*	*	*	*		*	*				*	*	
6		Open subjects – Electives from other technical and /or emerging *subjects	*	*	*	*	*	*	*	*	*			*			
7		Project work, seminar and internship in industry or elsewhere		*	*	*		*	*	*	*	*	*	*			
8		Specific core subject		*	*	*		*		*							*
9		Mandatory Course (Non credit)						*	*	*	*	*		*			

		1	6		4	s.	2	-	æ		0	1	7			
	ses/POs	PO	PO	ЬО	Od	Οd	PO	PO	PO	PO	POI	IOd	POI			
Semester	Name of the Cour	Engineering knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning	PS01	PSO 2	PSO 3
	Mathematics-I	*														
	Engineering Physics	*														
st	Basic Computer Engineering	*	*													
nester-I	Basic Mechanical Engineering	*														
Sen	Basic Civil Engineering & Mechanics	*	*					*					*			
	Language Lab										*					
	Self Study / GD Seminar		*			*			*							
	Mathematics-II	*														
	Engineering Chemistry	*														
Ind	English for Communication										*	*				
lester-L	Basic Electrical & Electronics Engineering	*														
Sem	Engineering Graphics			*	*											
	Manufacturing Practices				*	*										
	Industrial Training									*	*	*	*	*		
	Mathematics –III	*	*		*											
	Construction Materials			*	*											
IIIrd	Surveying			*	*					*				*	*	
ester-	Building Planning & Architecture			*		*								*		
Sem	Strength of Materials	*	*	*										*		
	Ancient Construction Techniques												*		*	
	Self study /GD Seminar		*			*			*							

	Energy, Ecology, Environment and Society						*	*						*		
	Construction Technology			*	*		*							*		*
Vth	Structural Analysis-I		*	*	*										*	
ester-I	Transportation Engineering-I							*		*		*				*
Sem	Engineering Geology & Remote Sensing	*														
	Software lab														*	*
	Industrial Training-I										*	*	*	*		
	Advanced Surveying			*	*					*						*
	Fluid Mechanics	*		*				*						*		*
	Structural Design & Drawing-I (RCC)		*	*	*	*								*		
ter-Vth	Professional Elective-I (A)Water Resources & Irrigation Engineering						*	*	*						*	
Semes	(B)Renewable Energy Sources						*	*								*
	Open Core Elective - I (A)Remote Sensing & GIS			*	*	*				*				*		
	(B)Highway Engineering				*			*		*		*				*
	Industrial Training-II								*	*	*	*	*	*		
	Transportation Engineering- II							*		*		*		*		
	Geotechnical Engineering-I			*	*	*		*						*		
	Professional Elective-II (A)Structural Analysis-II		*	*	*		ste	ate	ata					*		*
Ith	(B) Ground Water Engineering Professional Elective-III						*	* *	*					*	*	^
ster-V	(A) Environmental Engineering-I						*	*	*						~ *	
Seme	(B)Industrial Waste Treatment	*		*	*										~	*
	Open Core Elective – II (A) Structural Design & Drawing – I (STEEL)															
	(B) Highway Geometric Design				*			*		*		*				*
	Minor Project -I								*	*	*	*	*	*		

	Quantity Surveying & Costing				*	*						*		*		*
	Professional Elective-IV (A)Structural Design & Drawing-I (RCC-II)		*	*	*	*										*
VIIth	(B)Design of Hydraulic Structures			*	*		*		*						*	
ester-	Open Core Elective-III (A)Traffic Engineering						*	*	*							*
Sem	(B)Construction Planning & Management				*		*			*		*		*		*
	Major Project-I									*	*	*	*	*		
	Self Study/GD/Seminar		*			*			*							
	Geotechnical Engineering-II			*	*	*		*								
ц.	Professional Elective-V (A)) Structural Design & Drawing-II (STEEL-II)	*	*	*	*	*								*		*
r-VIII	(B) Earthquake Resistant Design of Structures			*	*	*								*		*
meste	Open Core Elective-IV (A) Pavement Design				*			*								*
Š	(B) Urban Transportation Planning							*		*		*				*
	Major Project-II									*	*	*	*	*		

Semester wise PO's and SPO's Mapping

Structure of Programme: To fulfill the need of development of all the POs/ GAs, as per above mapping, the following semester wise programme structure are as under.

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

Total Credits*= 160

S. No.	Course Category	Credits of the CE Curriculum
1.	Humanities and Social Sciences including Management	11
2.	Basic Sciences	24
3.	Engineering Sciences including workshop, drawing, basics of electrical/mechanical/computer etc.	19
4.	Professional Core Subjects	<mark>52</mark>
5.	Professional Subjects: Subjects relevant to chosen specialization/branch	18
6.	Open Subjects: Electives from other technical and/or emerging subjects	18
7.	Project work, seminar and internship in industry or elsewhere	18
8.	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	Non-credit
	Total	160

Structure of Undergraduate Engineering program:

***Definition of Credit:**

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (Lab)/week	1 Credit

> Scheme of Exanimation (Civil Engineering) Academic Year 2019-20

I Semester

			Maxin	num Maı Slot	ks Theory	Maxim (Pract	um Marks ical Slot)		P hou	eriod 1r/ w	s/ eek	
S. No.	Subject Code	Subject Name	End Sem. Exam	Mid Tests	Assign- ments/Qu iz	End Sem. Practical & Viva	Practical Record /Assignmen t/ Quiz / Presentatio n	Total Marks	L	Т	Р	Credits
1	BEBSC-101	Mathematics-I	60	30	10	-	-	100	3		-	3
2	BEBSC-202	Engineering Physics	60	30	10	30	20	150	2	1	2	4
3	BEESC-203	Basic Computer Engineering	60	30	10	30	20	150	3	-	2	4
4	BEESC-204	Basic Mechanical Engineering	60	30	10	30	20	150	2	-	2	3
5	BEESC-205	Basic Civil Engineering & Mechanics	60	30	10	30	20	150	3	-	2	4
6	BEHSMC- 206	Language Lab	-	-	-	30	10	40	-	-	2	1
7	BELC-107	Self Study / GD Seminar					10	10			2	1
		Total	300	150	50	150	100	750	13	1	12	20

II Semester

			Maximum I	Marks The	ory Slot	Maxim (Pract	um Marks ical Slot)		Per	iods/ ł week	nour/	
S. No.	Subject Code	Subject Name	End Sem. Exam.	Mid Tests	Assign- ments/Q uiz	End Sem. Practic al & Viva	Practical Record /Assignm ent/ Quiz / Presentat ion	Total Marks	L	Т	Р	Cre dits
1	BEBSC-201	Mathematics-II	60	30	10	-	-	100	3		-	3
2	BEBSC-102	Engineering Chemistry	60	30	10	30	20	150	3		2	4
3	BEHSMC-103	English for Communication	60	30	10	30	20	150	3	-	2	4
4	BEESC-104	Basic Electrical Engineering	60	30	10	30	20	150	2	-	2	3
5	BEESC-105	Engineering Graphics	60	30	10	30	20	150	2	1	2	4
6	BEESC-106	Manufacturing Practices	-	-	-	30	10	40	-	-	2	1
7	BELC-207	Industrial Training					10	10	-	-	2	1
		Total	300	150	50	130	100	800	13	1	12	20

III SEMESTER

			Maxim	um Mark Slot	s Theory	Maximum N S	Iarks (Practical Slot)		Perio	ds/ hour/	week	
S. No.	Subject Code	Subject Name	End Sem. Exam.	Mid Tests	Assign- ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	Total Marks	L	Т	Р	Credits
1	BEA-301	Mathematics –III	60	30	10	-	-	100	3		-	3
2	CEA-302	Construction Materials	60	30	10	-	-	100	3	1	-	4
3	CEA-303	Surveying	60	30	10	30	20	150	2		2	3
4	CEA-304	Building Planning & Architecture	60	30	10	30	20	150	2	1	2	4
5	CEA-305	Strength of Materials	60	30	10	30	20	150	2	1	2	4
6	CEA-306	Ancient Construction Techniques	-	-	-	30	20	50	-	-	2	1
7	CEA-307	Self study /GD Seminar	-	-	-	-	50	50	-	-	2	1
	TOTAL			150	50	120	130	750	13	2	10	20

IV SEMESTER

			Maxi	mum Marks T	heory Slot	Maximum 1	Marks (Practical Slot)		Period	ls/ hour/	/ week	
S.No.	Subject Code	Subject Name	End Sem. Exam.	Mid Tests	Assign- ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	Total Marks	L	Т	Р	Credits
1	CEA-401	Energy, Ecology, Environment & Society	60	30	10	-	-	100	3	-	-	3
2	CEA-402	Construction Technology	60	30	10	30	20	150	3		2	4
3	CEA-403	Structural Analysis-I	60	30	10	30	20	150	3		2	4
4	CEA-404	Transportation Engineering-I	60	30	10	30	20	150	2	1	2	4
5	CEA-405	Engineering Geology & Remote Sensing	60	30	10	30	20	150	2	1	2	4
6	CEA-406	Software lab	-	-	-	30	20	50	-	-	2	1
7	CEA-407	Industrial Training-I		To be	completed during	fourth semester	break. Its evaluation	/credit to be add	led in fif	th semes	ter	
	TOTAL		300	150	50	150	100	750	13	2	10	20

V SEMESTER

			Max (T	timum N 'heory S	Aarks lot)	Maxin (Prac	num Ma ctical Slo	orks ot)		Pe hou	eriod ır/ w	s/ reek	
S. No	Subjec t Code	Subject Name	End Sem. Exam	Mid Test s	Assign- ments/ Quiz	End Sem. Practica l & Viva	Prae Ree /Assig / Q Prese	ctical cord gnment uiz / ntation	Total Marks	L	т	Р	Credit s
1	CEA- 501	Advanced Surveying	60	30	10	30		20	150	2	1	2	4
2	CEA- 502	Fluid Mechanics	60	30	10	30	-	20	150	2	1	2	4
3	CEA- 503	Structural Design & Drawing-I (RCC)	60	30	10	30	20		150	2	1	2	4
4	CEA- 504	Professiona l Elective-I	60	30	10	-			100	3	1	0	4
5	CEA- 505	Open Core Elective - I	60	30	10	-			100	3	1	0	4
6	CEA- 506	Industrial Training-II	-	-	-	150	1	.00	250	-	-	4	2
	тот	'AL	300	150	50	240	1	00	900	12	5	10	22
			1		ELECT	VE SUBJEC	Г	1					
C	EA-504 Pr Electi	ofessional ive-I	(A)Wat Enginee	er Reso ering	urces & Irr	igation		(B)Rene	ewable En	ergy S	Sourc	es	
	CEA-505 (Electiv)pen Core ve – I	(A)Ren	note Sen	sing & GIS			(B)High	way Engir	neerin	ıg		

VI SEMESTER

			Max T	ximum M 'heory S	larks lot	Maxin (Prae	num Ma ctical Sl	orks ot)		Per h	riod our, veek	s/ /	
S. No.	Subject Code	Subject Name	End Sem. Exam.	Mid Tests	Assign- ments/ Quiz	End Sem. Practical & Viva	Pra Re /Assig Qı Prese	ctical cord nment/ uiz / ntation	Total Marks	L	Т	Р	Credits
1	CEA-601	Transportation Engineering-II	60	30	10	30	:	20	150	2	1	2	4
2	CEA-602	Geotechnical Engineering-I	60	30	10	30		20	150	2	1	2	4
3	CEA-603	Professional Elective-II	60	30	10	-	-		100	3	1	0	4
4	CEA-604	Professional Elective-III	60	30	10	-		-	100	3	0	0	3
5	CEA-605	Open Core Elective - II	60	30	10	-			100	3	0	0	3
6	CEA-606	Minor Project - I	-	-	-	180	1	20	300	-	-	4	2
	Т0'	ΓAL	300	150	50	240	1	60	900	13	3	8	20
					ELECTIVE	SUBJECT							
CEA	-603 Profes	sional Elective-II		(A)	Structural	Analysis-II		(1	3) Ground	l Wat	er E	ngir	neering
CE4	A-604 Profes I		(A) Env	ironmenta	l Engineerin	ıg-I	(E	3) Industr	ial W	aste	Tre	atment	
	CEA-605 Elect	(A) St	ructural	Design & I (STEEL)	Drawing – I		(B) Tr	New Tec ansporta	hnolo tion E	gies Ingir	for neer	ing	

			Max T	timum N Theory S	Aarks lot	Maxin (Prac	num Ma ctical Sl	arks ot)		Pe h	rioc Iour veel	ls/ ·/ k	
S. No	Subject Code	Subject Name	End Sem. Exam.	Mid Tests	Assign- ments/ Quiz	End Sem. Practical & Viva	Pra Re /Assig Qu Prese	ctical cord gnment/ uiz / entation	Tota l Mar ks	L	Т	Р	Credits
1	CEA- 701	Quantity Surveying & Costing	60	30	10	30		20	150	3	0	2	4
2	CEA- 702	Environmental Engineering-II	60	30	10	30		20	150	3	0	2	4
3	CEA- 703	Professional Elective-IV	60	30	10			-	100	3	0	0	3
4	CEA- 704	Open Core Elective-III	60	30	10	-		-	100	3	0	0	3
5	CEA- 705	Major Project-I	-	-	-	120		80	200	-	-	10	5
6	CEA- 706	Self Study/GD/Seminar	-	-	-	-	2	200	200	-	-	2	1
	1	TOTAL	240	120	40	180	3	320	900	12	0	16	20
ELECTIVE SUBJECT													
CEA-703 Professional Elective-IV		(A) Structural Design & Drawing-I (RCC-II)			[(B) Design of Hydraulic Structures							
CE	EA-704 Ope	en Core Elective-III	(A)	Traffic	Engineerin	g		(B)	Constru Manage	ction ment	Plar	ıning	&

VIII SEMESTER

			Max T	kimum M Theory S	larks lot	Maxin (Prac	num Mar ctical Slot	ks :)		P	erio hou wee	ds/ r/ k	
S. No.	Subject Code	Subject Name	End Sem. Exam.	Mid Tests	Assign- ments/ Quiz	End Sem. Practical & Viva	Pract Reco /Assign Qui Presen	tical ord ment/ z / tation	Total Marks	L	Т	Р	Credits
1	CEA- 801	Geotechnical Engineering-II	60	30	10	30	20)	150	3	0	2	4
2	CEA- 802	Professional Elective-V	60	30	10		-		100	3	0	0	3
3	CEA- 803	Open Core Elective-IV	60	30	10	-	-		100	3	0	0	3
4	CEA- 804	Major Project-II	-	-	-	240	16	0	400	-	-	16	8
TOTAL		180	90	30	270	18	0	750	9	0	18	18	
					ELECTIVI	E SUBJECT							
CEA-802 Professional Elective-V		(A)) Structural Design & Drawing-II (STEEL-II)			(B) Earthquake Resistant Design of Structures								
CEA-803 Open Core Elective-IV			(A) Pav	rement D	lesign			(B) Ur	ban Trans	spor	tatic	on Pla	nning

* Additional open electives can be provided as per the availability of faculty in the University and student should produce prior permission from Dean with a batch of atleast 5 students.

Course Content

I SEMESTER

BEBSC-101 Mathematics-I

BEBSC-101 Mathematics-I	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

The Preamble of this foundational course is to review mathematical concepts already learnt in higher secondary. This course will also introduce fundamentals of mathematical functions, derivatives and aspects of calculus to students. This course deep understanding of matrix, differential equations, Sequences and series, Vector Space as well as a strong sense of how useful the subject can be in other disciplines of learning.

Unit-I Calculus

Unit-II Integral

Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two variables), Method of Lagrange's Multipliers.

Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas, Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumes of the curves.

Unit-III Sequences and series

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit-IV Vector Spaces

Vector Space, Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.

Unit-V Matrices

Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

Outcome:-

Course work is designed to provide students the opportunity to learn key concepts of mathematical functions, key concepts of matrix, Vector Spaces as well as fundamentals and applications of integral calculus.

10Hr

6 Hr

6 Hr

6 Hr

10 Hr

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References:-

- 1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- 2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- 3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
- 4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
- 5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
- 6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- 7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BEBSC-102

Engineering Chemistry

BEBSC-102	Engineering Chemistry	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

- 1. To acquire knowledge about hardness of water and importance of water in industrial purpose.
- 2. To understand the concept of molecular spectroscopy.
- 3. To gain the knowledge of about polymeric material and biodegradable substances.
- 4. To understand the mechanism of lubricant and properties of lubricant.

UNIT-I Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. water treatment- Introduction, hardness of water, Units of hardness, disadvantage of hard water, scale and sludge formation in boilers, boilers troubles.

UNIT-II Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

UNIT-III Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions. Lubricant-Introduction, mechanism of lubricant, classification of lubricant, properties of lubricating oils.

UNIT-IV Use of free energy in chemical equilibria

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. High Polymers-Introduction, nomenclature, types of polymerization, classification of polymers, plastics-important, thermo-plastic resins and thermo setting resin,

6Hr

6Hr

10Hr

UNIT-V Periodic properties

10Hr

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Outcomes:

- 1. Develop innovative methods to produce soft water for industrial use.
- 2. Identify the structure of unknown / new compounds with the help of spectroscopy.
- 3. Substitute metal with conducting polymers and produce cheaper biodegradable polymers to reduce environmental pollution.
- 4. Apply their knowledge for use and protect to industrial and domestic equipment.

REFRENCES:

- 1. University chemistry, by B. H. Mahan
- 2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
- Fundamentals of Molecular Spectroscopy, by C. N. Banwell
 - 3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.
 - 4. Physical Chemistry, by P. W. Atkins
 - 5. engg. Chemistry jain.jain
 - 6. engg. Chemistry shashi chawla.

BEBSC-102

Engineering Chemistry

BEBSC-102	Engineering	0L:0T:2P	1 credits	2Hrs/Week
	Chemistry			

LIST OF EXPERIMENTS:

- 1. Determination of surface tension and viscosity
- 2. Determination of chloride content of water
- 3. Determine the change of viscosity of given lubricating oil with change in temperature by Redwood Viscometer No. 1.
- 4. Determine the change of viscosity of given lubricating oil with change in temperature by Redwood Viscometer No. 2.
- 5. To determine the flash and fire point of given lubricating oil by Cleveland's open cup apparatus.
- 6. To determine the flash and fire point of given lubricating oil by Abel's closed cup apparatus.
- 7. To determine the flash and fire point of given lubricating oil by Pensky Marten's apparatus.
- 8. To determine the total hardness of given water sample by titrating it against EDTA solution using EBT as an indicator.

Laboratory Outcomes:

The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions,
- redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

BEHSMC-103

English for Communication

BEHSMC-103	English for Communication	3L:0T:0P	3 credits	3Hrs/Week	

Preamble:-

- 1. To enhance Professional competence in reading, writing, listening and speaking.
- 2. To modify the tactic of providing information about the language by using several techniques.
- 3. To minimize the Grammar Translation Method of ELT by replacing it with Direct Learning Method.
- 4. To Introduce Communicative Method of ELT and focusing the teaching pedagogy to the student-centered learning rather than the teacher-centered learning.
- 5. To develop the skills to master three major forms of communications which are vital in academic and professional settings namely professional presentations, interviews and group communications respectively.
- 6. To provide a deep insight of techniques for delivering effective presentations, appealing job interviews, and actively participating in various forms of group communication.

UNIT-I Identifying Common errors in writing

Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

UNIT-II Vocabulary building and Comprehension

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

UNIT-III Communication:

Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

UNIT-IV Developing Writing Skills

Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report.

UNIT-VBusiness Correspondence

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

10 Hr

6 Hr

6 Hr

10 Hr

Outcome:-

At the end of this course students will have:

- **CO1:** Ability to design a language component or process to meet desired need within Realistic, Constraints such as economic, environmental, social, political, ethical Scenario.
- **CO2:** Ability to analyze the usage of English words in different contexts.
- **CO3:** An understanding of technical and academic articles' comprehension.
- **CO4:** The ability to present oneself at multinational levels knowing the type of different Standards of English

References:-

- 1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
- 2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
- 3. 'Communication Skill, Sanjay Kumar and pushlata, OUP2011
- 4. "Practical English Usage Michael Swan OUP, 1995.
- 5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
- 6. On writing well, William Zinsser, Harper Resource Book 2001.
- 7. Remedial English Grammar, F.T. Wood, Macmillan 2007.

BEHSMC-103

English for Communication

BEHSMC-	English for Communication	0L:0T:2P	1 credits	2Hrs/Week
103				

List of Experiments:-

- Listening Comprehension.
 Pronunciation, Intonation, Rhythm
 Practicing everyday dialogues in English
- 4. Interviews.
- 5. Formal Presentation.

BEESC-104

Basic Electrical & Electronics Engineering

BEESC-104 Basic Electrical Engineering	2L:0T:0P	2 credits	2Hrs/Week	
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Preamble:-

Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context and to provide students the working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.

Unit-I Electrical circuit elements

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and-delta transformation, nodal methods, Superposition of a theorem, Thevenin theorem, Norton theorem.

Unit-II AC Circuits

Representation of Sinusoidal waveforms –Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit-III Magnetic circuit

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit-IV Machines

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.

Unit-V Components of LT Switchgear:

Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

10 Hr

10 Hr

6 Hr

10 Hr

Outcome:-

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

Reference's: -

- 1. Ritu Sahdev, "Basic Electrical Engineering",
- 2. S. Singh, P.V. Prasad, "Electrical Engineeri
- 3. D. P. Kothari and ElectricalI.J.Nagrath, Engineering", "Basic Tat
- 4. D. C. Kulshreshtha, "Basic Electrical Engine
- 5. E. Hughes, "Electrical and Electronics Techn
- 6. 6. S. Bobrow, "Fundamentals of Electrical En
- 7. 7.V. D. Toro, "Electrical Engineering Fundamen

BEESC-104 Basic Electrical Engineering

BEESC-104	Basic Electrical Engineering	0L:0T:2P	1 credits	2Hrs/Week

Laboratory Preambles:

- 1. Read and demonstrate the rating of basic equipments used in electrical engineering
- 2. Connections of different components as per the rules
- 3. Application different components in electrical field

List of Experiments: -

- 1. Verification of Kirchhoff"s laws
- 2. Verification of Superposition and Thevenin Theorem.

3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor

- 4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
- 5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
- 6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
- 7. Determination of parameters of ac single phase series RLC circuit
- 8. To observe the B-H loop of a ferromagnetic material in CRO.
- 9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
- 10. Determination of efficiency of a dc shunt motor by load test

11. To study running and speed reversal of a three phase induction motor and record speed in both directions.

12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

Laboratory Outcomes

- 1. Get an exposure to common electrical components and their ratings.
- 2. Make electrical connections by wires of appropriate ratings.
- 3. Understand the usage of common electrical measuring instruments.
- 4. Understand the basic characteristics of transformers and electrical machines.

BEESC-105 Engineering Graphics

BEESC-105	Engineering Graphics	2L:1T:0P	3 credits	3Hrs/Week	
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Preambles:-

- 1. Increase ability to communicate with people.
- 2. Learn to sketch and take field dimensions.
- 3. Learn to take data and transform it into graphic drawings.
- 4. Learn basic Auto Cad skills.
- 5. Learn basic engineering drawing formats.
- 6. Prepare the student for future Engineering positions.

UNIT-I Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, Lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales –Plain, Diagonal and Venire Scales;

UNIT-II Orthographic Projections

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projections of Regular Solids those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale

UNIT-III Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid, Cone –Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

UNIT-IV Isometric Projections:

Principles of Isometric projection –Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT-V Overview of Computer Graphics:

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Objects, Isometric Views of lines, Planes, Simple and compound Solids; Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of Units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance.

1

6 Hr

10 Hr

10 Hr

10 Hr

Outcome:-

Student's ability to hand letter will improve.

- 1. Student's ability to perform basic sketching techniques will improve.
- 2. Students will be able to draw orthographic projections and sections.
- 3. Student's ability to use architectural and engineering scales will increase.
- 4. Students ability to produce engineered drawings will improve
- 5. Student's ability to convert sketches to engineered drawings will increase.
- 6. Students will become familiar with office practice and standards.
- 7. Students will become familiar with Auto Cad two dimensional drawings.

Students will develop good communication skills and team work.

References:-

Bhatt N.D., Paschal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
 Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
 Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
 Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
 CAD Software Theory and User Manuals

BEESC-105 Engineering Graphics

BEESC-105	Engineering Graphics	0L:0T:2P	1 credits	2Hrs/Week

List of Experiments:-

- 1. Sketching and drawing of geometries and projections based on above syllabus
- 2. Term work: A min. of 30 hand drawn sketches (on size A4 graphic sketch Book) plus 5 CAD-printouts on size A4 sheets plus 10 sheets of size A2 or 6 sheets of size A1, (50% marks to be allotted for this record + 25% marks for attendance +25% marks for Teachers Assessment

BEESC-106 Manufacturing Practices

BEESC-106	Manufacturing	0L:0T:2P	1 credits	2Hrs/Week
	Practices			

Preamble:-

- 1. To understand process of cutting shaping.
- 2. To understand working principles for various machining processes.
- 3. To understand construction, working and applications of various machine tools.
- 4. To learn basic set up, working and applications of a few important non conventional machining processes to get hand on experience on various machine tools.

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing / fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

- **1.** Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
- 2. CNC machining, Additive manufacturing
- **3.** Fitting operations & power tools
- 4. Carpentry
- 5. Plastic molding, glass cutting
- 6. Metal casting
- 7. Welding (arc welding & gas welding), brazing

List of Experiments:-

- **1.** Carpentry Shop Experiment To Make a T-LAP joint with wood Pieces
- 2. Machine Shop Experiment To Perform Knurling on Iron Rod
- 3. WELDING SHOP (LAP Joint), Tools, Accessories, Diagram And Explanation
- 4. SHEET METAL SHOP (Square Tray), Parts, Accessories, Diagram And Explanation
- 5. FITTING SHOP (Make a Joint), Parts, Accessories, Diagram And Explanation
- 6. CARPENTRY SHOP (T-Lap Joint), Cutting Tools, Accessories, Diagram and Explanation
- 7. MACHINE SHOP (the lathe machine) , Parts, Accessories, Diagram and Explanation

Outcome:-

- 1. The students will be able to understand the details about machines used in production.
- 2. The students will be able to understand the mechanics behind metal cutting.
- 3. The students will be able to understand the finishing and super finishing processes.
- 4. The students will be able to understand the Physics of material removal behind the various nonconventional machining processes.

BELC-107 Self Study / GD Seminar

BELC-207	Self-Study / GD Seminar	0L:0T:2P	1 credits	2Hrs/Week

Preamble:-

To improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation.

Outcome:-

- Analytical thinking
- Lateral thinking
- constructive argument
- Communication skill
- Presentation of views

Students will discuss the course related and interdisciplinary topics for problem solving. They will improve the mass communication and convincing / understanding skills about subject and their related problem in a group of students

II SEMESTER

BEBSC-201 Mathematics-II

BEBSC-201 Mathematics-II	3L:0T:0P	3 credits	3Hrs/Week
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Preamble:-

- 1. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
- 2. 2. To teach methods to solve differential equations of various types.
- 3. 3. To give an ability to apply knowledge of mathematics on engineering problems

Unit - I Ordinary Differential Equations I

Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

UNIT-II Ordinary differential Equations II

Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit III Partial Differential Equations

Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Unit IV Functions of Complex Variable

Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, theorem ,Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral

Unit V Vector Calculus

Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

Outcome:-

The students will be able to :

- 1. Classify differential equations according to certain features.
- 2. Solve first order linear equations and nonlinear equations of certain types and interpret the solutions.

6 Hr

10 Hr

10 Hr

10 Hr

3. Understand the conditions for the existence and uniqueness of solutions for linear differential equations 4. Solve second and higher order linear differential equations with constant coefficients and construct all solutions from the linearly independent solutions

5. Find series solutions about ordinary and regular singular points for second order linear differential equations.

6. Solve initial value problems using the Laplace transform.

7. Solve systems of linear differential equations with methods from linear algebra

References : -

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. W. E. Boyce and R. C. Dip Rima, Elementary Differential Equations and Boundary Value Problems, 9th End., Wiley India, 2009.

4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

5. E. A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

6. E. L. Inca, Ordinary Differential Equations, Dover Publications, 1958.

7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill,

2004.

8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

BEBSC-202 Engineering Physics

BEBSC- 202 Engineering Physics	2L:1T:0P	3 credits	3Hrs/Week
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Preamble:-

- A comprehensive, high-quality education in the physical sciences
- A flexible curriculum with multiple concentrations that allows students to tailor their education according to their specific interests
- The opportunity to experience the excitement of scientific discovery through direct • participation in faculty research
- An increased awareness of the physical processes in the surrounding world
- The essential knowledge and analytical, mathematical and computational tools with which to pursue post-graduate education in a variety of physics-related and other fields
- The foundation and practical skillsets for eventual success in any of a broad array of • careers
- The motivation for a lifelong love of learning •

Unit I Relativistic Mechanics:

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Unit II Solid state & Nuclear physics

Free electron theory of metals, Qualitative discussion of Kronig-penny model and origin of energy bands. Intrinsic and Extrinsic Semiconductors. V-I Characteristics of PN junction diode, Zener diode, Hall-effect.

Introduction to Nuclear Physics, Static properties of Nucleus, Nuclear liquid drop model, Nuclear Shell Model, Linear particle accelelerator, Cyclotron, Betatron, Bainbridge mass sprectrograph.

Unit III Quantum Mechanics:

Introduction to Quantum mechanics, Wave particle duality, Matter waves, Particle velocity, Phase velocity, Group velocity and their relation. Heisenberg's Uncertainty Principle. Time-dependent and time-independent Schrodinger wave equation, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Unit IV Wave Optics:

Interference :Coherent sources, Interference in uniform and wedge shaped thin films, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction

10 Hr

6 Hr

6Hr

grating, Spectra with grating, Dispersive power of grating, Rayleigh's criterion of resolution. Resolving power of grating and Prism.

Unit V Fibre Optics & Lasers: Fibre Optics

10 Hr

Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Outcome:-

- an ability to apply knowledge of mathematics, science, and engineering.
- an ability to design and conduct experiments, as well as to analyze and interpret data.
- an ability to design a system, component, or process to meet desired needs within realistic constraints.
- an ability to function on multidisciplinary teams.
- an ability to identify, formulate, and solve engineering problems.
- an understanding of professional and ethical responsibility.
- an ability to communicate effectively.
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- a recognition of the need for, and an ability to engage in life-long learning.
- a knowledge of contemporary issues.
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Reference Books: -

- 1. Concepts of Modern Physics AurthurBeiser (Mc-Graw Hill)
- 2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
- 3. Optics Brijlal& Subramanian (S. Chand)
- 4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
- 5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
- 6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

BEBSC- 202 Engineering Physics

BEBSC-202	Engineering Physics	0L:0T:2P	1 credits	2Hrs/Week

List of Experiments: -

1. To determine the wavelength of sodium light by Newton's ring experiment.

2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.

3. To determine the energy band gap of a given semiconductor material.

4. To determine the plank's constant with help of photocell.

5 .Resolving Power of Telescope.

6.V-I Charecteristics of P-N Junction diode.

7. Zener diode characteristics.

8. To determine the dispersive power of prism.

BTEESC-203 Basic Computer Engineering

BTEESC-203 Basic Computer Engineering	3L:0T:0P	3 credits	3Hrs/Week
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Preamble:-

- Successfully practice computer engineering to serve state and regional industries, government agencies, or national and international industries.
- Work professionally in one or more of the following areas: computer hardware and software design, embedded systems, computer networks and security, system integration, and electronic design automation.
- Achieve personal and professional success with awareness and commitment to their ethical and social responsibilities, both as individuals and in team environments.
- Maintain and improve their technical competence through lifelong learning, including entering and succeeding in an advanced degree program in a field such as engineering, science, or business.

Unit –I Computer:

Definition, Classification, Organization i.e. CPU, register, Memory & Storage Systems, I/O Devices, and System & Application Software. Computer application E-Business, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and, Computer Gaming, Multimedia and Animation etc.

Unit –II Introduction to Algorithms

Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object oriented Programming. Introduction to C, Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions,

Unit – III Computer System Overview

Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-Preambles and functions, Evolution of Operating System. - Computer System Organization- Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

Unit IV Computer Networking

Introduction, Goals, OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Topology, Introduction to Internet, World Wide Web, E• commerce Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, Logic bombs, Hacking Spamming, Cyber Defamation, Security measures Firewall, **Unit V Data base Management System** 10 Hr

6 Hr

6Hr

10 Hr
Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages. Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public' private, community and hybrid clouds), Pros and Cons of cloud computing

Outcome:-

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Reference books:

- 1. Introduction of computers: Peter Norton, TMH
- 2. Object oriented programming with c++ :E.Balaguruswamy,TMH
- 3. Object oriented programming in C++: Rajesh k.shukla ,Wiley India
- 4. Computer network: Andrew Tananbaum,PHI
- 5. Data base management system,Korth,TMH
- 6. Operating system-silberschatz and Galvin-Wiley India

BTEESC-203 Basic Computer Engineering

BTEESC-203	Basic Computer Engineering	0L:0T:2P	1 credits	2Hrs/Week

List of Experiment:-

- 1. Study of input and output devices of computer systems .
- 2. Write a program of addition, subtract, multiplication and division by using C.
- 3. Write a program to check weather a number is prime or not.
- 4. Study of various types of Operating System.
- 5. Study and practice of basic Linux commands-ls, cp, mv, rm, chmod kill, ps etc.
- 6. Design color coding of straight & crossover cable.
- 7. Installation of oracle 10g. Also create a employee table.

BEESC-204 Basic Mechanical Engineering

BEESC-204 Basic Mechanical 2L Engineering	0T:0P 2 credits	2Hrs/Week
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Preamble:-

- To provide a comprehensive knowledge of basic mechanical systems. •
- Basic concepts from mechanical engineering sciences,
- Basic concepts I.C Engine
- Modern engineering tools (machine-tools, laboratory instrumentation, Working principle of steam Engine), and related subjects to design mechanical engineering components

Unit I Materials

Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness ductility, brittleness, malleability etc. of materials, Tensile test-Stress-strain diagram of ductile and brittle materials,

Unit II Measurement

Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set. Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry, welding etc Introduction to Lathe and Drilling machines and their various operations.

Unit III Fluids

Fluid properties pressure, density and viscosity etc. Types of fluids, Newton's law of viscosity , Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps.

Unit IV Thermodynamics

Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering: Classification and working of boilers, mountings and accessories of boilers, Efficiency and performance analysis, natural and artificial draught, steam properties, use of steam tables.

Unit V Reciprocating Machines

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

10 Hr

6 Hr

10Hr

10 Hr

6Hr

Outcome:-

- After successful completion of this course students will able to
- To describe and use basic engineering concepts
- principles and components of mechanical equipment
- measuring & testing method of physical quantities
- Assessment of boiler component.

References : -

1- Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age . 2- Nakra & Chaudhary , Instrumentation and Measurements, TMH.

3- Nag P.K, Engineering Thermodynamics, TMH.

4- Ganesan, Internal Combustion Engines, TMH.

5- Agrawal C M, Basic Mechanical Engineering , Wiley Publication. 6- Achuthan M , ,

Engineering Thermodynamics, PHI

BEESC-204 Basic Mechanical Engineering

BEESC-204	Basic Mechanical	0L:0T:2P	1credits	2Hrs/Week
	Engineering			

List of Experiments:-

- 1- Study of Universal Testing machines.
- 2- Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and
- 3- Study of Lathe Machine.
- 4- Study of Drilling Machines.
- 5- Verification of Bernoulli's Theorem.
- 6- Study of various types of Boilers.
- 7- Study of different IC Engines.
- 8- Study of different types of Boilers Mountings and accessories.

BEESC-205 Basic Civil Engineering & Mechanics

BEESC-205 Basic Civil Engineering & Mechanics	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios. Problems of particular types are explored in detail in the hopes that students will gain an inductive understanding of the underlying principles at work; students should then be able to recognize problems of this sort in real-world situations and respond accordingly.

The civil engineering program will serve Connecticut and the nation by providing a quality engineering education that enables students to enter a profession that can improve the civil infrastructure, and economic welfare. Our civil engineering program will maintain a strong emphasis on undergraduate education with the goal that our program will be recognized for quality instruction in civil engineering analysis and design

Unit I Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

Unit II Surveying & Positioning

Introduction to surveying Instruments – levels, theodolites , plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal levelling.

Unit III Basics of Engineering Mechanics covering

Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces ,Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

Unit IV Centroid and Centre of Gravity covering

Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

(10 Hrs):

(10 Hrs):

10 Hr

10 Hr

10 Hr

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames

Outcome:-

- Demonstrate knowledge of various surveying methods.
- Conduct a chain survey.
- Conduct a compass survey.
- Conduct levelling survey and be able to do RL calculations.
- Demonstrate knowledge of properties of various building materials.
- Draw free body diagrams and determine the resultant of forces and/or moments.
- Determine the centroid and second moment of area of sections.
- Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
- Analyse statically determinate planar frames.

Reference Books:

- 1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
- 2. Prasad I.B., Applied Mechanics, Khanna Publication.
- 3. Punmia, B.C., Surveying, Standard book depot.
- 4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI

BEESC-205 Basic Civil Engineering & Mechanics

BEESC-205	Basic Civil Engineering &	0L:0T:2P	1 credits	2Hrs/Week
	Mechanics			

List of Experiments:-

1. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.

2. To perform leveling exercise by height of instrument of Rise and fall method.

3. To measure horizontal and vertical angles in the field by using Theodolite.

4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.

5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.

6. To determine the Compressive Strength of brick .

7. To determine particle size distribution and fineness modulus of course and fine Aggregate.

8. To verify the law of Triangle of forces and Lami's theorem.

9. To verify the law of parallelogram of forces.

10. To verify law of polygon of forces

11. To find the support reactions of a given truss and verify analytically.

12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.

13. To determine the moment of inertia of fly wheel by falling weight method.

BEHSMC-206

Language Lab and Seminar

BEHSMC-206	Language Lab and Seminar	0L:0T:2P	1 credits	2Hrs/Week

Preamble:-

This course intends to impart practical training in the use of English Language for Communicative purposes and aims to develop students' personality through language Laboratory.

Topics to be covered in the Language laboratory sessions:

- 1. Introducing oneself, family, social roles.
- 2. Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
- 3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
- 4. To write a book review. Standard text must be selected by the teacher.
- 5. Role plays: preparation and delivery topic to be selected by teacher/faculty.

6.

BELC 207 Industrial Training

BELC 207 Industrial Training 0L:0T:2P 1 credit	s 2Hrs/Week
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- Industrial environment and work culture.

- Organizational structure and inter personal communication.

- Machines/ equipment/ instruments - their working and specifications.

- Product development procedures and phases.

- Project planning, monitoring and control.

III SEMESTER

BEA- 301 Mathematics-III

BEA- 301	Mathematics-III	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve on basic tools for specialized studies in many fields of engineering and technology.

UNIT-I

UNIT-II

UNIT-III

Numerical Methods – 1 Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Numerical Methods – 2 Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, GaussSeidal, and Relaxation method.

Numerical Methods – 3 Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank- Nicholson methods), Finite difference explicit method for wave equation.

UNIT-IV

UNIT-V

Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

12hr

10hr

10hr

9hr

10hr

Outcome:-

On completion of this course, students are able

- to know how root finding techniques can be used to solve practical engineering problems.
- to apply the concept of numerical analysis to find the relative strengths and weaknesses of each computation method and know which are most applicable for given problem
- to apply the analytical technique to express periodic function as a Fourier sine and cosine series.
- to apply partial differential techniques to solve the physical engineering problems.
- to implement integration technique to determine the extreme values of a functional.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.

- 2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
- 3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- 4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

CEA- 302 Construction Materials

BEA- 302	onstruction Materials	3L:1T:0P	4 credits	4Hrs/Week	
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Preamble:-

• To introduce students to various materials commonly used in civil engineering construction and their properties

UNIT-I

Stones, Brick, Mortar and Concrete: Stones :Occurrence, Classification of Rocks, varieties, Characteristics and their testing, uses, quarrying and dressing of stones, Deterioration of Stones, Retardation of Decay of Stones, Preservation of Stones, Artificial Stones. Brick : Manufacturing , characteristics, Classification and uses, Improved brick from inferior soils, Hand molding brick table, Clay-fly ash brick table Concrete : Ingredients, Grades of Concrete ,Concrete Production ,Special Concrete

UNIT-II

Timber ,Glass , Steel and Aluminium : Timber: Important timbers, their engineering properties and uses, defects in timber, seasoning and treatment, need for wood substitutes,

,Plywood, Particle Board ,Fibre Board, Applications of wood and wood products , Plaster Boards, Adhesives, types of Gypsum Board and their uses Glass: What is glass , Nature of Glass, Structure of Glass, Macro Molecular Structure, Main Oxides in Glass, Thermal and Optical Properties ,Effect of Coating, Steel : Physical Properties of Structural Steel, Grades of Steel Aluminium : Properties ,Forms ,Uses, Advantages

UNIT-III

Flooring , Roofing ,Plumbing and Sanitary Material: Flooring and Roofing tiles , Types of Flooring – Marble, Kota stone , wood etc. Type of Roofing , P.V.C. materials, CI , GI, Asbestos pipe , Stone ware pipes

UNIT-IV

Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish, French Polish, Wax Polish

UNIT-V

Miscellaneous Construction Materials: Bitumen, Tar and Asphalt their characteristics and uses ,Ultra Poly Vinyl chloride Pipes, Thermal and sound insulating materials, and water proofing materials .

10hr

10hr

7hr

6hr

10hr

Outcome:-

On completion of this course the students will be able to

- Compare the properties of most common and advanced building materials.
- understand the typical and potential applications of lime, cement and aggregates
- know the production of concrete and also the method of placing and making of concrete elements.
- understand the applications of timbers and other materials
- Understand the importance of modern material for construction.

References Books:

1. Donald R Askeland, Pradeep P Fulay, Wendelin J Wright, The science and Engineering of Materials, Cengage Learning.

- 2. S K Duggal, Building Materials, New Age International.
- 3. P C Vaghese, Building Materials, PHI Learning.
- 4. S.C. Rangwala, Engineering Materials, Charotar.
- 5. M S Shetty, Concrete Technology, S. Chand Technical.

A M Neville, J J Brooks, Concrete Technology, Prentice Hall.

CEA- 303 Surveying

BEA- 303	Surveying	2L:0T:0P	2 credits	2Hrs/Week

Preamble:-

- To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world Civil Engineering problems.
- To introduce the concepts of Control Surveying
- To introduce the basics of Astronomical Surveying

UNIT-I

Surveying &Levelling : Basic Definitions of Surveying, Principles , Classification of surveying ,Methods of Linear Measurement Ranging , Accessories for linear measurement ,Chain Surveying , Compass Surveying , Plane Table Surveying ,Correction and Errors Definition of Levelling , types of levelling operations ,Principles , Problems , Computation of Area and Volumes

UNIT-II

Theodolite Traversing: Types, Temporary Adjustment ,latitude & Departure ,plotting & Adjustment ,Omitted Measurements EDM , Trigonometric Levelling

UNIT-III

Tacheometry: Tachometric systems and principles, stadia system, uses of analytic lens, tangential system, subtense system, instrument constant, field work reduction, direct-reading tacheometer, use of tacheometry for traversing and contouring.

UNIT-IV

Curves: Classification and use; elements of circular curves, calculations, setting out curves by offsets and by theodolites, compound curves, reverse curves, transition curves, vertical curves, setting out.

UNIT-V

Hydrographic Survey: Soundings, methods of observations, computations and plotting. Principles of photographic surveying: aerial photography, tilt and height distortions, Setting out works.

Outcome:-

At the end of the course the student will be able to understand

- The use of various surveying instruments and mapping
- Measuring Horizontal angle and vertical angle using different instruments
- Methods of Leveling and setting Levels with different instruments
- Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth
- Concept and principle of modern surveying.

10hr

8hr

10hr

9hr

10hr

References Books:-

- 1. B.C Punmia , Surveying Vol-II & III ,Laxmi Publication.
- 2. S.K. Duggal, Surveying Vol. II McGraw Hill Publishing Company Ltd.
- 3. Saikia MD, Das BM, Das MM, Surveying, McGraw hill
- 4. T.P. Kanetkar and S.V. Kulkarini Surveying and Leveling-Part-I & II , Pune
- VidyarthiGrihaPrakashan, Pune.

5. Gopi A, Satikumar R- Advance surveying, Pearson 6. Remote Sensing and image interpretation

by Lillesand T.M. and Kiefer R.W.

- 7. R.Agor, Advance Surveying ,Khanna Publisher
- 8. Chandra AM, Higher Surveying, New Age International, new Delhi
- 9. Bhavikatti SS, Surveying and Levelling Vol. II, I.K International
- 10. Venkatramaiah, Surveying, University Press, Mumbai
- 11. BhattaBasudeb, , Remote Sensing and GIS, Oxford, New Delhi.
- 12. Subramanaian, Surveying &levelling, Oxford, New Delhi.
- 13. Joseph George Fundamentals of Remote Sensing

CEA-304 Building Planning & Architecture

BEA- 304 Building Planning & Architecture	2L:1T:0P	3 credits	3Hrs/Week	
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Preamble:-

• To understand the concept of building planning and architecture.

• To understand the various building codes to be followed while planning a building.

• To have the knowledge of various building components.

UNIT-I

Drawing of Building Elements- Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

UNIT-II

Building Planning- Classification of buildings, Provisions of National Building Codes and Rules, Building bye-laws, open area, Setbacks, FAR terminology, Design and drawing of Building, Design concepts and philosophies, Preparing sketch plans and working drawings of various types of buildings like residential building, institutional buildings and commercial buildings, site plans, presentation techniques, pictorial drawings, perspective and rendering, model making, introduction to computer aided design and drafting, Applying of principle of architectural composition (i.e. unity, contrast, etc.), Principles of planning, orientation in detailed drawings.

UNIT-III

Building Services- Introduction of Building Services like water supply, sewerage and drainagesystems, sanitary fittings and fixtures, plumbing systems, principles of internal & externaldrainage systems, principles of electrification of buildings, intelligent buildings, elevators &escalators their standards and uses, air-conditioning systems, fire-fighting systems, buildingsafety and security systems, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

UNIT-IV

Principles of architectural design- Definition of architecture, factors influencing architectural development, characteristics features of style, historic examples, creative principles. Principles of architectural composition– Unity, balance, proportion, scale, rhythm, harmony, Accentuation and contrast. Organising principles in architecture– Symmetry, hierarchy, axis, linear, concentric, radial, and asymmetric grouping, primary and secondary masses, Role of colour, texture, shapes/ forms in architecture. Architectural space and mass, visual and emotional effects of geometric forms, space activity and tolerance space. Forms related to materials and structural systems. Elements of architecture: Functions – Pragmatic utility, circulatory function, symbolic function, Physiological function. Structure – Physical structure, Perceptual structure. Space in architecture Positive and negative space. Aesthetics: Visual perception. Protective: Protection from climate and other elements, architecture a part of the environment. Comfort factors.

13hr

10hr

12hr

13hr

UNIT-V

12hr

Perspective Drawing and Town Planning- Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings. Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs - planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc., planning standards for density distributions, density zones, planning standards for traffic network, standard of roads and paths, provision for urban growth, growth models, plan implementation, town planning legislation and municipal acts, panning of control development schemes, urban financing, land acquisition, slum clearance schemes, pollution control aspects

Outcome:-

- Understanding of building planning, orientation, drawing and architectural aspects.
- Representation of a building on Paper.

References Books:

- 1. Shah, Kale & Patki; Building Design and Drawing; TMH
- 2. Malik & Meo; Building Design and Drawing
- 3. W B Mckay, OrientBlackswan Building Construction Vol 1 -4, Pearson
- 4. Gurucharan Singh and Jagdish Singh, Building Planning, Designing and Scheduling, Standard Publishers Distributors.
- 5. Layal JS, Dongre A, Building Design and Drawing, SatyaPrakashan
- 6. Ghose D.N., Civil Engineering Design and Drawing, CBS publisher
- 7. Das B M, Principles of Foundation Engineering, Cengage Learning.
- 8. Agrawal S. C., Architecture and Town Planning, DhanpatRai& Co.
- 9. S.C. Rangwala, Town Planning, Charotar Publishing House.
- 10. Lewis Keeble, Principles and Practice of Town and Country Planning.
- 11. Rame Gouda, Principles & Practices of Town Planning, University of Mysore, ManasaGangotri.

CEA- 304 Building Planning & Architecture

BEA- 304	Building Planning & Architecture	0L:0T:2P	1credits	2Hrs/Week

List of Experiments:-

1. Sketches of various building components.

2. Drawing of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.

3. Drawings for services and interiors of buildings.

4. Drawings containing detailed planning of one/two bed room residential building (common to all student)

5. Drawing of residential and institutional building (Each student performs a different drawing).

6. Use of Auto CAD for preparation of drawings.

CEA-305 Strength of Materials

BEA- 305 Strength of Materials	3L:0T:0P	3 credits	3Hrs/Week
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Preamble:-

- To learn the fundamental concepts of Stress, Strain and deformation of solids.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyze plane and space trusses

UNIT- I

Simple Stress and Strains: Concept of Elastic body stress and Strain, Hooke's law, Various types of stress and strains, Elastic constants, Stresses in compound bars, composite and tapering bars, Temperature stresses. Complex Stress and Strains- Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and Strains, Mohr's circle of stresses.

UNIT-II

Bending and Shearing Stresses: Theory of simple bending, Concept of pure bending and bending stress, Equation of bending, Neutral axis, Section-Modulus, Differential equation of the elastic curve, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading, Bending stress distribution across a section of beam, Shearing Stress and shear stress distribution across a section in Beams.

UNIT-III

Determination of Slope and Deflection of beams by Double Integration Method, Macaulay's Method, Area Moment Method, Conjugate Beam Method, and Strain Energy Method, Castiglione's Method, and Unit Load Method.

UNIT- IV

Columns and Struts: Theory of columns, Slenderness ratio, Direct and bending stresses in short columns, Kern of a section. Buckling and stability, Euler's buckling/crippling load for columns with different end conditions, Rankin's formula, Eccentric loads and the Secant formula Imperfections in columns. Thin Pressure Vessels: cylinders and spheres. Stress due to internal pressure, Change in diameter and volume. Theories of failure.

UNIT-V

Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Torsion of solid and hollow circular shafts, Analyses of problems based on combined Bending and Torsion. Unsymmetrical Bending: Principal moment of Inertia, Product of Inertia, bending of a beam in a plane which is not a plane of, symmetry. Shear centre; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis.

9hr

10hr

9hr

10hr

12hr

Outcome:-

Students will be able to

- Understand the concepts of stress and strain, principal stresses and principal planes.
- Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
- Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
- Apply basic equation of torsion in design of circular shafts and helical springs, .
- Analyze the pin jointed plane and space trusses

Reference Books:-

- 1. Punmia B.C., Mechanics of Materials, ,Laxmi Publications (P) Ltd.
- 2. S.S Bhavikaati, Strength of Materials, Vikas Publisher, new Delhi
- 3. Rajput R. K., Strength of Materials, S. Chand.
- 4. S. Ramamrutham, R. Narayanan, Strength of Materials, DhanpatRai Publications.
- 5. R. Subramaniam, Strength of Materials, Oxford University Press.
- 6. Sadhu Singh , Strength of Material , Khanna Publishers
- 7. Mubeen A, Mechanics of solids, Pearsons.
- 8. D.S PrakashRao, Strength of Material , University Press , Hyderabad
- 9. Debrath Nag, Strength of Material , Wiley
- 10. Jindal , Strength of Material , Pearsons.
- 11. Bansal R.K, Strength of Materials, Laxmi Publisher, New Delhi.
- 12. Nash, W.A., Strength of Materials, Mcgraw hills, New Delhi.
- 13. Chandramouli, Strength of Materials, PHI learning
- 14. Dongre A.P., Strength of Materials, Scitech, Chennai
- 15. Negi L. S ,Strength of Materials, McGraw Hill Professional.
- 16. Raj Puroshattam, Strength of Material, Pearsons
- 17. J.M. Gere, J. G. Barry Mechanics of Material, Cengage Learning

CEA-305 Strength of Materials

BEA- 305	Strength of Materials	0L:0T:2P	1 credits	2Hrs/Week	
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List of Practicals :-

- 1. Study of Universal testing machine
- 2. To determine the compressive and tensile strength of materials.
- 3. To determine the Brinell hardness of materials.
- 4. To determine the Rockwell hardness of materials
- 5. To determine the toughness of the materials.
- 6. To determine the stiffness of the spring.
- 7. To determine the deflection of beam by the use of deflection-beam apparatus.

CEA- 306 Study of Historical & Ancient Civil Engineering Practices

BEA- 306	Study of Historical & Ancient Civil Engineering Practices	0L:0T:2P	1credits	2Hrs/Week
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Preamble:-

To understand study the various aspects of civil engineering practices in ancient and historical structures.

Course Contents – 1. General Study of ancient monuments e.g. Forts, Bridges, Buildings and various other civil engineering related structures.

2. Environmental practices adopted in construction of historical structure during ancient/medieval period.

3. Construction techniques and materials used in historical structures.

4. Various planning aspects adopted in historical structures.

5. Visit of various historical structures and museums to understand history of civil engineering practices.

List of Practicals :-

1. Detailed study report on various aspects e.g. environmental practices, constructions techniques and materials, planning etc. of any one important ancient structure along with relevant sketches/drawings etc. and its presentation before departmental committee.

CEA- 307 Self study /GD Seminar

BEA- 307	Self study /GD	0L:0T:2P	1 credits	2 Hrs/Week
	Seminar			

Preamble:-

The main objective is to improve the mass communication and convincing/understanding skills of students .And to give the students an opportunity to exercise their rights to express themselves.The evaluation will be done based on their presentation work and group discussion.

BEA-401 Energy, Ecology, Environment and Society

BEA- 401 Energy, Ecology, Environment and Society	3L:0T:0P	3credits	3Hrs/Week	
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Preamble:-

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human

world; envision the surrounding environment, its functions and its value.

UNIT-1

Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydro, nuclear sources.

UNIT-2

Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation

UNIT-3

Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

UNIT-4

Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

UNIT-5

Society, Ethics & Human values– Impact of waste on society. Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

7 Hr

9Hr

10 Hr

12Hr

8Hr

Outcome:-

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
Public awareness of environmental is at infant stage.

References Books:-

- 1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
- 2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
- 3. Raynold, GW "Ethics in information Technology"; Cengage.
- 4. Svakumar; Energy Environment & Ethics in society; TMH
- 5. AK De "Environmental Chemistry"; New Age Int. Publ.
- 6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
- 7. Bala Krishnamoorthy; "Environmental management"; PHI
- 8. Gerard Kiely, "Environmental Engineering" ; TMH
- 9. Miller GT JR; living in the Environment Thomson/cengage
- 10. Cunninghan WP and MA; principles of Environment Sc; TMH
- 11. Gandhiji M.K.- My experiments with truth

CEA- 402 Construction Technology

BEA- 402	Construction Technology	3L:0T:0P	3credits	3Hrs/Week
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Preamble:-

• To introduce students to various materials commonly used in civil engineering construction and their properties.

UNIT-I

Design features and construction of Foundations Introduction and essential requirements of foundations, footing types and depth of footings, contact pressure below footings such as strip footings, isolated footings, eccentrically loaded footings, Grillage foundations, , design features and construction detail of combined footing, strap footing, problem of frost heave, its causes and prevention, effect of ground water on footings. Purpose of pile foundation, classification based on different criterion and types, advantages and disadvantages, selection of pile type, pile action, behaviour of pile and pile group under load, definition of load failure.

UNIT-II

Formwork and Temporary Structures Design and construction features of different types of temporary structures, stationary and slip form work techniques, special features of in-sit construction, stripping and removal of formworks, formworks for special structures, e. g. shells bridges towers etc.

UNIT-III

Masonry and walls Brick masonry, Bonds, Jointing, Stone masonry, casting and laying, masonry construction, brick cavity walls, code provisions regarding load bearing and nonload bearing walls, common defect in construction and their effect on strength and performance of walls, Design of brick masonry, precast stone masonry, hollow concrete block and hollow block masonry walls, plastering and pointing, white and colour washing, distempering, dampness and its protection. Doors windows and ventilators: types based on materials etc. size location fittings, construction sunshades, Sills and jambs, RCC doors/windows frames, Stair types, rules of proportionality, etc., Repair Techniques for masonry, walls, doors and windows.

UNIT-IV

Construction of Floors Ground floor-introduction, Components of a floor, Materials for construction, Selection of flooring material, Construction of Various types of floorings such as Mud, Brick, Cement, Terrazzo, Mosaic, Tiled, Marble, Rubber, Glass and plastic floorings etc., Upper floor- Introduction, construction of Slab floors, Jack arch floors, RCC floors, Ribbed or Hollow tiled flooring, Filler Joist floors, Pre-cast concrete floors, Timber floors etc. Repair Techniques for floors. Construction of Roofs Introduction and types of roofs, Construction of Pitched roofs,

7Hr

12Hr

10Hr

12Hr

single roofs, double or purlin roofs, trussed roofs, steel roof trusses etc. roof coverings for pitched roofs and flat terraced roof etc. Repair Techniques for roofs.

UNIT-V

7Hr

Construction of Earthquake Resistant Building Planning of earthquake resistant building, Construction of walls – provision of corner reinforcement, construction of beams and columns, Base isolation.

Outcome:-

On completion of this course the students will be able to

- compare the properties of most common and advanced building materials.
- understand the typical and potential applications of these materials
- understand the relationship between material properties and structural form
- understand the importance of experimental verification of material properties

Reference Books :-

- 1. Mohan Rai & M. P. Jai Singh, Advances in Building materials and Constructions.
- 2. S. P. Arora and S. P. Bindra, A text Book of Building Construction-Dhanpat Rai and Sons, New Delhi.
- 3. S. K. Sarkar and Saraswati, Construction Technology- Oxford University Press, New Delhi.
- 4. Sushil Kumar, Building Construction.
- 5. B. C. Punmia , Building Construction.
- 6. Metchell , Building Construction.
- 7. Chudley R., Construction Technology.
- 8. Dr. K.R. Arora Soil Mechanics & Foundation Engg Std. Publishers Delhi
- 9. B.C. Punmia, Soil Mechanics & Foundation Engg. Laxmi Publications Delhi

CEA- 402 Construction Technology

BEA- 402	Construction Technology	0L:0T:2P	1credits	2Hrs/Week
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List of Experiments : -

1. Tests on Bricks

2. Tests on Aggregates (fine and Coarse)

- 3. Tests on Cements and concrete
- 4. Tests on tiles

CEA- 403 Structural Analysis-I

BEA- 403 St	tructural Analysis-I	3L:0T:0P	3credits	3Hrs/Week	
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Preamble:-

•To introduce the students to the basic theory and concepts of classical methods of structural analysis and to analyses the arches and suspension bridges

UNIT-I

Virtual work and Energy Principles: Principles of Virtual work applied to deformable bodies, Strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

UNIT-II

Indeterminate Structures-I: Static and Kinematics indeterminacy, Analysis of Fixed and Continuous beams by theorem of three moments, Effect of sinking and rotation of supports, Moment distribution method (without sway)

UNIT-III

Indeterminate Structures - II: Analysis of beams and frames by slope Deflection method, Column Analogy method.

UNIT-IV

Arches and Suspension Cables: Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and Temperature effects.

UNIT-V

Rolling loads and Influence Lines: Maximum SF and BM curves for various types of Rolling Loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches.

Outcome:-

Students will be able to

- •Analyze the pin-jointed plane and space frames
- •Analyze the continuous beams and rigid frames by slope defection method.
- •Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.
- •Draw influence lines for statically determinate structures and calculate critical stress resultants.
- •Analyze three hinged, two hinged and fixed arches

12 Hr

10 Hr

8 Hr

10 Hr

11Hr

References:

- 1. Rammamurtham, Theory of Structures, Dhanpat Rai.
- 2. Bhavikatti S.S. Analysis of Structures (I&II) Vikas Publication
- 3. B C Punmia, Theory of Structures, Firewall Media.
- 4. A Kassimali, Structural Analysis, Cengage Learning.
- 5. A Ghali, A Neville, T G Brown, Structural Analysis: CRC Press.
- 6. Hibbler, Structure Analysis -1, Pearson Education India
- 7. C S Reddy, Basic Structural Analysis, Tata McGraw Hill Publishing Company.
- 8. Pandit and Gupta, Theory of Structures I, McGraw Hills
- 9. West HH, Fundamental of Structural Analysis, Wiley India
- 10. Das MM, Structural Analysis, PHI
- 11. Thandavamurthy TS, Structural Analysis, Oxford
- 12. Muthuku, Azmi I, Basic Structural Analysis, IK International Publisher

CEA- 403 Structural Analysis-I

BEA- 403	Structural Analysis-I	0L:0T:2P	1credits	2Hrs/Week

List of Experiments : -

1. To verify Maxwell- Bett's Law.

2. To determine the flexural rigidity of the beam verify it theoretically

3. To determine the deflection of a pin jointed truss and to verify the results theoretically and graphically

4. To verify strain in an externally loaded beam with the help of a strain gauge indicator and to verify theoretically.

5 .To study behaviour of different types of columns and find Euler's buckling load for each case.

6. To study two hinged arch for the horizontal displacement of the roller end for a given system of loading and to compare the same with those obtained analytically

7. To study the behaviour of a portal frame under different end conditions.

8. To find the value of flexural rigidity (EI) for a given beam and compare it with theoretical value.

9. To determine the deflection of a pin connected truss analytically & graphically and verify the same experimentally.

10. To verify the Muller Breslau theorem by using Begg's deformator set.

CEA- 404 Transportation Engineering –I

BEA- 404	Transportation Engineering –I	2L:1T:0P	3credits	3Hrs/Week
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Preamble:-

To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

UNIT-I

Introduction, Tractive resistances & Permanent way : Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations. Route Surveys and alignment, railway track, development and gauges. Hauling capacity and tractive effort. 1. Rails: types, welding of rails, wear and tear of rails, rail creep. 2. Sleepers: types and comparison, requirement of a good sleeper, sleeper density. 3. Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails. 4. Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast. Different methods of plate laying, material trains, and calculation of materials required, relaying of track

UNIT-II

Geometric Design ; Station & Yards; Points and Crossings & Signaling and interlocking : Formation, cross sections, Super elevation, Equilibrium, Cant and cant deficiency, various curves, speed on curves. Types locations, general equipments, layouts, marshalling yards. Definition, layout details, design of simple turnouts. Types of signals in stations and yards, principles of signaling and inter-locking.

UNIT-III

Bridge Site Investigation and Planning ; Loading Standards & Component parts: Selection of site, alignment, collection of bridge design data : essential surveys, hydraulic design, scour depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges : Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges. Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

UNIT-IV

Bridge Foundations, Construction, Testing and Strengthening of Bridges: Different types of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants, inspection and data collection, strengthening of bridges, Bridge failure.

UNIT-V

Tunnels: 1. Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts. 2. Construction of tunnels in soft soil, hard soil and rock. Different types of lining, methods of lining. Mucking operation, Drainage and ventilation. Examples of existing important tunnels in India and abroad.

8Hr

7Hr

14 Hr

10Hr

8Hr

Outcome:-

On completing this course, the Students will be able to

- Analyse traffic problems and plan for traffic systems various uses
- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems

References Books :-

1. Chakraborty and Das; Principles of transportation engineering; PHI

2.Rangwala SC; Railway Engineering; Charotar Publication House, Anand

3.Rangwala SC; Bridge Engineering; Charotar Publication House, Anand

4.Ponnuswamy; Bridge Engineering; TMH

5.Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons

6.Railway Track by K.F. Antia 7.Principles and Practice of Bridge Engineering S.P. Bindra -

Dhanpat Rai & Sons 8.Bridge Engineering - J.S. Alagia - Charotar Publication House, Anand

9.Railway, Bridges & Tunnels by Dr. S.C. Saxena

10.Harbour, Docks & Tunnel Engineering - R. Srinivasan

11.Essentials of Bridge Engg. By I.J. Victor; Relevant IS & IRS codes.

CEA- 404 Transportation Engineering –I

BEA- 404	Transportation Engineering -I	0L:0T:2P	1credits	2Hrs/Week

List of Experiments : -

1. Collection of different types of photographs showing a. Various bridge types b. Rail tracks c. Tunnels

2. Hydraulic design of bridges.

3. Various modern large span bridges: Pre stressed bridges and launching process.

4. Visit of Railway bridges for rehabilitation.

5. Visit of Railway Over Bridges and Under Bridges.

CEA-405 Engineering Geology & Remote Sensing

BEA- 405 Engineering Geology & Remote Sensing	2L:1T:0P	3credits	3Hrs/Week	
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Preamble:-

At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundations.

UNIT-I

Introduction and physical geology: branches application and scope of geology, age and parts of the earth, weathering or rocks, geological action of river, ground water, sea and oceans, Concept and causes of earthquakes and volcanoes.

UNIT-II

Mineralogy and crystallography: fundamentals of mineralogy, physical properties, study of common rock forming minerals and ore minerals, importance to civil engineering, and element of crystals and introduction to crystal systems.

UNIT-III

Petrology: rock cycle, composition, classification and structures of igneous, sedimentary and metamorphic rocks of civil engineering importance, study of common rock types, brief geological history of India.

UNIT-IV

Structural geology: dip, strike, outcrops, classification and detailed studies of geological structures i.e. Folds, Faults, Joints, Unconformity and their importance in civil engineering.

UNIT-V

Applied geology and remote sensing, engineering properties of rocks, selection of sites for Dam, Tunnel, Reservoirs and Canals, uses of remote sensing technique. Types, components and elements of remote sensing, EMS and MSS, Visual interpretation technique, application of GIS in civil engineering and resource mapping (site selection, water resources, rocks and soil)

Outcome:-

The students completing this course

• Will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and the action of various geological agencies.

• Will realize the importance of this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor

• Can choose the types of foundations and other related aspects

12Hr

7Hr

8Hr

10Hr

10Hr
Reference Books :-

- 1. Prabin Singh -"Engineering and General Geology"
- 2. P. K. Mukherjee -"A test Book of Geology"
- 3. S. K. Garg -- "A text Book of Physical and Engineering Geology"

CEA- 405 Engineering Geology & Remote Sensing

BEA- 405	Engineering Geology & Remote Sensing	0L:0T:2P	1credits	2Hrs/Week	
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List of Experiment's (Expandable)

1. Identification of simple rock forming minerals and important ores.

2. Identification of rocks

3. Simple map Exercises.

4. Field Visit/Geological Excursion

CEA- 406 Software Lab

BEA- 406	Software Lab	0L:0T:2P	1credits	2Hrs/Week

Preamble:-

An important distinction in programming languages is the difference between an object-oriented language and an object-based language. A language is usually considered object-based if it includes the basic capabilities for an object: identity, properties, and attributes.

List Of Experiments:

15 Hr

1. Introduction to CAD, Introduction to AutoCAD, Software and hardware requirements, various input and output devices. Getting started with AutoCAD, Setting drawing limits, Units etc.

2. Learning and practice of Draw commands, Modify commands, utility and other commands.

3. Drawing basic Geometric Shapes, Basic Plotting and Editing Tools, Architectural Views & Drafting Views.

4. 3D modelling with AutoCAD

5. Dimensioning, Annotating in AutoCAD with Text & Hatching, Blocks, drafting symbols and Attributes, Layers, Templates & Design Center, Advanced plotting (Layouts, Viewports)

2. Drawing plan, section and elevation of 1 BHK house.

CEA- 407 Industrial Training –I

BEA- 407		To be completed during fourth semester semester break. Its
2211 101	Industrial Training –I	evaluation/credit to be added in fifth semester

Preamble:-

The main objective of Industrial Training is to expose the students to actual working environment and enhance their knowledge and skill from what they have learned in the college. Another purpose of this program is to instill the good qualities of integrity, responsibility and self confidence. All ethical values and good working practices must be followed by student.

Duration:- 2 weeks after the IV semester in the summer break, Assessment in V semester.

Students must observe following to enrich their learning during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.

V SEMESTER

CEA-501 Advance Surveying

CEA-501 Advance Surveying 2L:1T:0	PP 3 credits 3Hrs/Week
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Preamble:-

The main objectives of the course are

To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
To prepare the students to handle the errors they are likely to come across any large scale survey works.

UNIT-I

Modern equipment's for surveying: Digital levels and theodolites, Electronic Distance measurement(EDM), Total Station and Global Positioning Systems (GPS), Digital Plannimeter .

UNIT-II

Surveying Astronomy: Definitions of astronomical terms, coordinate systems for locating heaven ly bodies, geographic, geodetic, geocentric, Cartesian, local and projected coordinates for earth resources mapping, convergence of meridian, parallel of latitude, shortest distance between two points on the earth, determination of latitude and longitude.

UNIT-III

GPS Surveying: Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datum's, GPS receivers, GPS observation methods and their advantages over conventional methods. Digital Terrain Model (DTM): Topographic representation of the terrain and generation of DTM on computers using spot heights and contour maps.

UNIT-IV

Photogrammetry : Principle, definitions and classifications of terrestrial and aerial photogrammetry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic.

UNIT-V

Remote Sensing: Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. Geographic Information Systems (GIS): Definition, components and advantages. Surveying Project - Student will go for one week Surveying Camp to carry out Project Work.

10 Hr

8 Hr

12 Hr

12 Hr

Outcome:-

•On the successful completion of this course the students will get a diverse knowledge of surveying practices applied for real life problems.

•The students will learn to work with various surveying equipment's, like, Theodolite, Total station, etc. in order to apply the theoretical knowledge to carry out practical field work.

•The knowledge of limits of accuracy will be obtained by making measurements with various surveying equipment employed in practice.

References Books :

1. Surveying and Leveling-Part-I & II by T.P. Kanetkar and S.V. Kulkarini, Pune Vidyarthi Griha Prakashan, Pune

2. Engineering Surveying : Theory and Examination Problems for Students by W. Schofield, Butterworth, Heinemann,Oxford.

3. Surveying: Problems Solving with theory and objective type questions by A.M. Chandra, New Age International Publishers N. Delhi.

4. Advance Surveying by A.M. Chandra, New Age International Publishers N. Delhi.

5. Surveying Vol. II by S.K. Duggal, Tata McGraw Hill Publishing Company Ltd. New Delhi.

6. Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.

CEA-501 Advance Surveying

CEA-501	Advance Surveying	0L:0T:2P	1 credits	2Hrs/Week

List of Experiments:-

SURVEYING PROJECT:- Student will go for one week surveying camp to carry project

CEC-502 Fluid Mechanics

CEA-502	Fluid Mechanics	2L:1T:0P	3 credits	3Hrs/Week

Preamble:-

•To introduce the students about properties of the fluids, behavior of fluids under static conditions and to impart basic knowledge of the dynamics of fluids through the control volume approach and to expose to the applications of the conservation laws to uniform and non-uniform flow in open channel, flow through pipes (both laminar and turbulent) and forces on pipe bends with an exposure to the significance of boundary layer theory and its applications and fluid machines.

UNIT-I

Properties of fluid :- Fluid and continuum, Physical properties of fluids. Newtonian and non-Newtonian fluids. Pressure transducers, Pascal's law, pressure variation in a fluid at rest, Hydrostatic law, Manometer, Hydrostatic force on submerged body, Buoyancy and Flotation.

UNIT-II

Uniform & Non uniform flow in open channels: Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, Saint Venant equation. Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, Venturi flume

UNIT-III

Laminar flow & Turbulent flow: Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically smooth and rough boundaries, Reynolds's experiment, Hagen-Poiseuille Equation, flow of viscous fluids between two parallel plates, Drop of pressure head. Effect of turbulence, Expression for loss of head due to friction in pipes. Resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes. Pipe flow problems: Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Hardy Cross Method.

Unit-IV

Forces on immersed bodies: Types of drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, Magnus effect.

UNIT-V

Fluid Machines: Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque,

12Hr

12Hr

8Hr

14Hr

power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation. Pumps: Centrifugal pumps: Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves. Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

Outcome:-

On completion of the course, the student is expected to be able to-

•Demonstrate the difference between solid and fluid, its properties and behavior in static conditions.

•Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

•Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

•Explain the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.

Reference Books:

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi

2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., New Delhi

3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi

4. Fluid Mechanics, Hydraulics & Hydraulic Machanics - K.R. Arora - Standard Publishers Distributors 1705- B, Nai Sarak, Delhi-6

5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)

6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)

7. Engineering Hydraulics By H. Rouse

8. Centrifugal & Axial Flow Pump By Stempanoff A.J. New York

9. Relevant IS codes.

CEC-502 Fluid Mechanics

CEA-502	Fluid Mechanics	0L:0T:2P	1credits	2Hrs/Week

List of Experiments-

1. Study the performances characteristics of Pelton Wheel

2. Study the performances characteristics of Francis Turbine

3. Study the performances characteristics of Kaplan Turbine

4. Calibration of multistage (Two) Pump & Study of characteristic of variable speed pump

5. To study the performance & details of operation of Hyd. Ram

6. Determination of coefficient of discharge for a broad crested weir & to plot water surface Profile over weir

7. Study of the characteristic of the Reciprocating pump

8. To study the variation of friction factor for pipe flow.

9. To determine the head loss for a sudden enlargement.

10. To determine the head loss for a sudden Contraction.

11. To determine of head loss in various pipe fittings.

12. To study of Reynolds experiment for demonstration of stream lines & turbulent flow

13. To study the characteristics of a centrifugal pump

CEC-503 Structural Design & Drawing-I (RCC-I)

CEA-503	Structural Design & Drawing-I	2L:1T:0P	3credits	3Hrs/Week

Preamble:-

•To impart knowledge on basic of concepts of design of reinforced concrete structures and to make the students able to design and detail the basic elements like beam, slab, column, footing and staircase.

UNIT –I

Basic Principles of Structural Design: Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design of singly reinforced beam, Partial load factors.

UNIT – II

Design of Beams: Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Circular girders: Deep beams. Design of beam for shear and bond.

Design of Slabs: Slabs spanning in one direction. Cantilever, simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs, Waffle slabs, Flat slabs, Yield line theory.

UNIT - IV

UNIT-III

Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Isolated and combined footings, Strap footing, Columns subjected to axial loads and bending moments (sections with no tension), Raft foundation.

UNIT -V

Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slab less tread-riser staircase.

Outcome:-

At the end of the course the student will be able to

Explain the various design concepts and design a beam under flexure and draw the reinforcement details.
Design the beam under shear and torsion, Calculate the anchorage and development length and check the serviceability requirements for RC structural elements.

•Design a RC slab and staircase and draw the reinforcement details.

•Design short columns and strip, isolated and combined footings and draw the reinforcement details.

7Hr

10Hr

10Hr

12Hr

7Hr

83

Reference Books: -

- 1. Plain & Reinforced Concrete Vol. I & II O.P. Jain & Jay Krishna
- 2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
- 3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
- 4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
- 5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
- 6. Plain & reinforced concrete Rammuttham
- 7. Plain & reinforced concrete B.C. Punnia
- 8. Structural Design & Drawing by N.K.Raju

CEC-503 Structural Design & Drawing-I (RCC-I)

CEA-503	Structural Design & Drawing-I	0L:0T:2P	1credits	2Hrs/Week

Student should prepare the drawing sheets for reinforcement detail of the following-

- 1. Reinforcement details of RCC Beam.
- 2. Reinforcement details of RCC Slab.
- 3. Reinforcement details of RCC Column.
- 4. Reinforcement details of footings (Isolated, stepped, combined footing)
- 5. Reinforcement details of Stair Cases

NOTE:- All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids)

Professional Elective-I

CEA-504(A) Water Resources & Irrigation Engineering

CEA-504(A)	Water Resources & Irrigation	3L:1T:0P	4 credits	4Hrs/Week
	Engineering			

Preamble:-

•To introduce the students to the concept of soil-plant characteristics and their water requirements and to understand the necessity of planning an irrigation system to provide water at the right time and right place.

UNIT - I

Irrigation water requirement and Soil-Water-Crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

UNIT - II

Ground Water and Well irrigation: Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow Conditions, infiltration galleries. Ground water recharge-necessity and methods of improving Ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence causes and effects. Reclamation of water logged and salt affected lands. Types of wells, well Construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

UNIT- III

HYDROLOGY : Hydrological cycle, precipitation and its measurement, recording and non-recording rain gauges, estimating missing rainfall data, rain gauge networks, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

UNIT - IV

Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz. Dams, Spillways, Weirs, Barrages, Canal Regulation Structures.

10Hr

12Hr

12Hr

UNIT-V

Floods: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

Outcome:-

On completion of the course, the student is expected to be able to

•Describe the national water policy structure and soil plant water characteristics.

•Describe the basics of requirements and estimation of crop water.

•Design the various types of hydraulic structure includes dams, spillways and dissipaters.

•Design the components of irrigation canal include canal drops and cross drainage works.

•Apply the concepts of Irrigation water management, water user association for participatory irrigation management.

Reference Books:-

1. Irrigation & Water Power Engineering by Punmia & Pandey B.B.Lal

- 2. Engineering Hydrology by K. Subhramanya Tata Mc Graw Hills Publ. Co.
- 3. Engineering Hydrology J.NEMEC Prentice Hall
- 4. Hydrology for Engineers Linsley, Kohler, Paulnus Tata Mc.Graw Hill.
- 5. Hydrology & Flood Control by Santosh Kumar Khanna Publishers
- 6. Engineering Hydrology by H.M. Raghunath

Professional Elective-I

CEA-504(B) Renewable Energy System

CEA-504 (B) Renewable Energy System	3L:1T:0P	4 Credits	4Hrs/Week
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Preamble:-

•Understand the various forms of conventional energy resources.

•Learn the present energy scenario and the need for energy conservation.

•Explain the concept of various forms of renewable energy.

•Outline division aspects and utilization of renewable energy sources for both domestics and industrial application.

•Analyse the environmental aspects of renewable energy resources.

UNIT-I

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

UNIT-II

Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

UNIT-III

Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes. power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

UNIT-IV

Production of biomass, Classification of biomass; Physicochemical characteristics of biomass as fuel Biomass conversion routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values. Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

UNIT-V

Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues.

7Hr

10Hr

9Hr

12Hr

Outcome:-

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

•Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.

•Know the need of renewable energy resources, historical and latest developments.

•Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.

•Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.

•Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.

•Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

Reference Books:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn

2. Khan, B H, NonConventional Energy, TMH.

3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.

4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application

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Open Core Elective - I

CEC-505(A) Remote Sensing & GIS

	CEA-505 (A)	Remote Sensing & GIS	3L:1T:0P	4 Credits	4Hrs/Week
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Preamble:-

•To make the students to understand the concepts, components and source of remote sensing.

- •To gain knowledge about different types of remote sensing platforms and sensors.
- •To explain the concept of satellite image interpretation.
- •To understand the applications of remote sensing in Civil Engineering

UNIT

Introduction And Concepts- Introduction of Remote Sensing – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmosphere scattering, Absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern, vegetation, soil, water bodies- Spectral reflectance

UNIT II-

Aerial Photography And Photogrammetry- Introduction-, Terrestrial and Aerial photographs - vertical and oblique photographs - height determination contouring - photographic interpretations - stereoscopy – parallax bar-Flight Planning- Photo Interpretation, Applications of aerial Photos-Photo theodolite.

UNIT II

Satellite Remote Sensing Principles Data Acquisition – Procedure, Reflectance and Digital numbers- Intensity Reference data, Ground truth, Analog to digital conversion, Detector mechanism-Spectro- radiometer-Ideal remote sensing system – Characters of real and successful remote sensing system- Platforms and sensors- orbits types – Resolution

UNIT IV

Remote Sensing Satellites Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High resolution satellites, character and applications, CARTOSAT series, IKONOS Series, OUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT

UNIT V

Types Of Remote Sensing And Image Interpretation Introduction- Active, Passive, Optical Remote sensing, visible, infrared, thermal, sensors and characters. Microwave remote sensing Sensors, Concept of Microwave remote sensing, SLAR, SAR Scattro-meters,- Altimeter, Characteristics, Image interpretation characters.

Outcome:-

On completion of the course, the student is expected to be able to

- Understand the concepts and laws related to remote sensing
- Understand the interaction of electromagnetic radiation with atmosphere and earth material

12Hr

10Hr

9Hr

10Hr

- Acquire knowledge about satellite orbits and different types of satellites
- Understand the different types of remote sensors
- Gain knowledge about the concepts of interpretation of satellite imagery and civil engineering applications
- Apply various spatial analysis tools for deriving GIS based outcome

Reference Books:-

1. M. Anji Reddy, Textbook of Remote Sensing and Geographical Information systems, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8

2. A.M.Chandra and S.K. Gosh. Remote Sensing and GIS, Narosa Publishing Home, New Delhi 2009.

3. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman Remote sensing and image interpretation John Wiley & Sons, 2008

4. George Joseph , Fundamentals of Remote Sensing Universities Press, Hyderabad 2005

Open Core Elective – I

CEA-505 (B) **Highway Engineering**

CEA-505 (A)	Highway Engineering	3L:1T:0P	4 Credits	4Hrs/Week
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Preamble:-

To give an overview on the basics of highway engineering and to impart the various process and methods involved in the planning, development, design, construction and maintenance of highways.

UNIT-I

HIGHWAY PLANNING AND ALIGNMENT :- History of road development in India - Classification of highways -Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment – Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT-II

GEOMETRIC DESIGN OF HIGHWAYS :- Typical cross sections of Urban and Rural roads -- Cross sectional elements - Horizontal curves, super elevation, transition curves, widening of curves - Sight distances - Vertical curves, gradients, hairpin bends – Lateral and vertical clearance at underpasses – IRC standards-Road signs and safety. Urban utility services.

UNIT III

DESIGN OF FLEXIBLE AND RIGID PAVEMENTS :- Design principles - pavement components and their role -Design practice for flexible and rigid pavements (IRC methods only).

UNIT IV

HIGHWAY CONSTRUCTION AND MAINTENANCE :- Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavements including modern materials and methods, Highway drainage – Special considerations for hilly roads; Evaluation and Maintenance of pavements.

UNIT V

HIGHWAY ECONOMICS AND FINANCE Introduction, Highway User Benefits, Highway Costs, Vehicle Operation Costs, Economic analysis, Highway projects under Public-Private Sector Participation, Bidding process, Highway finance.

Outcome:-

On completion of the course, the student is expected to be able to -

•Understand the concepts and standards adopted in Planning, Design and construction of Highways and its related infrastructures.

• Apply the knowledge of science and engineering fundamentals in designing the geometrics for an efficient Highway network and design concepts.

•Designing various types of pavements to meet specified needs of safety, efficiency and long time sustainability by adopting various design standards.

•Select appropriate methods for construction, evaluation and maintenance of roadways.

10Hr

10Hr

8Hr

8Hr

•Understand the bidding processes and types of highway projects and analyze the economic, financial aspects of the highway projects

Reference Books:

1. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2005

2. Kadiyali. L. R. Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 1997.

3. Indian Road Congress (IRC), Guidelines and Special Publications on Planning and Design of Highways.

4. Sharma.S.K Principles , Practices and Design of Highway Engineering, S.Chand and Company Ltd. 1995

CEA-506 Industrial Training-I

CEA-506	Industrial Training-I	0L:0T:4P	2credits	4Hrs/Week

Preamble:-

1. To expose the students to actual working environment of Civil engineering and enhance their knowledge and skill from what they have learned in the classes.

2. Another purpose of this program is to instill the good qualities of integrity, responsibility and self-confidence.

3. To persue students with the civil engineering field ethics and rules in terms of the society.

Outcome:-

Ability to communicate efficiently. Acquired to be a multi-skilled engineer with good technical knowledge of civil engineering and their processing, management, leadership and entrepreneurship skills. Ability to identify, formulate and model problems and find engineering solution based on a systems approach. Students must observe following points to enrich their learning in civil engineering during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance & costing.
- Roles and responsibilities of different categories of personnel.
- Problems related to various areas of Work etc.
- Layout if any

To be submitted :The students has to submit the power point presentation of minimum15 slides of the training performed(comprising of points stated above) along with the original certificate of training performed with proper seal and signature of the authorized person.

VI SEMESTER

CEA-601 Transportation Engineering-II

CEA-601	Transportation Engineering-II	2L:1T:0P	3credits	3Hrs/Week

Preamble:-

•The Course will try to introduce the basic engineering principles that helps in the planning, design, construction, operation and maintenance of Railways and Airports.

UNIT-I

High way planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location. Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.

UNIT -II

Bituminous & Cement Concrete Payments: Design of flexible pavements, design of mixes and stability, WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars. Brief study of recent developments in cement concrete pavement design, fatigue and reliability.

UNIT – III

Low Cost Roads, Drainage of Roads, Traffic Engg. & Transportation Planning: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads-types, specifications, construction, maintenance and causes of failures. Surface and sub-surface drainage, highway materials: properties and testing etc. Channelized and un-channelized intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages, marking, signs and signals, street lighting. Principles of planning, inventories, trip generation, trip distribution, model split, traffic assignment, plan preparation.

UNIT - IV

Airport Planning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, wind-rose diagrams, basic runway length and corrections, classification of airports. Geometrical elements: taxi ways and runways, pattern of runway capacity.

UNIT - V

Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surfaceimaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental lending system, precision approach radar, VOR enroute traffic control.

11Hr

9Hr

12Hr

8Hr

Outcome:-

Upon completion of the Transportation Engineering-II course, Students are expected to attain the following outcomes-

•Can handle the design, construction, and operation of railroads and mass transit systems that use a fixed guide way.

•Tasks that include determining horizontal and vertical alignment design, station location and design, and construction cost estimating.

•Will able to design and construct airports.

•Can account for the impacts and demands of aircraft in their design of airport facilities.

Reference Books:

- 1. Highway Engineering by Gurucharan Singh
- 2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
- 3. Highway Engineering by O'Fleherty
- 4. Highway Engineering by S.K. Khanna & C.E.G. Justo
- 5. Airport Planning & Design by S.K. Khanna & M. G. arora
- 6. Foresch, Charles "Airport Planning"
- 7. Horonjeff Robert "The Planning & Design of Airports"
- 8. Sharma & Sharma, Principles and Practice of Highway Engg.
- 9. Haung, Analysis and Design of Pavements
- 10. Relevant IRC & IS codes
- 11. Laboratory Manual by Dr. S. K. Khanna
- 12. Highway Engg. By Hews & Oglesby
- 13. Highway Material by Walker

CEA-601 Transportation Engineering-II

CEA-601	Transportation Engineering-II	0L:0T:2P	1credits	2Hrs/Week

LIST OF EXPERIMENTS:

- 1. Aggregate Crushing Value Test
- 2. Determination of aggregate impact value
- 3. Determination of Los Angeles Abrasion value
- 4. Determination of California Bearing Ratio values
- 5. Determination of penetration value of Bitumen
- 6. Determination of Viscosity of Bituminous Material
- 7. Determination of softening point of bituminous material
- 8. Determination of ductility of the bitumen
- 9. Determination of flash point and fire point of bituminous material
- 10. Determination of Bitumen content by centrifuge extractor
- 11. Determination of stripping value of road aggregate
- 12. Determination of Marshall Stability value for Bituminous mix
- 13. Determination of shape tests on aggregate

CEA-(602) Geotechnical Engineering-I

CEA-602	Geotechnical Engineering-I	2L:1T:0P	3credits	3Hrs/Week

Preamble:-

•To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

UNIT - I

Basic Definitions & Index Properties: Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behavior. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

UNIT - II

Soil Water and Consolidation: Soil water, Permeability Determination of permeability in Laboratory and in field. Seepage and seepage pressure. Flow nets, uses of a flow net, Effective, neutral and total stresses. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of reconsolidation pressure, settlement analysis. Calculation of total settlement.

UNIT - III

Stress Distribution in Soils and Shear Strength of Soils: Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. New mark's influence chart. Contact pressure distribution. Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Tri axial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

UNIT - IV

Stability of Slopes: Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

UNIT - V

Lateral Earth Pressure: Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wall friction. Arching in soils. Reinforced earth retaining walls.

10Hr

9Hr

11Hr

8Hr

Outcome:-

Students will be able to

•Analyze the pin-jointed plane and space frames

•Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.

•Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.

•Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

Reference Books: -

1. Soil Mech. & Found. Engg. by Dr. K.R. Arora - Std. Publishers Delhi.

2. Soil Mech. & Found. by Dr. B.C.Punmia- Laxmi Publications, Delhi.

3. Modern Geotech Engg. by Dr.l Aram Singh - IBT Publishers, Delhi.

- 4. Geotech Engg. by C. Venkatramaiah New Age International Publishers, Delhi
- 5. Soil Mech. & Found. Engg. by S.K. Garg- Khanna Publishers, Delhi.
- 6. Soil Testing for Engg. by T.W. Lambe John Wiley & Soms. Inc.
- 7. Relevant I.S. Codes

CEA-(602) Geotechnical Engineering-I

CEA-602	Geotechnical Engineering-I	0L:0T:2P	1credits	2Hrs/Week

List of Experiments:

1. Determination of Hygroscopic water content

2. Particle - size analysis

3. Determination of Specific gravity of soil particles

- 4. Determination of plastic limit
- 5. Determination of liquid limit
- 6. Determination of shrinkage limit
- 7. Permeability tests
- 8. Direct shear test
- 9. Consolidation test

Professional Elective-II

CEA-603(A) Structural Analysis-II

CEA-603 (A)	Structural Analysis-II	3L:1T:0P	4 credits	4 Hrs/Week

Preamble:-

UNIT-II

•To introduce the students to the basic theory and concepts of classical methods of structural analysis.

UNIT-I 10Hr Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Plastic analysis of beams and frames.

UNIT-III 10Hr Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

UNIT-IV 10Hr

Matrix method of structural analysis: force method and displacement method.

UNIT-V

Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns.

Outcome:-

Students will be able to

•Analyze the pin-jointed plane and space frames

•Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.

•Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.

•Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

Reference Books:-

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.

10Hr

2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.

- 3. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
- 4. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.

5. Weaver W &Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi

Professional Elective-II

CEA-603(B) Ground Water Hydrology

	CEA-603 (B)	Ground Water Hydrology	3L:1T:0P	4credits	4 Hrs/Week
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Preamble:-

To study occurrence movement and distribution of water that is a prime resource for development of a civilization.
To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology.

•To know the basic principles and movement of ground water and properties of ground water flow.

UNIT-I

Introduction: Ground water utilization & historical background, ground water in hydrologic cycle, ground water budget, ground water level fluctuations & environmental influence, literature/ data/ internet resources.

UNIT-II

Occurrence And Movement Of Ground Water: Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics/classification, groundwater basins & springs, Darcy's Law, permeability & its determination, Dupuit assumptions, heterogeneity & anisotropy, Ground water flow rates & flow directions, general flow equations through porous media.

UNIT-III

Pollution And Quality Analysis Of Ground Water: Municipal ,industrial ,agricultural ,miscellaneous sources & causes of pollution, attenuation, underground distribution, potential evaluation of pollution, physical ,chemical ,biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples, graphical representations of ground water quality.

UNIT-IV

Surface & Sub-Surface Investigation Of Ground Water: Geological ,geophysical exploration, remote sensing , electric resistivity ,seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground water investigation through geophysical , resistivity ,spontaneous potential ,radiation , temperature ,caliper , fluid conductivity , fluid velocity ,miscellaneous logging.

UNIT-V

Artificial Ground Water Recharge: Concept & methods of artificial ground water recharge, recharge mounds & induced recharge, wastewater recharge for reuse, water spreading.

10Hr

10Hr

9Hr

7Hr

Outcome:-

On completion of the course, the student is expected to be able to

•Provide a background in the theory of hydrological processes and their measurement

•Apply science and engineering fundamentals to solve current problems and to anticipate, mitigate and prevent future problems in the area of water resources management

•A systematic understanding of the nature of hydrological stores and fluxes and a critical awareness of the methods used to measure, analyze and forecast their variability; and the appropriate contexts for their application.

REFERENCE BOOKS: -

1. D.K. Todd and L. F. Mays, "Groundwater Hydrology", John Wiley and sons.

- 2. K. R.Karanth, "Hydrogeology", TataMcGraw Hill Publishing Company.
- 3. S. Ramakrishnan, "Ground water", S. Ramakrishnan.

Professional Elective-III

CEA-604 (A) Environmental Engg.-I

CEA-604 (A)	Environmental EnggI	3L:0T:0P	3credits	3Hrs/Week
CEA-604 (A)	Environmental EnggI	3L:0T:0P	3credits	3Hrs/Week

Preamble:-

•To prepare students for the effective use of the conventional techniques and engineering analytical methods for design and operation of water and wastewater treatment engineering systems.

•To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.

UNIT - I

Estimation of ground and surface water resources. quality of water from different sources, Demand & quantity of water, fire demand, water requirement for various uses, fluctuations in Demand, forecast of population.

UNIT - II

Impurities of water and their significance, water-borne diseases, physical, chemical and Bacteriological analysis of water, water standards for different uses. Intake structure, Conveyance of water, pipe materials, pumps - operation & pumping stations.

UNIT -III

Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

UNIT - IV

Layout and hydraulics of different distribution systems, pipe fittings, valves and appurtenances, analysis of distribution system. Hardy cross method, leak detection, maintenance of distribution systems, service reservoir capacity and height of reservoir.

UNIT - V

Rural water supply schemes, financing and management of water supply project, water pollution control act, conservancy & water carriage system, sanitary appliance and their operation, building drainage system of plumbing.

Outcome:-

The students after completing this course will be able to

•Design and draw various units of municipal water treatment plants and sewage treatment plants.

•Recognize the design philosophy of water and wastewater treatment processes.

•The students will learn to understand the theoretical and practical aspects of environmental engineering along with the design and management applications.

11Hr

10Hr

11Hr

8Hr

Reference Books:-

- 1. Water Supply Engineering by B.C. Punmia Laxmi Publications (P) Ltd. New Delhi
- 2. Water Supply & Sanitary Engg. by G.S. Birdi Laxmi Publications (P) Ltd. New Delhi
- 3. Water & Waste Water Technology by Mark J.Hammer Prentice Hall of India, New Delhi
- 4. Environmental Engineering H.S. Peavy & D.R.Rowe-Mc Graw Hill Book Company, New Delhi
- 5. Water Supply & Sanitary Engg. by S.K. Husain
- 6. Water & Waste Water Technology G.M. Fair & J.C. Geyer
- 7. Relevant IS Codes

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Professional Elective-III

CEA-604(B) Industrial Waste Treatment

CEA-604 (B)	Industrial Waste Treatment	3L:0T:0P	3credits	3Hrs/Week
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Preamble:-

• To provide knowledge on sources and characteristics of Industrial Wastewaters, Techniques and approaches for minimizing the generation of wastewaters at the source and application of physico-chemical, biological and advanced treatment methods for recovery, reuse and disposal of wastewaters in Indian Industries.

UNIT – I

Introduction:- Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent - Bioassay studies - effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT - II

Cleaner Production:- Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT – III

Pollution From Major Industries:- Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants - Wastewater reclamation concepts

UNIT - IV

Treatment Technologies:- Equalization - Neutralization - Removal of suspended and dissolved organic solids -Chemical oxidation - Adsorption - Removal of dissolved inorganics - Combined treatment of industrial and municipal wastes - Residue management - Dewatering - Disposal

UNIT - V

Hazardous Waste Management: - Hazardous wastes - Physico chemical treatment - solidification - incineration -Secure land fills

Outcome:-

On Completion of the course, the student is expected to be able to

•Explain the source and types of industrial wastewater and their environmental impacts and choose the regulatory laws pertaining to environmental protection

•Apply knowledge and skills to design industrial wastewater treatment schemes

•Design facilities for the processing and reclamation of industrial wastewater

•Plan and develop sludge management scheme for sludge generated from industries

12Hr

10Hr

8Hr

7Hr

•Conduct research to develop effective management systems for industrial wastewater that are technically sound, economically feasible and socially acceptable.

Reference Books:

(i) Rao M. N. & Dutta A. K., "Wastewater Treatment", Oxford – IBH Publication, 1995.

- (ii) Eckenfelder W.W. Jr., "Industrial Water Pollution Control", McGraw Hill Book Company, New Delhi, 2000.
- (iii) Patwardhan. A.D., Industrial Wastewater Treatment", Prentice Hall of India, New Delhi 2010.
Open Core Elective - II

CEA-605(A) Structural Design & Drawing - I (STEEL)

CEA-605(A)	Structural Design & Drawing – I (STEEL)	3L:0T:0P	3credits	3Hrs/Week
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Preamble:-

•To study the behaviour of members and connections, analysis and design of Industrial buildings and to study the design of with cold formed steel and plastic analysis of structures.

UNIT - I

Various loads and mechanism of the load transfer, partial load factors, structural properties of Steel, Design of structural connections -Bolted, Riveted and Welded connections.

UNIT - II

Design of compression members, Tension members, Roof Trusses - Angular & Tubular, Lattice Girders.

UNIT-III

Design of simple beams, Built-up beams, Plate girders and gantry girders.

UNIT - IV

Effective length of columns, Design of columns-simple and compound, Lacings & battens. Design of footings for steel structures, Grillage foundation.

UNIT - V

Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers. NOTE: - All the designs for strength and serviceability should strictly be as per the latest version Of IS:800.

Outcome:-

On completion of the course, the student is expected to be able to

•Design the steel members such as purlins, gable wind girders, base plates subjected to combined forces

•Explain and design the different types of steel connections such as welded, bolted and moment resisting connections

•Analyse and design the industrial structures such as trusses, portal frames subjected to seismic forces.

•Explain the effect of axial force and shear force on steel structures and analyse the continuous beams, frames using plastic theory

•Evaluate the behaviour and design of compression and flexural members

10Hr

9Hr

12Hr

8Hr

Reference Books :-

i) Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee

- ii) Design of steel structures by P.Dayaratnam
- iii) Design of steel structures Vol. I & II by Ramchandra
- iv) Design of steel structures by L.S. Negi
- v) Design of steel structures by Ramammutham
- vi) Design of steel structures by Punmia

Open Core Elective-II

CEA-605(B) Highway Geometric Design

CEA-605(B)	Highway Geometric Design	3L:0T:0P	3credits	3Hrs/Week

Preamble:-

•To give an overview on the basics of highway engineering and to impart the various process and methods involved in the planning, development, design, construction and maintenance of highways.

UNIT-I

Introduction: Geometric Control factors like Topography –design speed – design vehicle – Traffic – Capacity – volume – environment and other factors as per IRC and AASHTO standards and specifications- PCU concept – factors controlling PCU for different design purpose

UNIT-II

Cross Sectional Elements: Pavement surface characteristics –friction – skid resistance – pavement unevennesslight reflecting characteristics – camber – objectives – types of camber – methods of providing cambers in the field – problems – carriage way – kerb – median –shoulder – foot path – parking lanes – service roads – cycle tracks – Driveways – Right of way – Factors influencing right of way – Design of Road humps as per latest I RC provisions

UNIT-III

Sight Distance Important, types, Side distance at uncontrolled intersection, derivation, factors affecting side distance, IRC, AASHTO standards, problems on above.

UNIT-IV

Horizontal Alignment Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum and maximum radius, Assumptions – problems – method of providing super elevation for different curves – Extra widening of pavement on curves –objectives – Mechanical widening – psychological widening – Transition curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve – Setting the transition curve in the field, set back distance on horizontal curve and problems on above

UNIT-V

Vertical Alignment Gradient – Types of gradient – Design criteria of summit and valley curve – Design of vertical curves based on SSD – OSD– Night visibility considerations – Design standards for hilly roads –problems on the above. Principle – At grade and Grade separated junctions – Types – channelization – Features of channelizing Island –median opening – Gap in median at junction.

8Hr

13Hr tal_cu

9Hr

10Hr

Outcome:-

On completion of the course, the student is expected to be able to

•Understand the concepts and standards adopted in Planning, Design and construction of Highways and its related infrastructures.

•Apply the knowledge of science and engineering fundamentals in designing the geometrics for an efficient Highway network and design concepts.

•Designing various types of pavements to meet specified needs of safety, efficiency and long time sustainability by adopting various design standards.

•Select appropriate methods for construction, evaluation and maintenance of roadways.

•Understand the bidding processes and types of highway projects and analyze the economic, financial aspects of the highway projects.

REFERENCE BOOKS:-

1. Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand & Bros, Roorkee (U.A).

2. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.

3. Kadiyali, L.R. & Lal, N.B., Principles & Practices of Highway Engineering, Khanna Publishers, New Delhi. 4. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.

5. IRC – 37 "Guidelines for Design of flexible Pavements", IRC, New Delhi, 2001.

6. IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001. 30

7. IRC: 58, 2002: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.

8. IRC:70, 1977: "Guidelines on Regulation and Control of Mixed Traffic in Urban Areas"

9. IRC:106, 1990: "Guidelines for Capacity of Urban Roads in Plain Areas"

CEA 606 Projects-I (Minor)

CEA 606 Project-I (Minor)	0L:0T:4P	2 credits	4Hrs/Week
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GUIDELINES:

- 1. The Minor-project is a team activity having 3-4 students in a team. This is based on civil engineering construction works.
- 2. The Minor project may be a complete hardware or a combination of hardware and software. The software part in Minor project should be less than 50% of the total work.
- 3. Minor Project should cater to a small system required in laboratory or real life.
- 4. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and Preambles of Minor project.
- 5. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
- 6. The student is expected to exert on design, development and testing of the proposed work as per the schedule.

VII SEMESTER

CEA-701 Quantity Surveying & Costing

CEA-701	Quantity Surveying & Costing	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

•The course objective is introducing the student to the fundamental of quantity surveying, cost estimating and specifications.

•To impart knowledge in estimation, tender practices, contract procedures, and valuation of Civil Engineering works.

UNIT – I

Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

UNIT – II

UNIT – III

Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)

Detailed Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as watersupply, drainage and electrification.

UNIT - IV

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building. Preparation of DPR.

UNIT – V

Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

Outcome:-

On completion of the course, the student is expected to be able to

•Explain the basic concept of quantity estimation for building, roads, canals and hydraulic structures by manual and software packages.

•Acquire the knowledge to calculate rate analysis and man-hours required for the common civil works by manual and software packages.

•Develop the specification for the materials used in construction, online and offline tender procedures and tender document preparation and report preparation.

•Acquire the knowledge of construction contracts and contract document preparation.

<u>QHr</u>

8Hr

8Hr

9Hr

•Identify the valuation for building, land and plant and machineries, calculation of rent, mortgage and lease.

Reference Books:

- Quantity Surveying & Costing B.N. Datta
 Estimating & Costing for Civil Engg. G.S. Birdi
- 3. Quantity surveying & costing Chakraborty
- 4. Estimating & Costing S.C. Rangawala

CEA-701 Quantity Surveying & Costing

CEA-701 Quantity Surveying & Costing	0L:0T:2P	1 credits	2Hrs/Week	
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Practical Works:

1. Preparation of detailed estimate.

2. Detailed estimate for services of plumbing and water supply or Electrification work.

3. Detailed estimate for earth work for the road construction or arched culvert.

4. Rate analysis for at least 8 items of construction.

5. Preparation of DPR of Civil Engineering Project.

CEA-702 Environmental Engineering-II

CEA-702	Environmental Engineering-II	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

•To prepare students for the effective use of the conventional techniques and engineering analytical methods for design and operation of sewerage systems.

•To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.

UNIT - I

Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.

UNIT-II

Characteristics and analysis of waste water, rcycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

UNIT-III

Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment. Sewage filtration- theory & design.

UNIT - IV

Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

UNIT-V

Advanced Waste Water treatment - Diatomaceous earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal classification, composition, collection, & disposal methods.

Rural sanitation - collection & disposal of refuse, sullage & night soil Laboratory work shall be based on the topics of environmental engineering I & II and consist of experiments of water and waste water quality as per facility available in the institution.

Outcome:-

The students after completing this course will be able to

•Design and draw various units of sewage treatment plants.

•Recognize the design philosophy of water and wastewater treatment processes.

•The students will learn to understand the theoretical and practical aspects of environmental engineering along with the design and management applications.

9Hr

10Hr

12Hr

8Hr

•The students will learn to understand the methods of biological treatment and its design.

Reference Books :-

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company,

2. (P) Ltd. New Delhi

3. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi

4. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company

5. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company New Delhi

6. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi7. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi

CEA- 702 Environmental Engineering-II

CEA-702 Environmental Engineering-II	0L:0T:2P	1 credits	2Hrs/Week	
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List of Experiment:-

1. To study the various standards for waste water

2. To study the sampling techniques for waste water

3. To determine the alkalinity in water sample

4. To determine the acidity in water sample

5. Determination of Dissolved Oxygen in the water and waste water sample

6. Determination of Biological Oxygen demand of a waste water sample

7. Determination of Chemical Oxygen demand of a waste water sample

8. Determination of various types of solids in the waste water sample

9. Determination of bacterial number by membrane filter Technique

10. Determination of bacterial colonies by standard plat count method

Professional Elective-IV

CEA-703 (A) **Advanced Structural Design (RCC)-II**

CEA-703 (A)	Advanced Structural Design (RCC)-II	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

•To impart knowledge on basic of concepts of design of reinforced concrete structures and to make the students able to design and detail the elements like sway non-sway building, shear wall, retaining wall, water tanks, silo, bunker and T-beam, slab bridges.

UNIT - I 10Hr **Design of Multistory Buildings -** Sway and Non-sway buildings, Shear walls and other bracing elements.

UNIT II Earth Retaining Structures: Cantilever and counter fort types retaining walls.

UNIT - III 10Hr **Water Tanks:** Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

UNIT - IV Silos and Bunkers

UNIT - V

T-beam & Slab bridges- for highway loading (IRC Loads). Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

Outcome:-

At the end of the course the student will be able to

•Explain various design concepts and design building under sway and non-sway condition.

- •Design earth retaining structure.
- •Design water tank and draw the reinforcement details.

•Design of silo and bunker and design of T-beam & slab bridges.

Reference Books: -

- 1. R.C.C. by O.P. Jain Vol. II
- 2. R.C.C. by B.C. Punmia
- 3. Essentials of Bridge engineering D.J. Victor
- 4. Bridge Engineering Ponnuswamy
- 5. Advanced R.C.C. Design by N.K. RAJU

6. N.Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill, New Delhi.

10Hr

10Hr

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Professional Elective-IV

CEA-703 (B) Design of Hydraulic Structures

Preamble:-

•This course is aimed to develop the understanding of basic principles and concepts of analysis and design of hydraulic structures on permeable foundation such as weirs and barrages, canal falls and various river training works along with the detailed insight in to the theories of sub-surface flow. The course also intends to learn the detailed design principles of canal transitions and regulation works.

UNIT - I

Reservoir Planning: Investigations, Capacities, Zones of storage, Mass Inflow and Mass Demand curves, Life of Reservoir. Earth Dams: Types, causes of failure and design criteria, soils suitability for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

UNIT - II

Gravity dams: Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, practical profile, evaluation of profile by method of zoning, foundation treatment, construction joints, galleries in gravity dams.

UNIT - III

Spillways: Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways. Design of outlets and rating curves Energy dissipaters: Principles of energy dissipation Energy dissipaters based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles. Design of canal regulating structures, Design of Channel transitions,

UNIT - IV

Structures on Pervious formations: Bligh's creep theory, limitations, Khoslas's theory of independent variable, Khosla's corrections, Design of Weir and Barrages: design of waterways and crest levels, design of impervious floors and protection works.

UNIT - V

Canal Structures and Hydropower Plants: Design of canal falls, Regulators, Cross drainage works, Introduction of Hydropower development, general features of hydro-electric schemes, selection of turbines.

Outcome:-

Upon successful completion of this course, it is expected that students will be able to-

•Understand the design aspects of various hydraulic structures on permeable foundation and their causes of failure. •Plan and design the efficient silt control structures and relevant river training works.

8Hr

9Hr

8Hr

11Hr

•Plan and design suitable transition structures for subcritical and supercritical flow conditions using standard available methods.

•Plan and design of canal regulation works.

REFERENCE BOOKS: -

- 1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
- 2. Hydroelectric Hand Book by Creager
- 3. Hydraulic Structures by Varshney
- 4. Irrigation & Water Power Engg. by Punmia & Pandey B.B. Lal
- 5. Water Power Engineering by Dandekar

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Open Core Elective-III

CEA- 704 (A) **Traffic Engineering**

CEA-704 (A)	Traffic Engineering	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

•To give an overview of Traffic engineering, various surveys to be conducted, traffic Regulation, management and traffic safety.

UNIT -I

Traffic Characteristics: (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. (ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

UNIT -II

Traffic Studies: (i)Spot Speed Studies and Volume Studies. (ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. (iii) Origin and destination Studies (0 & D) : Various methods, collection and interpretation of data, planning and sampling. (iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

UNIT -III

Traffic Operations and Control: (i) Traffic regulations and various means of control.(ii) One way streetsadvantages and limitations. (iii) Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

UNIT-IV

Street Lighting : (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

UNIT-V

Accident Studies & Mass Transportation: (i) Accident Studies: Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

10Hr

8Hr

10Hr

10Hr

Outcome:-

Students who successfully complete this course will be able to-

•Understand the principles and standards adopted in Planning and Design of Traffic system.

•Apply the knowledge of science and engineering fundamentals in conducting traffic surveys and analyze the problems.

•Designing various types of control and regulatory measures to meet an efficient traffic network.

•Select appropriate methods to ensure the safety of the road users and analyze the environmental issues related to traffic network.

•Understand various traffic management measures in addressing the demand, pricing and ITS applications.

REFERENCE BOOKS :-

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi

- 2. Traffic Engineering by Matson, W.S.Smith & F.W. Hurd
- 3. G.J. Pingnataro, Principles of Traffic Engineering
- 4. D.R.Drew, Traffic Flaw Theory
- 5. W.R. Mchsne and R.P. Roess "Traffic Engg"
- 6. Wohl & Martin, Traffic System Analysis for Engineering & Planners

Open Core Elective-III

CEA- 704 (B) Construction Planning & Management

CEA-704 (B) Construction Planning & 3L:0T:0P 3 credits 3Hrs/Week Management
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Preamble:-

•To study and understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.

UNIT –I

Preliminary and detailed investigation methods: Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

UNIT –II

Construction equipments: Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

UNIT –III

Tenders & Contracts: Different types of Tenders & Contracts, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

UNIT –IV

Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

UNIT-V

Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

Outcome:-

• On completion of this course the students will know the development of construction planning, management procedure and different construction equipment, tender & contracts.

10Hr

8Hr

9Hr

10Hr

Reference Books:-

- 1. Construction Equipment by Peurify
- 2. CPM by L.S. Srinath
- 3. Construction Management by S. Seetharaman4. CPM & PERT by Weist & Levy
- 5. Construction, Management & Accounts by Harpal Singh
- 6. Tendering & Contracts by T.A. Talpasai

CEA-705 Major Project-I

CEA-705Major Project-I0L:0T:10P5 credits10 Hrs/Week

Preamble:-

The object of Major project I or dissertation is to enable the student to extend further the investigative study taken up under civil engineering Construction projects, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry.

GUIDELINES:-

- 1. The Major-project is a team activity having 3-4 students in a team.
- 2. The Major project may be a complete hardware or a combination of hardware and software. The software part in Minor project should be less than 50% of the total work.
- 3. Minor Project should cater to a small system required in laboratory or real life.
- 4. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and objectives of Minor project.
- 5. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
- 6. The student is expected to exert on design, development and testing of the proposed work as per the schedule.

CEA-706 Self Study/GD/Seminar

CEA-706	Self-Study/GD/Seminar	0L:0T:2P	1 credits	2Hrs/Week

Preamble:-

The main objective is to improve the mass communication and convincing/understanding skills of students and to give the students an opportunity to exercise their rights to express themselves. The evaluation will be done based on their presentation work and group discussion.

Presentation Skills

They will be able to make use of visual, audio and audio-visual material to support their presentation, and will be able to speak cogently with or without notes. Students will present either in groups or as individuals.

Discussion Skills

Students will be able to judge when to speak and how much to say, speak clearly and audibly in a manner appropriate to the subject, ask appropriate questions, use evidence to support claims, respond to a range of questions, take part in meaningful discussion

Listening Skills

Students will demonstrate that they have paid close attention to what others say and can respond constructively. Through listening attentively, they will be able to build on discussion fruitfully, supporting and connecting with other discussants. They will be able to follow academic discussions, infer meanings that are not overt, and take notes from a discussion or presentation.

Argumentative Skills and Critical Thinking

Students will develop persuasive speech, present information in a compelling, well-structured, and logical sequence, respond respectfully to opposing ideas, show depth of knowledge of complex subjects, and develop their ability to synthesize, evaluate and reflect on information.

Questioning

Through asking appropriate questions, students will demonstrate their understanding of discussions and spark further discussion.

Interdisciplinary Inquiry

Students will be able to reach across diverse disciplines to apply theories, methods and knowledge bases from multiple fields to a single question or problem.

Engaging with Big Questions

Students will engage with important questions that stimulate discussion and debate.

Studying Major Works

Students will engage with works that are widely held to be significant in the field of study, while recognizing cultural diversity and the ever-changing nature of what is regarded as important.

Outcome:-

In terms of content, students will be able to

VIII SEMESTER

CEA-801 Geotechnical Engineering-II

CEA-801	Geotechnical Engineering-II	3L:0T:0P	3 credits	3Hrs/Week	
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Preamble:-

• To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and other structures.

UNIT - I

Shallow Foundations: Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

UNIT - II

Deep Foundation: Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

UNIT - III

Soil Improvement Techniques: Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.

Soil stabilisation: Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilisation and sabilisation by grouting. Geo-synthetics, types, functions, materials and uses.

UNIT - IV

Soil Exploration and Foundations on Expansive and Collapsible soils: Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

UNIT - V

Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications. Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

LABORATORY WORK: Laboratory work will be based on the course of Geotech. Engg. I & II as required for soil investigations of engineering projects and not covered in the lab. Work of Geotech. Engg. I

9Hr

10Hr

8Hr

10Hr

Outcome:-

On completion of the course, the student is expected to be able to-

•Graduate will demonstrate an ability to plan and execute a detailed site investigation to select geotechnical design parameters and type of foundation.

•Graduate will demonstrate an ability to design shallow foundations, its component or process as per the needs and specifications.

•Graduate will demonstrate an ability to design combined footings and raft foundations, its component or process as per the needs and specifications.

•Graduate will demonstrate an ability to design deep foundations, its component or process as per the needs and specifications.

REFERENCE BOOKS :-

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi

2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publiscations Delhi

3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.

4. Geotech. Engg. by C.Venkatramaiah- New AGE International Publishers, Delhi

5. Found. Engg. by GALeonards McGraw Hill Book Co. Inc.

6. Relevant IS Code

CEA-801 Geotechnical Engineering-II

CEA-801 Ge	eotechnical Engineering-II	0L:0T:2P	1 credits	2Hrs/Week
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LIST OF EXPERIMENTS

1. Indian Standard Light Compaction Test/Std. Proctor Test

2. Indian Standard Heavy Compaction Test/Modified Proctor Test

3. Determination of field density by Core Cutter Method

4. Determination of field density by Sand Replacement Method

5. Determination of field density by Water Displacement Method

6. The corifiled Compression Test

7. Triaxial compression test

8. Lab. Vane Shear test

9. CBR Test

10. Demonstration of Plate Load Test SPT & DCPT

Professional Elective-V

CEA-802 (A) Structural Design And Drawing-II (Steel-II)

CEA-802 (A)	Structural Design And Drawing-II (Steel-II)	3L:0T:0P	3 credits	3Hrs/Week
Preamble:-				
• To introduce th bending loads, in systems such as a	e students to limit state design of struct cluding connections. 🛛 To provide the st roof trusses and gantry girders as per pr	ural steel member tudents the tools n ovisions of curren	rs subjected to co necessary for des nt code (IS 800 - 1	ompressive, tensile and signing structural 2007) of practice.
Unit – I Plate girder bridg	ges (Riveted and welded)			9Hr
Unit – II Trussed girder b	ridges for railways and highways (IRC &	IRS holding). Bea	rings for bridges	11Hr
Unit – III Water Tanks: Pre bottom and conic	essed steel tanks, tanks with ordinary pla cal bottom.	ates, square, recta	ngular, circular v	12Hr with hemispherical
Unit - IV Chimneys: Guyec	l and self-supporting steel stacks.			8Hr
Unit – V Bunkers, Silos &	Towers			9Hr
OUTCOME: Upon completion • Recognize the c and welded conn • Select the most	of this course, students will be able to: lesign philosophy of steel structures and lections, and determine their design stre suitable section shape and size for tensi	l identify the differ ngths on and compressi	rent failure mod on members and	es of bolted l beams

according to specific design criteria

PRACTICAL & SESSIONAL WORK:

Laboratory work will be based on the course of STEEL-II as required for The design of engineering projects.

CEA-802 (B) Earthquake Resistant Design of Structures

CEA-802 (B)	Earthquake Resistant Design of	3L:0T:0P	3 credits	3Hrs/Week
	Structures			

Preamble:-

• Apply seismic coefficient and response spectrum methods for analysis of multi storied buildings.

- Apply concepts of ductility in the design of multi-storeyed structures.
- Analyse a water tank structure based on latest earthquake code.
- Understand the concepts of base isolation

UNIT I

Seismic Strengthening of Existing Buildings: Cases Histories-Learning from earthquakes, seismic strengthening procedures.

UNIT II

Torsion & Rigidity: Rigid Diaphragms, Torsional moment, Center of mass and center of rigidity torsion effects. Lateral Analysis of Building Systems: Lateral load distribution with rigid floor diaphragms, moment resisting frames, shear walls, lateral stiffness of shear walls, shear wall-frame combination, examples.

UNIT III

Concept of Earthquake Resistant Design: Objectives of seismic design, Ductility, Hysteric response & energy dissipation, response modifications factor, design spectrum, capacity design, classification of structural system, IS code provisions for seismic design of structures, multi-storied buildings, design criteria, P-A effects, storey drift, design examples ductile detailing of RCC structures.

UNIT IV

Seismic Design of Special Structures: Elevated liquid storage tanks, Hydrodynamic pressure in tanks, stack like structures, IS-1893 code provisions for bridges; Superstructures, substructures, submersible bridges, dams; Hydrodynamic effect due to reservoir, concrete gravity dams.

UNIT V

Engineering Seismology: Basic terms, seismic waves, earthquake magnitude and intensity, ground motion, dynamic response of structures, normalized response spectra, seismic coefficients and seismic zone coefficients.

Outcome:-

Students who successfully complete this course will be able to-

•Understand the seismic coefficient and response spectrum methods for analysis of multi storied buildings.

- •Understand design concepts of ductility in the design of multi-storeyed structures.
- •Understand the design of water tank structure based on latest earthquake code.

•Understand the concepts of base isolation.

Reference Books:

- 1. Chopra A.K., Dynamics of Structures', Theory & Applications to Eqrthquake Engineering, Prentice Hall India, New Delhi-1995
- 2. Clough & Penzien, Dynamics of Structures, McGraw Hill Book CO. Inc.

8Hr

10Hr

11Hr

10Hr

8Hr nic s

- 3. Paz M, Structural Dynamics, Van Nostrand Reinhold, New York
- 4. Paz, M, International Handbook of Earthquake Engineering, Chapman & Hall, New York.
- 5. IS-1893-1984, Indian Standard Criteria for Earthquake Resistant Design of Structures, B.I.S., New Delhi.
- 6. IS-4326-1993, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings, B.I.S., New Delhi.

Open Core Elective-IV

CEA-803 (A) Pavement Design

CEA-803(A)	Pavement Design	3L:0T:0P	3 credits	3Hrs/Week

Preamble:-

• Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and evaluate the serviceability conditions of pavements.

UNIT-I

Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

UNIT-II

Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory, Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

UNIT -III

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

UNIT-IV

Rigid pavement design : IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis. PAVEMENT JOINTS: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

UNIT-V

Evaluation and Strengthening of Existing Pavements : Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Outcome:-

Upon completion of this course, students will be able to-

•Explain concepts and standards adopted in Planning, Design and construction of Pavements.

•Apply the knowledge of science and engineering fundamentals in designing flexible pavement. by adopting various design standards.

•Apply the standards adopted in designing rigid pavement.

•Select appropriate methods for construction and evaluation of Pavements.

•Address the problem statement in construction of pavement and to impart knowledge in stabilization techniques.

9Hr

9Hr

10Hr

7Hr

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Reference Books:--

- 1. Principles of pavement design by E.J.Yoder & M.W. Witczak
- 2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
- 3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
- 4. DSIR, Conc. Roads Design & Construction
- 5. Srinivasan M. "Modern Permanent Way"

Open Core Elective-IV

CEA-803 (B) Urban Transportation Engineering

CEA-803(B)	Urban Transportation Engineering	3L:0T:0P	3 credits	3Hrs/Week

Preamble:-

•Student will understand and apply basic concepts and methods of urban transportation planning. Student will learn methods of designing, conducting and administering surveys to provide the data required for transportation planning. In addition students will understand and be able to apply travel demand modelling, project development and financing, regulations and policies, environmental related issues, land use and contemporary issues in transportation planning.

UNIT- I

Transportation Planning Process: Definition of Study Area; Zoning Principles; Types of Surveys: Home Interview Studies, Commercial Vehicle Surveys, Road Side Interview Methods, Public Transport Studies, Land Use Inventory; O-D Matrix and Desire Line Diagram. Accident Studies & Mass Transportation: (i)Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

UNIT – II

Trip Generation: Four Stage UTP Process; Travel Demand Models; Sequential Models and Direct Demand Models; Factors affecting Travel Demand; Trip Generation; Multiple Regression Analysis; Category Analysis; Aggregate and Disaggregate Models. TRIP Distribution: Trip Distribution Models- Growth Factor Models: Uniform Growth Factor, Average Growth Factor, Fratar Method and Furness Method; Limitations of Growth factor Models; Gravity Model – Calibration of Gravity Model.; Opportunity Models. Traffic Assignment: Purpose of Traffic Assignment; Assignment Techniques-All-or-Nothing Assignment, Multiple Route Assignment, Capacity restraint assignment; Use of Diversion Curves in Assignment.

UNIT -III

Mode Split: Factors affecting Mode Split; Pre-distribution Mode Split; Post Distribution Mode Split; Advantages and Disadvantages; Probit, Logit and Discriminant Analysis in Mode Split. Land use and transportation system: Urban system components, Concept and definitions, criteria for measuring and comparing urban structure, land use and transportation.

UNIT – IV

Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads. Flexible Pavements Design: Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory ,Burmister's two layered theory, methods of design, Group Index method, CBR method, IRC method, AASHTO method, Burmister's method and North Dakota cone method. Applications of pavement design software.

12Hr

10Hr

12Hr

10Hr

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UNIT -V

10Hr

Rigid Pavements: Evaluation of sub grade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions. Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and expressways as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design.

Outcome:-

Students who successfully complete this course will be able to-

- •Design, conduct and administer surveys to provide the data required for transportation planning. [
- •Learn and understand zonal demand generation and attraction regression models.
- •Understand transportation project planning and development.
- •Knowledge on principles of planning, surveys and analysis. in developing an urban area.
- •Knowledge on development of regional, master plan and norms for development of smart cities.
- •Planning of standards, implanting and financing of Urban projects.

Reference Books:-

1. Adib Kanafani. (1983). Transportation Demand Analysis. Mc Graw Hill Series in Transportation, Berkeley.

2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York. 3. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.

4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd

Edition, Prentice - Hall of India Pvt Ltd., 318-436.

5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.

6. Yoder and Witczak, Priniciples of Pavement Design, John Wiley and Sons

7. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.

8. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)

9. W.Ronald Hudson, Ralph Haas and Zeniswki, Modern Pavement Management, Mc Graw Hill and Co Academic Session 2016-17

10. Relevant IRC Codes

- 11. Bruton M J (1981), "Introduction to transportation planning", Hutchinson of London
- 12. Dickey J W(1980), "Metropolitan Transportation Planning", Tata McGraw Hill
- 13. Principles of Transportation Engineering : P. Chakraborty and A. Das
- 14. Fundamentals of Transportation Engineering: : C.S. Papacoastas

15. Traffic Engineering and Transport Planning: : L.R. Kadyal

CEA-804 Major Project-II

CEA 804 Major Projects-II	0L:0T:16P	8 credits	16Hrs/Week	
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Preamble:-

The object of Major project II or dissertation is to enable the student to extend further the investigative study taken up under civil engineering projects, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under civil engineering construction projects.

2. Review and finalization of the Approach to the Problem relating to the assigned topic;

3. Preparing an Action Plan for conducting the investigation, including team work;

4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;

5. Final development of product/process, testing, results, conclusions and future directions;

6. Preparing a paper for Conference presentation/Publication in Journals, if possible;

7. Preparing a Dissertation in the standard format for being evaluated by the Department.

8. Final Seminar Presentation before a Departmental Committee.

Assessment

nent	nent	PO 1	P02	PO3	P04	P05	P06	P07	Р 08	P09	P010	P011	P01 2
PO/Course Asses Tools Types	PO/Course Asses Tools	Engineering Knowledge	Problem Analysis	Design/Develop ment of Solution	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning
	Test	*	*	*	*				*		*	*	
Direct	Assignments	*	*			*				*			
Tools	lab /seminar/indu strial training/projec ts(Rubrics)	*	*	*		*		*	*	*	*	*	*
	Course end survey	*				*		*					
	Exit survey	*	*										*
Indirec t Tools	Faculty Survey		*	*	*			*					
	Alumni Survey	*			*		*		*	*	*		*
	Program Statistics	*			*				*			*	