SYLLABUS

Bachelor of Technology

Civil Engineering

B Tech

Department of Civil Engineering
Faculty of Engineering & Technology
Jamia Millia Islamia
New Delhi - 110025 (INDIA)
www.jmi.ac.in

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July 2013

Preface

The revision and modification of the syllabus is a continuous process. The department was established in 1985 and a workshop of prominent engineers and educational list was held to develop the curriculum for the B-Tech in Civil engineering. The syllabus was later modified and published in the printed form in 1993. Since then a number of revisions have taken place both in the course structure and course content keeping in view the current trends in civil engineering education and demands of the industry.

The latest version of the syllabus is the outcome of a thorough revision of course structure and course content with inputs from subject experts and professionals. The syllabus has been designed to provide a solid foundation in the core areas of Civil engineering namely; structural engineering, geo-technical engineering, environmental engineering, water resources engineering, civil engineering materials, transportation engineering, surveying and GIS and construction management keeping in view the latest developments in these subject areas.

I wish to acknowledge the hard work put in by the faculty members in the updating and revision of syllabus. I also wish to convey my sincere thanks to the subject experts who gave their valuable inputs in finalizing this syllabus.

Professor Mohammad Shakeel
Head

About The University

Jamia Millia Islamia, an institution originally established at Aligarh in United Provinces, India in 1920 became a Central University by an act of the Indian Parliament in 1988. In Urdu language, Jamia means 'University', and Millia means 'National'.

The story of its growth from a small institution in the pre-independence India to a central university located in New Delhi—offering integrated education from nursery to research in specialized areas—is a saga of dedication, conviction and vision of a people who worked against all odds and saw it growing step by step. They "built up the Jamia Millia stone by stone and sacrifice by sacrifice," said Sarojini Naidu, the nightingale of India.

Under the colonial British rule, two dominant trends joined hands and contributed towards in the birth of Jamia. One was the anti-colonial Islamic activism and the other was the pro-independence aspiration of the politically radical section of western educated Indian Muslim intelligentsia. In the political climate of 1920, the two trends gravitated together with Mahatma Gandhi as a catalyst. The anti-colonial activism signified by the Khilafat and the pro-independence aspirations symbolised by the non-cooperation movement of the Indian National Congress helped to harness creative energies and the subsequent making of Jamia Millia Islamia. Rabindranath Tagore called it "one of the most progressive educational institutions of India".

Responding to Gandhiji's call to boycott all educational institutions supported or run by the colonial regime, a group of nationalist teachers and students quit Aligarh Muslim University, protesting against its pro-British inclinations. The prominent members of this movement were Maulana Mehmud Hasan, Maulana Mohamed Ali, Hakim Ajmal Khan, Dr. Mukhtar Ahmad Ansari, and Abdul Majid Khwaja. Hakim Ajmal Khan, Dr. Mukhtar Ahmed Ansari and Abdul Majeed Khwaja supported by Gandhiji shifted Jamia from Aligarh to Karol Bagh, in New Delhi in 1925. In 1925, after long deliberation, a group of three friends studying in Germany—Dr. Zakir Husain, Dr. Abid Husain and Dr. Mohammad Mujeeb—decided to serve Jamia.

One of the first steps they took was the introduction of the hugely popular evening classes for adult education. This movement was later to become, in October 1938, an institution called Idara-i-Taleem-o-Taraqqi.

In 1928 Hakim Ajmal Khan passed away. That was the beginning of the second financial crisis, as it was Hakim Sahib himself who had been meeting most of Jamia's financial needs. The leadership of Jamia then moved into the hands of Dr. Zakir

Husain, who became its Vice Chancellor in 1928. To resolve Jamia of these frequent crises, a group of young Jamia teachers, led by Dr. Zakir Husain, took a pledge to serve Jamia for the next twenty years on a salary not more than Rs. 150. This group was called the Life Members of Jamia. (History repeated in 1942 when a second group of Jamia teachers took a similar pledge).

Jamia's department of Printing and Publications was trifurcated in 1928 with the newly established Jamia Press at Darya Ganj, Urdu Academy, and Maktaba Jamia under the charge of Prof. Mohammad Mujeeb, Dr. Abid Husain and Mr. Hamid Ali respectively.

On 1st March 1935, the foundation stone for a school building was laid at Okhla, then a non-descript village in the southern outskirts of Delhi. In 1936, all institutions of Jamia, except Jamia Press, the Maktaba and the library, were shifted to the new campus. The basic emphasis of Jamia was on evolving innovative education methods. This led to the establishment of a teacher's college (Ustadon ka Madrasa) in 1938.

The fame of Jamia as an innovative education movement spread and dignitaries from foreign countries began visiting Jamia. Husein Raouf Bey (1933), Dr. Behadjet Wahbi of Cairo (1934), Ms. Halide Edib of Turkey (1936) were some of them. Foreigners, impressed by Jamia, began working in Jamia. The German lady Ms. Gerda Philipsborn (popularly known as Aapa Jaan) served Jamia for many years is buried in Jamia.

In 1939, Maulana Ubaidullah Sindhi (1872-1944), a theologian and freedom fighter, came to stay in Jamia on the invitation of Dr. Zakir Husain. He started a school of Islamic Studies in Jamia, called Baitul Hikmal, propagating the ideology of Shah Waliullah. Zakir Husain, later the President of India, recalled those days of indestructible optimism in the face of depravity 'when they had a longing to build and nothing to build with, as "days of joy".

After the attainment of Independence, Jamia continued to grow as an academic institution with a difference. Many foreign dignitaries made it a point to visit Jamia Millia Islamia during their visits to New Delhi. Among those who visited Jamia include Marshal Tito (1954), king Zahir Shah of Afghanistan (1955), crown prince Faisal of Saudi Arabia, king Reza Shah Pehlavi of Iran (1956) and prince Mukarram Jah (1960).

In 1962, the University Grants Commission declared the Jamia a 'deemed to be University'. Soon thereafter, the School of Social Work was established in 1967. In 1971, Jamia started the Zakir Husain Institute of Islamic Studies, to honour Dr. Zakir

Husain, who had passed away in 1969. BE course in Civil Engineering commenced in 1978; in 1981, the faculties of Humanities and Languages, Natural Sciences, Social Science, and the State Resource Centre were founded. In 1983, it started the Mass Communication Research Centre and the Centre for Coaching and Career Planning. In 1985, it established the Faculty of Engineering & Technology and the University Computer Centre. Academic Staff College and the Academy of Third World Studies followed in 1987 and 1988.

By a Special Act of the Parliament, Jamia Millia Islamia was made a central university of India in December 1988.

At present Jamia has Nine faculties and a number of centres of learning and research, like AJK-Mass Communication Research Centre (MCRC), Academy of International Studies etc. The Jamia is also marching ahead in the field of Information Technology (IT). It offers various undergraduate and postgraduate IT courses. Apart from this, the Jamia has a campus wide network which connects a large number of its departments and offices.

About the Department

The Department of Civil Engineering is one of the oldest and the largest department in the Faculty of Engineering & Technology. The department has produced several eminent engineers who have made important contributions in the planning and execution of many important Civil Engineering projects in India as well as abroad.

The Department offers two undergraduate courses in Civil Engineering. The Department also offers Master's programme with specialisations in Environmental Engineering and Earthquake Engineering .In all, there are around 560 students in undergraduate programme and 75 students pursuing their Masters degree. These courses are supported with strong doctoral programmes in all the major specialisations of Civil Engineering. More than 45 Ph. D. research scholars including many from foreign countries are currently working in the department on emerging research areas.

The Department is known for its reputed faculty with expertise in diverse fields. Presently, the department has 23 highly qualified, experienced, sincere and dedicated teaching faculty members, actively participating in research and consultancy work. During last 5 years, faculty members have published more than 280 papers in reputed refereed International Journals.

Over a period of time, the Department has built up a wide research potential. The research programmes of the department are funded by various agencies such as Ministry of Human Resource Development (MHRD), Department of Science & Technology (DST), Ministry of Environment & Forests (MoEF), Central Pollution Control Board (CPCB), All India Council of Technical Education (AICTE), University Grants Commission (UGC), Ministry of Steel and Ministry of Urban Development. Major area of research in the Department include; Sustainable Development, low cost sanitation, water treatment, air, noise and water quality modelling, Reuse of concrete, application of GIS and remote sensing in water resources and environment, Vulnerability assessment, Seismic analysis of structures, retrofitting, Soil structure interaction, Hydro-climatology, Water resource assessment and management.

The Department has established a state of the art experimental facilities and laboratories in different fields of Civil Engineering. It has received the prestigious funding under FIST from DST and SAP from UGC. The Department has mobilized more than Rs 250 millions from various external agencies to carry out research in cutting edge technologies in different fields of Civil Engineering.

The faculty also renders technical advice on live engineering problems to various Government and Private Sector companies throughout the country. These live projects are effectively used as training desk for our students at undergraduate and postgraduate levels. RITES, Military Engineering Services, Municipal Corporations of Delhi, Faridabad, Gurgaon, Gaziabad, NOIDA, PWD, CPWD, DDA, HUDA, Jal Nigam etc. regularly hire services for technical advice and vetting of designs of infrastructure projects. The Department has generated around Rs 800 million through consultancies during the last five years.

International and national conferences, seminars and special lectures are a regular feature of the Department to impart education and training. The Department has active collaboration with academics and industry such as University of Applied Sciences Erfurt (Germany), Wessex Institute (UK), University of Waterloo (Canada), Asian Institute of Technology (Bangkok) and Steel Authority of India (INDIA).

Leading MNCs and public sectors are regular recruiter of our students and many students have been selected in Engineering Services. Several of our alumni pursued higher education in USA, UK, Germany, Canada, Australia and France and have been appointed as faculty members and consultants abroad.

The Department strongly believes in continuous efforts to strive for excellence by exploring new frontiers of knowledge, imparting the latest technical knowledge to the students and conducting high quality research.

Program Educational Objectives

The **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)** are the statements that describe the expected achievements from the programme. They are guided by global and local needs, the vision of the department, long term goals etc. The Programme Educational Objectives of B-Tech in Civil Engineering includes:

1. To train and equip graduates in Civil Engineering with professional skills for successful careers dealing with analysis, design and management of infrastructural projects both in India and Abroad.
2. To develop core competency in the civil engineering field so as to formulate, analyze and solve civil engineering and allied problems using the principles of mathematics and science and applying basic engineering tools.
3. To provide the students with a comprehensive and balanced understanding of the several branches of Civil Engineering such as Structural Engineering, Geotechnical Engineering, Transportation Engineering, Hydraulic and Water Resources Engineering, Environmental Engineering.
4. To inculcate in students in maintaining high ethical standards, effective oral and written communication skills, to work as part of teams on multidisciplinary projects in diverse professional environments, and relate engineering issues to the society and nation.
5. To provide student with an academic excellence, leadership as well as team work management skills and the life-long learning needed for a successful professional career.

Program Outcomes

The curriculum and syllabus for B-Tech Civil Engineering program conform to result oriented teaching learning process. In general, **ELEVEN PROGRAM OUTCOMES (POs)** have been identified and the curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Program outcomes are statements that describe significant and essential learning that students have achieved, and can reliably demonstrate at the end of a course or program. Program outcomes identify what students will know and be able to do by the end of a course or program – the essential and enduring knowledge, abilities (skills) and attitudes (values, dispositions) that constitute the integrated learning needed by a graduate of a course or program.

Graduates of the civil engineering program will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals and principles in the solution of complex civil engineering problems.
2. Design and conduct experiments, as well as to analyze and interpret the results and report them in a professional format.
3. Design Civil Engineering projects while following standard specifications and IS codes and meeting individual requirements within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Learn basic techno-economic and techno-legal aspects of engineering projects, and preliminary aspects of project management and to work in a multidisciplinary environment.
5. Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
6. Use current techniques, skills, and modern engineering tools such as CAD, FEM, GIS etc. necessary for computing and engineering practice.
7. Develop appropriate skills of written, oral and visual communications and make effective documentations and presentations.
8. Recognise and develop confidence for self education and ability to engage in continuing professional development.

9. Analyze the local and global impact of contemporary engineering issues on individuals, organizations and society.
10. Demonstrate their role as managers or entrepreneurs and contribute their skills to the society.
11. Recognize the importance of civil Engineering professional development by pursuing postgraduate studies or face competitive examinations that offer challenging and rewarding careers in computing

Course Structure

First Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	T	P	*Mid Sem*	*End Sem*	Practical
AS-101	English	3	2	1	--	30	45	
AS-102	Engg. Physics–I	3	2	1	--	30	45	
AS-103	Engg. Chemistry– I	3	2	1	--	30	45	
AS-104	Engg. Mathematics – I	3	2	1	--	30	45	
CE-101	Elements of Environmental Engg.	3	2	1	--	30	45	
ME-101	Engg. Mechanics	3	2	1	--	30	45	
EES-101	Basics of Electrical Engg.	3	2	1	--	30	45	
AS-105	Chemistry Lab–I	2	--	--	2	30	--	20
AS-106	Physics Lab – I	2	--	--	2	30	--	20
ME-102	Engg. Mechanics Lab	2	--	--	2	30	--	20
EES-111	Electrical Engg. Lab	2	--	--	2	30	--	20
ME-103	Engg. Graphics – I	2	--	--	3	30	--	20
ME-104	Workshop – I	2	--	--	3	30	--	20
Total		33	14	7	14	390	315	120
Total credit = 33			**Total Periods Per week = 35**			**Total Marks = 825**		

Second Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	**T**	**P**	***Mid Sem***	***End Sem***	**Practical**
AS-201	Social Science	3	2	1	--	30	45	--
AS-202	Engg. Physics–II	3	2	1	--	30	45	--
AS-203	Engg. Chemistry– II	3	2	1	--	30	45	--
AS-204	Engg. Mathematics – II	3	2	1	--	30	45	--
CE-110	Elements of Civil Engg.	3	2	1	--	30	45	--
ME-201	Thermodynamics	3	2	1	--	30	45	--
EC-201	Basics of Electronics and Comm.	3	2	1	--	30	45	--
CS - 201	Fundamentals of Computing	2	2	1	--	20	30	--
AS-205	Chemistry Lab.–II	2	--	--	2	30	--	20
AS-206	Physics Lab. – II	2	--	--	2	30	--	20
ME-202	Engg. Graphics–II	2	--	--	3	30	--	20
ME-203	Workshop – II	2	--	--	3	30	--	20
CE-160	Elements of Civil Engg. Lab	2	--	--	2	30	--	20
Total		**33**	**16**	**8**	**12**	**380**	**345**	**100**
Total credit = 33			**Total Periods Per week = 36**			**Total Marks = 825**		

Sum credit First and Second semester (33 + 33) = 66

Third Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	**T**	**P**	***Mid Sem***	***End Sem***	**Practical**
CE-201	Fluid Mechanics	4	3	1	-	40	60	-
CE-202	Mechanics of Solids	4	3	1	-	40	60	-
CE-203	Engg. Geology	4	3	1	-	40	60	-
AS-201	Numerical Methods	4	3	1	-	40	60	-
CE-205	Surveying	4	3	1	-	40	60	-
CE-206	Civil Engg. Materials	4	3	1	-	40	60	-
CE-251	Fluid Mechanics Lab	2	-	-	3	30	-	20
CE-253	Engg. Geology lab	2	-	-	3	30	-	20
CE-255	Surveying Lab	2	-	-	3	30	-	20
CE-256	Civil Engg. Materials Lab	2	-	-	3	30	-	20
Total		**32**	**18**	**6**	**12**	**360**	**360**	**80**
Total credit = 32			**Total Periods Per week = 36**			**Total Marks = 800**		

Fourth Semester

Course No.	Course Title	Credit	Period per week			Marks		
			L	T	P	Mid Sem	End Sem	Practical
CE-210	Structural Analysis - I	4	3	1	-	40	60	-
CE-211	Geo-informatics	4	3	1	-	40	60	-
CE-212	Hydraulics	4	3	1	-	40	60	-
CE-213	Building Construction	4	3	1	-	40	60	-
AS-214	Computer System & Application	4	3	1	-	40	60	-
CE-215	Civil Engg. Drawing Estimating and Costing	4	1	1	3	40	60	-
CE-260	Structural Analysis Lab - I	2	-	-	3	30	-	20
CE-261	Geo – Informatics Lab	2	-	-	3	30	-	20
CE-262	Hydraulics lab	2	-	-	3	30	-	20
CE-265	Computer Practice – I	2			3	30		20
Total		**32**	**16**	**6**	**15**	**360**	**360**	**80**
Total credit = 32			**Total Periods Per week = 37**			**Total Marks = 800**		

Sum credit Third & Fourth semester (32 + 32) = 64

Fifth Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	**T**	**P**	***Mid Sem***	***End Sem***	**Practical**
CE-301	Soil Mechanics	4	3	1	-	40	60	-
CE-302	Structural Analysis- II	4	3	1	-	40	60	-
CE-303	Design of Structures- I (Steel)	4	3	1	-	40	60	-
CE-304	Design of Structures-II (Concrete)	4	3	1	-	40	60	-
CE-305	Open Channel Flow	4	3	1	-	40	60	-
CE-306	Environmental Engg. - I	4	3	1	-	40	60	-
CE-353	Design of Structure Lab– I	2	-	-	3	30	-	20
CE-354	Design of Structure Lab-II	2	-	-	3	30	-	20
CE-356	Environmental Engg. Lab - I	2	-	-	3	30	-	20
CE-357	Survey Camp	2	-	-	4	30	-	20
CE-350	Computer Practice – II	2			3	30		20
Total		**34**	**18**	**6**	**16**	**390**	**360**	**100**
Total credit = 34			**Total Periods Per week = 40**			**Total Marks = 850**		

Sixth Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	**T**	**P**	***Mid Sem***	***End Sem***	**Practical**
CE-310	Geotechnical Engg.	4	3	1	-	40	60	-
CE-311	Structural Analysis-III	4	3	1	-	40	60	-
CE-312	Design of Structures-III	4	3	1	-	40	60	-
CE-313	Hydrology	4	3	1	-	40	60	-
CE-314	Transportation Engg.-I	4	3	1	-	40	60	-
CE-315	Environmental Engg.-II	4	3	1	-	40	60	-
CE-360	Geotechnical Engg. Lab.	2	-	-	3	30	-	20
CE-362	Design of Structures Lab- III	2	-	-	3	30	-	20
CE-364	Transportation Engg. Lab - I	2	-	-	3	30	-	20
CE-365	Environmental Engg. Lab -II	2	-	-	3	30	-	20
Total		**32**	**18**	**6**	**12**	**360**	**360**	**80**
Total credit = 32			**Total Periods Per week = 36**			**Total Marks = 800**		

Sum credit Fifth and Sixth semester (34 + 32) = 66

Seventh Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	**T**	**P**	***Mid Sem***	***End Sem***	**Practical**
CE-401	Foundation Engg. and Design	4	3	1	-	40	60	-
CE-402	Irrigation Engg.	4	3	1	-	40	60	-
CE-403	Transportation Engg.-II	4	3	1	-	40	60	-
CE-404	Design of Structures –IV (concrete)	4	3	1	-	40	60	-
CE-405	Engg. Economics & Construction Mgmt.	4	3	1	-	40	60	-
CE-406	Water Resources Engg.- I	4	3	1	-	40	60	-
CE-407	Summer Practical Training	2	-	-	-	-		50
CE-408A	Project	4	1	1	2	60	--	40
CE-454	Design of Structure lab-IV	2	-	-	2	30		20
CE-455	Construction Management Lab	2	-	-	2	20		30
Total		**34**	**19**	**7**	**6**	**350**	**360**	**140**
Total credit = 34			**Total Periods Per week = 32**			**Total Marks = 850**		

Eighth Semester

Course No.	Course Title	Credit	*Period per week*			*Marks*		
			L	**T**	**P**	***Mid Sem***	***End Sem***	**Practical**
CE-410	Water Resources Engg. - II	4	3	1	-	40	60	--
CE-411	Earthquake Resistant Design	4	3	1	-	40	60	--
CE-412	Environmental Engg. - III	4	3	1	-	40	60	-
CE-___	Elective – I	4	3	1	-	40	60	-
CE-___	Elective – II	4	3	1	-	40	60	-
CE-408B	Project	10	3	0	10	150	-	100
CE-470	Seminar	02						50
Total		**32**	**18**	**5**	**10**	**350**	**300**	**150**
Total credit = 32			**Total Periods Per week = 33**			**Total Marks = 800**		

Sum credit Seventh & Eighth semester (34 + 32) = 66
L-Lectures, T-Tutorials, P-Practicals

List of Electives

Course No.	Course Title
CE-412	Ground Water Engineering
CE-413	Ground Improvement Techniques
CE-414	Architecture and Town Planning
CE-415	Matrix Method of Structural Analysis
CE-416	Bridge Engg.
CE-417	Structural Dynamics
CE-418	Finite Element Method
CE-419	Prestressed Concrete Structures
CE-420	Computer Aided Analysis of Skeletal Structures
CE-421	Optimization Technique
CE-422	Hydraulic Structures
CE-423	Fluvial Hydraulics
CE-424	Offshore Structure
CE-425	Air pollution Control
CE-426	Computer Application in Environmental Engg.
CE-427	Industrial water pollution control
CE-428	Watershed Analysis and Optimization Techniques

FIRST SEMESTER

ENGLISH

Paper Code AS-101	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To enable students improve their lexical, grammatical and communicative competence.
- To emphasize the importance of language in academic and employability.
- To enhance their communicative skills in real life situations.
- To assist students understand the role of thinking in all forms of communication.
- To equip students with oral and appropriate written communication skills.
- To assist students with employability and job search skills.

Course Learning Outcome

To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

Course Description

Unit-I

Phonetics and Phology: Description of speech sounds; classification of vowels and consonants; phoneme; phoneme sequence; word accent; intonation.

Unit-II

Morphology and Syntax: Word; sentences; kind of sentences – simple, complex and compound.

Unit-III

Function: Writing tasks, covering the following functions: Inviting; thanking; apologizing; arguing; pursuing; persuading; convincing; informing; elaborating; replying; instructing.

Unit-IV

Development of writing skills: Essays: descriptive; narrative and analytical; Letters: formal and personal, Precise writing.

Unit-V

The following are meant for detailed study

Old man and the sea	:	Hemmingway
To Daffodils	:	Wordsworth
The Daffodils	:	Robert Herrick
The Express	:	Stephen Spender

Text Books

- English and Communication Skills for Students of Science and Engineering, Dhanavel .S.P., Orient Blackswan Ltd., 2009.
- Technical Communication- Principles and Practice, Meenakshi Raman and Sangeetha Sharma, Oxford University Press, 2009.

Reference Books

- English for Engineers, by Department of English and Foreign Languages, SRM University Publications, 2013.

ENGINEERING PHYSICS – I

Paper Code AS-102	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully.
- To understand the general scientific concepts required for engineering technology.
- To apply the Physics concepts in solving engineering problems.

Course Learning Outcome

- The study of Physics shall provide students the scientific ground for the research regarding the growth of information and technology for the use of human beings, thereby it will be possible to understand the principles of natural and live sciences.
- Students will learn and understand more about basic principles and to develop problem solving skills and implementation in technology.

Course Description

Unit-I

Dynamics: Conservative systems, conservation principles, non- conservation systems, damped harmonic motion.

Unit-II

Optics: Interferences of light, diffraction of light, Bohr's theory and hydrogen atom spectrum, introduction to lasers.

Unit-III

Electromagnetism: Maxwell's equation, electromagnetic waves, Michelson Morley experiment and its implications.

Unit-IV

Quantum Ideas: Quantum ideas, black body radiation puzzle, Planck' hypothesis, wave particles quality, Compton effect, uncertainty principle, probability amplitude and probability density.

Unit-V

Solids: Crystalline and amorphous solids, ionic crystal, classical free electron theory, Weidemann Franz, bragg diffraction and crystal structure.

Text Books

- Physics forTechnologists, by Thiruvadigal .J. D, Ponnusamy .S, Sudha.D and Krishnamohan .M, Vibrant Publication, Chennai, 2013.
- Engineering Physics, by Dattu R.Joshi, Tata McGraw- Hill,New Delih,2010.

Reference Books

- Engineering Physics, by Wiley precise, Text Wiley India Private Ltd., New Delhi. Book series – 2014
- Text Book of Engineering Physics, by M.N. Avadhanulu, Dr.P.G.Kshirsagar, S Chand Publishing, New Delhi – 2012.

ENGINEERING CHEMISTRY – I

Paper Code AS-103	**(Lectures-Tutorial-Practical)/Week(2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

To provide students with knowledge of engineering chemistry for building technical competence in industries, research and development in the fields of Electrochemistry & Battery Technology, Corrosion & Metal Finishing, Fuels & Solar energy, Polymers, Water Technology & Nano Materials.

Course Learning Outcome

- After completion of this course students will be able to understand the technology involved in improving quality of water for industrial and domestic use.
- Students will have adequate understanding of the principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing corrosion.

Course Description

Unit-I

Atoms molecules and Solid state: Homonuclear and hetronuclear concepts, non-covalent interaction (Van Der Waals and hydrogen bonding), idea of spatial periodicity of lattices, unit cells, bravis lattices, elements of band theory; conductors, semiconductors and insulators.

Unit-II

Reaction Dynamics and Electrochemistry: Rate laws, mechanism and theories of reaction rates and its types, collision and transition state theory. Electrode potential, redox reaction, nernst equation.

Unit-III

Transition metal: Structure of co-ordination compounds corresponding to co-ordination number upto 6, types of ligands, isomerism and its type, geometrical, optical ionization, linkage and co-ordination, theories of bonding in co-ordination compounds, viz.. crystal field

theory, valences bond theory, chelation.

Unit-IV

Catalysis and Polymerization: Activation Energy, characteristics and types of catalysis, theories of catalysis. Types of polymerization, mechanism of addition polymerization, classification of plastics, preparation properties and industrial applications of PTFE, PVC, Phenolic and polyester resin.

Unit-V

Structure and reactivity of organic molecules: Inductive effect, resonance, hyper conjugation, electrometric effect, carboniumion, carbanion and free radicals. Addition, elimination and substitution reactions.

Text Books

- Chemistry for Engineering Students, by B.S.Jai Prakash, R.Venugopal, Sivakumaraiah & Pushpa Iyengar., Subhash Publications, Bangalore.
- Engineering Chemistry, by R.V.Gadag & A.Nityananda Shetty., I K, International Publishing House Private Ltd. New Delhi.
- Engineering Chemistry, by P.C.Jain & Monica Jain.,"Dhanpat Rai Publications, New Delhi.

Reference Books

- Engineering Chemistry, by O.G.Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.
- Nanochemistry A Chemical Approach to Nanomaterials, by G.A.Ozin & A.C. Arsenault, RSC publishing, 2005.

ENGINEERING MATHEMATICS

Paper Code AS-104	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- Students should be proficient in the application of the laws of logic to mathematical statements.
- Students encounter this rigorous mathematical thinking in the pre-requisite linear algebra course, and expand and sharpen those skills in the required courses in analysis.
- To equip themselves familiar with the functions of several variables.
- To familiarize with the applications of differential equations.

Course Learning Outcome

The course aims to impart student with the analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Course Description

Unit-I

Curve Tracing And Applications Of Definite Integral: Two-dimensional curve tracing in Cartesian, polar and parametric forms, finding length of curves, volume and surface of solids of revolution, double points and point of inflexion

Unit-II

Techniques of One Variable Calculus: Leibnitz's theorem; n-th derivative off (x) at x = 0, Maclaurin's expansion of f (x) , Formation of Intrinsic and pedal equations, curvature, radius of curvature and centre of curvature in Cartesian, implicit parametric and polar forms

Unit-III

Calculus of Several Variables And Matrices: Taylor's expansion of a function of one & two variables, Lelbnitz's rule for differentiation under the sign of integration, Maxima and minima of a function of two variables, E1gen values and Eiqen vectors of a square matrix, properties of Eigen values, Applications of Cayley -Hamilton theorem.

Unit-IV

Ordinary Differential Equations: Orthogonal and Isogonal trajectories of a family of curves, Complementary function & Particular Integral of ordinary linear differential equations of higher order with constant and variable coefficients (Cauchy and Legendre forms), method of variation of parameters and solution of simultaneous differential equations with constant coefficients

Unit-V

Partial Differential Equations: Change of independent variables in P.D.E., Complete solution of homogeneous and non homogeneous L.P.D.E. of higher order with constant and variable coefficients.

Text Books

- A Text Book of Engineering Maths and Advanced Engineering Mathematics, Mathur & Jaggi, Khanna Publishers
- Elementary Engineering Mathmatics and Higher Engineering Mathematcs, B S Grewal, Khanna Publishers
- Higher Engineering Mathematics, B V Ramana, Tata McGrawHill

Reference Books

- Advanced Engineering Mathematics, Jain & Iyenger, Narosa Publishing House
- Engineering Mathematics, Vol.I by Kandasamy P etal.4th revised edition), Chand .S &Co., New Delhi, 2000.
- Advanced Mathematics for Engineering students, Volume I by Narayanan .S, Manicavachagom Pillay T.K, Ramanaiah, (2nd edition),S.Viswanathan Printers and Publishers, 1992.
- Engineering Mathematics – First Year (2nd edition), by Venkataraman .M.K., National Publishing Co., Chennai, 2000.

ELEMENTS OF ENVIRONMENTAL ENGINEERING

Paper Code CE-101	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

To provide detailed understanding of the components of environment and environmental degradation, concepts of ecosystem, renewable and non renewable resources, usage of water.

Course Learning Outcome

Students will gain adequate understanding of sustainable management of ecosystem and non renewable resources for the betterment of future.

Course Description

Unit-I

Introduction: Scope, components of environment and environmental degradation, need for public awareness; Sustainable Development; Environment and human health; Urban environmental problems; Environmental Ethics: issues and possible solutions.

Unit-II

Ecosystems: Concept of an ecosystem, structure and functions of ecosystem, producers, consumers and decomposers, energy flow in ecosystem, ecological succession, food chains, food webs and ecological pyramids; Introduction, types, characteristic features and function of forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystem.

Unit-III

Renewable and non-renewable resources: Natural resources and associated problems; Forest resources: use and over-utilization, deforestation, mining, dams and their effects on forest and tribal people; Water resources: use and over-utilization of surface and ground water, conflicts over water; Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources; Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

Unit-IV

Air Pollution: Atmospheric composition, sources of pollutants, primary and secondary pollutants; Effects of pollutants: effects on human health and property; Global implications of air pollution: green house effect, ozone layer depletion, acid rain. Noise pollution: sources, effects and standards of noise pollution.

Unit-V

Water resources: Surface and groundwater resources, water quality, major water pollutants, their origin and impacts on human and water bodies, effluent discharge standards. Water conservation measures, Rainwater harvesting.

Text Books

- Environmental Engineering Vol I, by Garg S. K., Khanna Publishers.
- Water Supply and Sanitary Engineering, by Birdie G.S & Birdie J.S, Dhanpat Rai & Sons.
- Elements of Environmental Engineering, by Duggal K N, S Chand & Co Ltd.

Reference Books

- Air Pollution Control Engineering, by Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Tokyo, 2004.
- Air Pollution Control Engineering, by Noel de Nevers, Mc Graw Hill, New York, 1995.

ENGINEERING MECHANICS

Paper Code ME-101	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To make students acquire the knowledge of force, moment, resolution of forces and comprehend free body diagrams and equilibrium equations.
- To understand the principle of centre of gravity for plane areas and solids; determination of the moment of inertia of plane areas and mass moment of area of solids.
- To introduce the concept of work energy principle, impulse momentum principle and kinematics of rigid bodies.

Course Learning Outcome

- Students will be able to draw complete free-body diagrams and write appropriate equilibrium equations from the free-body diagram, including the support reactions on a structure.
- Students will be able to calculate moments, centers of mass, and forces for particular structures.
- Students will be able to evaluate forces in trusses and analyse systems that include frictional forces.
- Students will be able to gain adequate understanding of translation and rotation, moving reference plain as well as energy momentum principle.

Course Description

Unit-I

Introduction: Force, moment, couple, Principle of Transmissibility, Varignon Theorem, Resolution of Forces, Concurrent and Non-concurrent Forces, Free body diagram, Equilibrium Equations.

Unit-II

Plane Trusses: Method of joints and sections, Laws of friction, Belt friction, Introduction to lifting machines.

Unit-III
Centroid: Center of gravity, First moment of area, Second moment of area, Mass M.O.I., Polar moment of Inertia, Transformations of axis.
Unit-IV
Equation of motion: General plane motion, Kinematics of a particle, Kinetics of particle, Work energy principle, Impulse momentum principle.
Unit-V
Kinematics of rigid bodies: Translation and rotation, plane motion, moving reference plane, velocity and acceleration, translatory motion, energy and momentum principle.

Text Books

- Vector Mechanics for Engineers by Beer and Johnson, Tata McGraw Hill
- Statics and Dynamics by Merium, Wiley Publishers.
- Engineering Mechanics by K. L. Kumar, Tata McGraw Hill.

Reference Books

- Engineering Mechanics: Statics and Dynamics, by Hibbeller, R.C and Ashok Gupta, 11th Edition, Pearson Education 2010.
- Engineering Mechanics – Statics and Dynamics, by Irving H. Shames and Krishna Mohana Rao. G., 4th Edition, Pearson Education 2006.
- Engineering Mechanics- Statics - Volume 1, by Meriam J.L. and Kraige L.G., Third Edition, John Wiley & Sons,1993.

BASICS OF ELECTRICAL ENGINEERING

Paper Code EES-101	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To understand and demonstrate the the fundamentals of electromagnetism, single phase transformers, electrostatics, and A.C. and D.C. circuits.
- To understand and apply the concept of electromagnetism for the working of the transformer.
- To understand and differentiate between electrical and magnetic circuits.
- To draw phase diagrams for single phase and three phase A.C. circuits.

Course Learning Outcome

- On completion of this course, student will be well versed with the working knowledge for the analysis of basic D.C. and A.C. circuits used in electrical and electronic devices.
- Course also aims to 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.

Course Description

Unit-I

DC Networks: Kirchoff's laws node voltage and mesh current methods; Delta-star-delta conversion: classification of network elements, superposition principle, thevenin's and norton's theorems.

Unit-II

AC Circuits: Single phase EMF generation average and effective values of sinusoids; solution of R, L, C series circuits, the j operator, complex representation of impedances: Phase diagram, power factor, power in complex notation; solution of parallel and series – parallel circuit; resonance. Introduction to three phase balanced circuits.

Unit-III

Magnetic circuits: Ampere's circuital law, B-H curve, solution of magnetic circuit: Hysteresis and eddy current loasses: Relays, an application of magnetic force.

Transformers: Construction, EMF, ratings; phase diagram on no load and full load; equivalent circuit, regulation and efficiency calculations; open and short circuits tests.

Unit-IV

DC Machines: Construction, EMF and torque equations; characteristics of DC generators and motors: speed control of DC motors and DC motors starters: Introduction, working principle, ratings, equivalent circuits of single phase induction motor.

Unit-V

Electrical Measuring Instruments: DC PMMC instruments, shuts and multiplier, multi-meters: Moving iron ammeters and voltmeters: Dynamometer wattmeters; AC watt-hour meters, extension of instrument ranges.

Text Books

- Basic Electrical Engineering, by D.C. Kulshreshtha, TMH, Revised First Edition.
- Electrical Technology, by E.Hughes, International Students 9th Edition, Pearson, 2005.
- Fundamentals of Electrical Engineering, by Rajendra Prasad, PHI, Third Edition, 2014.

Reference Books

- Basic Electrical Engineering by V. K. Mehta, S Chand and Co. Pvt. Ltd. New Delhi
- Basic Electrical and Electronics Engineering by Bhattacharya S. K.., Pearson

SECOND SEMESTER

SOCIAL SCIENCE

Paper Code AS-201	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To learn the basic concepts of personnel management or manpower planning and the process of recruitment and selection that they will go through as engineers.
- To learn leadership skills, industrial relations, work organizations, and impact of industry on society.
- To assist students understand the role of thinking in all forms of communication.
- To equip students with oral and appropriate written communication skills.
- To develop the awareness about personal, professional and social ethics

Course Learning Outcome

- Students will learn the ability to function as the leader, or member, of a multi-disciplinary team.
- The course aims to inculcate communication and problem solving skills and understand the influence of managerial attitude for efficient performance.
- Students will enhance holistic development improving their employability skills.

Course Description

Unit-I

Motivation and Work: Meaning, definition and types of human motivation, it's acquires learnt and inherent characteristics, significance of motivation for performance, Hertzberg's theory of motivation (1943).

Unit-II

Meaning of Organization: Formal and informal organization, similarities and differences therein, line and staff agencies, role and function of these agencies.

Unit-III

Communication: Definition, objectives and types of communication, superior, subordinate written and oral communications, effectiveness and barriers in communication.

Unit-IV

Management: Meaning and definition of management, roles and responsibilities of managers, characteristics of a successful manager.

Unit-V

A market survey and its interpretation on nay one of the following:
A socio- economic development issue (data based-secondary or primary).
An educational or organizational behaviour related issue.
A burning issue of the Indian Society-(rural/urban, male/female; a rich/poor); national / international.

Unit-III

Magnetic circuits: Ampere's circuital law, B-H curve, solution of magnetic circuit: Hysteresis and eddy current loasses: Relays, an application of magnetic force.
Transformers: Construction, EMF, ratings; phase diagram on no load and full load; equivalent circuit, regulation and efficiency calculations; open and short circuits tests.

Unit-IV

DC Machines: Construction, EMF and torque equations; characteristics of DC generators and motors: speed control of DC motors and DC motors starters: Introduction, working principle, ratings, equivalent circuits of single phase induction motor.

Unit-V

Electrical Measuring Instruments: DC PMMC instruments, shuts and multiplier, multi-meters: Moving iron ammeters and voltmeters: Dynamometer wattmeters; AC watt-hour meters, extension of instrument ranges.

Text Books

- Ethics in Engineering, by Mike W. Martin and Roland Schinzinger, Tata McGraw Hill, New Delhi, 2003.
- Engineering Ethics, by Govindarajan M, Natarajan S, Senthil Kumar V. S, Prentice Hall of India, New Delhi, 2004.
- Fundamentals of Ethics for Scientists and Engineers, by Edmund G Seebauer and Robert L Barry, Oxford University Press, Oxford, 2001 .

Reference Books

- World Community Service Centre, „ Value Education", Vethathiri publications, Erode, 2011.

ENGINEERING PHYSICS - II

Paper Code AS-202	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.

Course Learning Outcome

Course outcome exhibit strong skills in problem solving, leadership, teamwork, and understanding of fundamentals of nature.

Course Description

Unit-I

Special theory of relativity: Lorentz transformations and their consequences, relativistic momentum and energy.

Unit-II

Lasers: Einstein coefficients, ruby lasers, He-Ne lasers, semiconductors lasers, applications of lasers in research and industry.

Unit-III

Quantum Mechanics: Schrodinger equation, free particle solution, particle in a box, system of two independent particles, system of two identical particles.

Unit-IV

Solid State Physics: Classical and quantum statistics, fermi dirac and bose Einstein distributions, quantum mechanical free electron model, fermi energy, electrical conductivity of intrinsic and extrinsic semiconductors.

Unit-V
Frontiers of Physics: Big bang model of the universe, last nobel prize in physics.

Text Books

- Physics forTechnologists, by Thiruvadigal .J. D, Ponnusamy .S, Sudha.D and Krishnamohan .M Vibrant Publication, Chennai, 2013.
- Engineering Physics, by Dattu R.Joshi, Tata McGraw- Hill,New Delih,2010.

Reference Books

- Introduction to Solid State Physics, by Charles Kittel, Wiley India Pvt. Ltd, 7th ed., 2007.

ENGINEERING CHEMISTRY - II

Paper Code AS-203	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To enable the students to acquire knowledge in the principles of chemistry for engineering applications.
- To provide students with a solid foundation in basic scientific and engineering principles, while allowing specialization in applied chemistry, environment.

Course Learning Outcome

This course is intended to provide students with relevant experience using laboratory experiments and expertise using statistical tools for analyzing process data and designing experiments aimed at improving process operation and product quality.

Course Description

Unit-I

Water Treatment: Hardness of water, units of hardness, problems on hardness, scale and sludge formation in boilers, caustic embrittlement, boiler corrosion, priming and foaming, softening methods, problems on softening, chlorination, chemical analysis of water, (alkalinity and hardness), problem on analysis of water.

Unit-II

Fuel and Combustion: Fossil fuels, theoretical calculation of calorific value, bomb and boy's gas calorimeter, coal and its classification, analysis of coal and its significance, metallurgical coke and its manufacture, petroleum and its refining, knocking, octane number and cetane number, problems based on combustion.

Unit-III

Iron and Steel: Manufacture of pig iron, cast iron and its varieties, wrought iron, steel and its manufacture by Bessemer process, open hearth process, L & D process, Raoult's process, classification of steel effect of impurities on steel, heat treatment of steel.

Unit-IV

Lubricants: Types of lubrication, classification, liquid lubricants, grease. Solid lubricants, properties of liquid lubricants and greases, manufacture of Portland cement, chemical composition and constituents of Portland cement, setting and hardening of cement.

Unit-V

Corrosion, Ceramics and Refractories: Corrosion and its types, mechanisms of dry and wet corrosion, protection from corrosion, refractories, their manufacture and properties; neutral, acid and basic refractories, glass, its types and manufacture.

Text Books

- A Text Book of Engineering Maths and Advanced Engineering Mathematics, Mathur & Jaggi, Khanna Publishers
- Elementary Engineering Mathmatics and Higher Engineering Mathematcs, B S Grewal, Khanna Publishers
- Higher Engineering Mathematics, B V Ramana, Tata McGrawHill

Reference Books

- Advanced Engineering Mathematics, Jain & Iyenger, Narosa Publishing House
- Engineering Chemistry, by Jain.P.C and Monika Jain, Danpat Rai publishing company (P) Ltd, New Delhi, 2010.
- Engineering Chemistry – I, by Helen P .Kavitha, Scitech Publications, 2nd edition, 2008.

ENGINEERING MATHEMATICS – II

Paper Code AS-204	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

This course provides a quick overview of the concepts and results in complex analysis that may be useful in engineering. Also it gives an introduction to linear algebra and Fourier transform which are wealth of ideas and results with wide area of application.

Course Learning Outcome

To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Course Description

Unit-I

Three Dimensional Co-Ordinate Geometry and Multiple Integrals: Formation of equations of cylinder and cone under given geometrical conditions, tracing of some quadric (or Conicoids) three dimensional surfaces.

Evaluation of multiple integrals by change of order of integration, change of variables (use of Jacobiana).

Unit-II

Ordinary and Partial Differential Equations: Power series solution of ordinary differential equations of second order with variable coefficients (polynomials) by the method of Frobenius, complete solution of linear & non-linear P.D.E. of first order; Lagrange's method of undetermined multipliers, Charpit's method.

Unit-III

Complex Variables: Analytic function, C-R equation, geometrical representation of W = F (2), evaluation of complex contour integrals by Cauchy's integral theorem, Cauchy's integral formula associated with n^{th} derivative and Cauchy's residue theorem (without proof),

evaluation of real definite integrals.

Unit-IV

Laplace Transform: Laplace and inverse Laplace transforms of some well known elementary functions and special functions, change of scale, first and second shifting theorems, convolution theorem (without proof), Laplace transforms of derivative, integral, t^n f(t), f(t)/t, periodic function, Inverse Laplace transform and applications to simple differential equations.

Unit-V

Special Functions and Infinite Series: Generating functions, recurrence relations and orthogonal properties for Bessel's function J_n (x) and Legendre's polynomial P_n (x), test for convergence and divergence of positive term infinite series and alternating infinite series.

Text Books

- A Text Book of Engineering Maths and Advanced Engineering Mathematics, Mathur & Jaggi, Khanna Publishers
- Elementary Engineering Mathmatics and Higher Engineering Mathematcs, B S Grewal, Khanna Publishers
- Higher Engineering Mathematics, B V Ramana, Tata McGrawHill

Reference Books

- Advanced Engineering Mathematics, Jain & Iyenger, Narosa Publishing House
- Engineering Mathematics, by Veerajan. T, Tata McGraw Hill Publishing Co, New Delhi, 5th edition, 2006.
- Engineering Mathematics, by Kandasamy P etal. Vol.I (4th revised edition), Chand .S &Co., New Delhi, 2000.

ELEMENTS OF CIVIL ENGINEERING

Paper Code CE-110	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To study the engineering properties of the materials and solids and analyze the same to evaluate the stress –strain behaviour.
- To analyze the internal forces for the statistically determinate and compound beams having internal hinges with different types of loading.
- To understand the concept and behaviour of flexural members (beams) in flexure and shear, solid circular shaft for tension, thin shells for internal stresses.
- To introduce the concept of strain energy for axial, flexure, shear and torsion.
- To study the behaviour of axially loaded columns using different theories available for the analysis with various end conditions.

Course Learning Outcome

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

- Understand and determine the engineering properties for metals and non metals.
- Understand the concepts of shear force, bending moment, axial force for statically determinate beams and compound beams having internal hinges; and subsequently, its application to draw the shear force, bending moment and axial force diagrams.
- Study the behaviour of the structural member under the action of axial load, bending and twisting moment.
- Study the deformation behaviour of axially loaded columns having different end conditions and further, evaluate the strength of such columns.

Course Description

Unit-I

Stresses & strains: Introduction, normal stress & strain, shear stress & strain, relationship between stress and strain, Uniaxial tension test: Stress-Strain diagrams for different materials, Mechanical properties of materials: isotropy, homogeneity, continuity, elasticity, brittleness, yielding, plasticity, work hardening, ductility, hardness, toughness, creep, relaxation, fatigue;

Uniaxial deformations: Saint Venant's principle, principle of superposition, free body diagrams, bars of uniform cross sections.

Unit-II

Uniaxial Deformations: bars of variable cross sections, compound/ composite bars, temperature stresses.

Unit-III

Analysis of stresses: tensor notations, equilibrium equations, transformation of stresses, invariants of stress tensor, plane stress condition, principal stresses, maximum shear stress and their planes, Mohr's circle.

Unit-IV

Analysis of strains: transformation of strains, invariants of stain tensor, plane strain condition, principal strains, maximum shear strain and their planes; Strain Rosettes; Stress –Strain relationship, generalized Hooke's law, relation between elastic constants.

Unit-V

Structures and their forms: Loads, idealization of structures, supports and connections, elastic and linear behaviour of structures, determinate and indeterminate structures, SF & BM: relation between B.M., S.F. and loads, S.F. & B.M. diagrams in statically determinate simply supported (without overhang) and cantilever beams subjected to concentrated loads and UDL.

Text Books

- Engineering Mechanics of Solids By E.P. Popov, Pearson Education.
- Solid Mechanics by S.M.A. Kazimi, Tata McGRAW HILL.
- Mechanic of Materials by R.C. Hibbeler, Pearsons.

Reference Books

- Mechanics of Materials by Beer & Jonhston, Dewolf, McGRAW HILL.
- Strength of Materials by S. Timoshenko
- Strength of Materials by R. K. Rajput

THERMODYNAMICS

Paper Code ME-201	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To understand the principles basic principles of energy systems.
- To understand the laws of thermodynamics.
- To understand a wide range of thermodynamics cycles.
- To understand real life applications of thermodynamic principles.

Course Learning Outcome

- By the end of this course, students will be able to understand the thermodynamics implication and thermodynamics explanation for the states of matter.
- Students will also gain knowledge in understanding and applying basic energy conservation equations for kinetic, potential and flow energies.

Course Description

Unit-I

Thermodynamics system: control volume, properties of a system, thermal equilibrium, zeroth law and concept of temperature, wok, displacement work in various quasi-statics processes, heat, first law of thermodynamics, internal energy, enthalpy, first law for control volume, application of first law to non-cyclic process, steady flow energy equation.

Unit-II

Second law of thermodynamics: Kelvin-Plank and Clausius statement, reversible and irreversible process, the Carnot cycle, thermodynamic temperature scale, entropy. Physical interpretation of entropy, corollaries of the second law.

Unit-III

Combined first law and second law equations: entropy calculation through T-ds relations, Maxvel's relation, Clausius inequality, equations for specific heats, Carnot cycle, thermodynamics temperature scale.

Unit-IV
Properties of pure substance: use of steam tables and Mollier diagram, ideal gas, properties of ideal gas.
Unit-V
Real gas: equation of state, Vander-Walls equation, compressibility factor, generalized charts for compressibility, principles of corresponding state, fungacity, properties of steam.

Text Books

- Fundamentals of Engineering Thermodynamics, 6th Edition, M. J. Moran and H. N. Shapiro, 2008, John Wiley & Sons
- THERMODYNAMICS- An Engineering Approach, 6th or Latest Ed., by Y.A. Cengel and M.A. Boles, McGraw-Hill, Boston, MA.

Reference Books

- Fundamentals of Thermodynamics, by C. Borgnakke and R.E. Sonntag, 7th Edition, John Wiley and Sons, Inc., 2009.

BASICS OF ELECTRONICS AND COMMUNICATION ENGINEERING

Paper Code EC-201	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

This course provides comprehensive idea about working principle, operation and characteristics of electronic devices, transducers, Digital Electronics and Communication Systems.

Course Learning Outcome

At the end of the course students will be able to gain knowledge about the fundamentals of electronic components, devices, transducers as well as principles of various communication systems.

Course Description

Unit-I

Semiconductor Diodes: P-N junction diode, V-I characteristics, static and dynamic resistance, linear and non-linear applications of diodes: AND, OR gates etc., half wave, full wave and bridge rectifiers, zener diode, characteristics and its use as a voltage regulator.

Unit-II

Transistors (Bipolar and FET): Bipolar junction transistor(BTT), biasing and amplifier action, load line analysis of transistor amplifier, BJT amplifier configurations and their comparison, operational amplifier basics, practical op-am circuits: inverting amplifier, non-inverting amplifier, summing amplifier, integration and differentiations.

Unit-III

Feedback and Electronic Instruments: Feedback concept, principle of operation and working of oscillator: wein bridge and phase shift oscillator, cathode ray oscilloscope (CRO), electronic multi-meters.

Unit-IV
Communication Systems: Introduction to modulation, amplitude modulation: generation of AM waves, demodulation of AM waves, introduction to FM.
Unit-V
Elements of Information Technology: Data Vs information, digital modulation, modems, computer networking in block diagram.

Text Books

- Engineering Basics: Electrical, Electronics and Computer Engineering, by Thyagarajan .T, SendurChelvi .K.P, Rangaswamy .T.R, New Age International,Third Edition, 2007.
- Basic Electronics, by Somanathan Nair .B, Deepa .S.R, I.K. International Pvt. Ltd., 2009.

Reference Books

- Electronic Devices, by Thomas L. Floyd, Pearson Education, 9th Edition, 2011.
- Basic Electrical and Electronics Engineering, by Rajput .R.K, Laxmi Publications, First Edition, 2007.

FUNDAMENTALS OF COMPUTING

Paper Code CS-201	**(Lectures-Tutorial-Practical)/Week (2-1-0)**
Credits 3	**Course Marks (Mid-End-Total) (30-45-75)**

Course Objectives

- To enable the students to familiarize with mathematical models and numerical tools for solving and optimizing engineering problems.
- To introduce the fundamentals of algorithm and C programming.

Course Learning Outcome

- Students will be able to use standard software packages for civil engineering analysis.
- Will enable students to familiarize with mathematical models and numerical tools for solving and optimizing engineering problems.

Course Description

Unit-I

Introduction to computers: Computer hardware-classification (microcomputer, minicomputer, mainframe, supercomputer), components of modern computer systems, personal computer (PC), systems software –introduction to operating systems, file and directory to editors, basic features, different types of editors (text, graphics etc), overview of major editors (word star, edit, turbo C editor, notepad and vi editor), graphics editor.

Unit-II

Fundamentals of algorithm and C programming: Introduction to algorithm, flow chart, algorithms of simple problems determining minimum, series computation, factorial computation, sorting etc. Fundamentals of C programming. Primitive data type (int chart, float, long, double), enumerated type, constants, variables inpu and output functions, comments.

Unit-III

Operator, Expressions and Control Constructs: Operators, expressions, arrays, If-else, switch, loops (for, while, do while), break, continue, goto and labels.

Unit-IV

Other topics in C: Functions and program structure, scope rules, variables (external, static,

register). Structures, unions, pointers, typeset, file operations, library function (mathematical, string, random number generation, dynamic memory allocation).

Unit-V

Computer networks and engineering application: Computer networks introduction, LAN, WAN, Internet, networking equipment. Engineering applications – list of major engineering applications, overview of some engineering application software (math CAD, Auto CAD etc.).

Text Books

- Introductory Methods of Numerical Analysis, by Sastry S.S., Prentice Hall of India
- Numerical Mathematical Analysis, by Scarborough J.B., Oxford and IBH
- Engineering Optimization-Theory and Applications, by Rao S.S., New Age International Publishers

Reference Books

- Numerical Algorithms, by Krishnamoorthy E.V. and Sen S.K., Affiliated East West Press
- Optimum Structural Design, by Kirsch U., McGraw Hill
- Optimization Methods for Engineering Design, by Fox R.L., Addison Wesley

THIRD SEMESTER

FLUID MECHANICS

Paper Code CE-201	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To learn the importance, application and inter-relationship of various properties of fluid like mass density, viscosity, and surface tension.
- To study the properties of static and moving fluid like velocity and acceleration, and the forces on fluid through the continuity equation, Euler's and Bernoulli's equations.
- To determine the forces on plane and curved surfaces in a fluid at rest and the concepts of buoyancy and metacentre.

Course Learning Outcome

Completion of this course will enhance the knowledge in context to the fundamentals of fluid flow and its behaviour and to equip students to conveniently handle fluid mechanics related problems.

Course Description

Unit-I

Introduction: Real and ideal fluids, concept of continuum approximation, properties of fluids, equation of state, coefficient of compressibility, bulk modulus of elasticity, Newtonian and non- Newtonian fluid, coefficient of thermal expansion, surface tension, capillarity, concept of viscosity, effect of temperature on viscosity.

Unit-II

Fluid Static: Pascal's law, devices based on Pascal's law, hydrostatic law, pressure variation in isothermal and adiabatic condition; Manometry: Simple and differential manometers, relative equilibrium; Forces on submerged plane, inclined and curved surfaces; Buoyancy; Stability of floating and submerged bodies, meta center and meta centric height.

Unit-III

Fluid Kinematics: Kinematics of fluid Motion, Eulerian and Lagrangian description, type of motion, concept of control volume and control surface, streamline, path line, streak line and

stream tube, continuity equation in cartesian coordinate and polar coordinate, one and two dimensional flows, acceleration of fluid element, normal and tangential accelerations, linear momentum equation and its applications- forces on pipe bends, vanes, jets and propellers.

Unit-IV

Fluid Rotation: Vorticity and angular velocity in terms of velocity field, irrotational flow, velocity potential and stream function, flow net and its uses, free and forced vortex motion, ideal fluids flow, source and sink, doublet, flow past a stationary and rotating cylinder, Magnus Effects.

Unit-V

Fluid dynamics: Naivier- Stoke's equation, Euler's equation of motion and integration along streamline; Bernoulli's equation, physical significance of different heads, Bernoulli's equation for isothermal and adiabatic flow; Application of Bernoulli's equation: pitot tube, current meter, venture meter, orifice meter, mouth pieces; Calibration of flow measuring devices and its applications, Concept of kinetic energy, and momentum correction factors; Flow through an orifice; Flow over a weir and notch; Time required for emptying of tank.

Text Books

- Fluid Mechanics by Daugherty, Robert L., McGraw Hill
- Fluid Mechanics by R.J. Garde., New Age International Publishers
- Fluid Mechanics by A.K. Jain, Khanna Publishers
- Fluid Mechanics by S.K. Som, Tata McGraw Hill

Reference Books

- Fluid Mechanics, by Duncan, Tom & Young, ELBS
- Engineering Fluid Mechanics, by Kumar .K.L, Eurasia Publishing House, 2002.

MECHANICS OF SOLIDS

Paper Code CE-202	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- Resolution of forces and to comprehend free body diagrams; determination of stresses and strains.
- To analyse the state of stress (two and three dimensional) and evaluate the principal stresses and principal planes by analytical and graphical treatment.
- To study the behaviour of determinate beams and examine the internal forces, stresses induced and learn the theory of torsion and stresses developed in solid hollow shafts and helical springs.

Course Learning Outcome

Students will be able to learn about the stress distributions inside simple structural elements such as bars, beams, shafts under their specific external load, axial load, bending and shear force as well as torsion.

Course Description

Unit-I

Thin Cylindrical shells: Longitudinal and hoop stresses, volumetric strains; Thick Cylinders: Lame's equations, stresses due to internal and external pressure; Torsion: Circular and non-circular shafts, power transmitted by shafts; Concept of strain energy and resilience; Theories of failure.

Unit-II

Shear force and Bending moment: SF and BM Diagrams for simply supported over-hanged and cantilever beams subjected to moments and varying loads; SF, BM & Torque Diagrams for inclined beams & brackets subjected to concentrated load, udl, moments and varying loads.

Unit-III

Bending in beams: Bending theory, bending equation, bending stresses in rolled steel and built up sections; Shear stresses in beams: shear flow, shear centre, variation of shear stresses

in beam cross-section.

Unit-IV

Deflection of beams: Direct integration and Macaulay's methods for simply supported and cantilever beams subjected to concentrated loads, uniformly distributed loads, varying loads and moments.

Unit-V

Columns and struts: Columns and struts subjected to compression and bending, middle third & middle fourth rules, core or kernel of sections, masonry column, dams and retaining walls; Long columns: Euler's, Rankine's and Secant formulae.

Text Books

- Engineering Mechanics of Solids By E.P. Popov, Pearson Education.
- Solid Mechanics by S.M.A. Kazimi, Tata Mcgraw Hill.
- Strength of materials by S. Ramamrutham & N. Narayan, Dhanpat Rai Publishing Company
- Mechanic of Materials by R.C. Hibbeler, Pearsons.

Reference Books

- Mechanics of Materials by Beer & Jonhston, Dewolf, Mcgraw Hill.
- Strength of Materials by R. Subramanian, Oxford University Press
- Strength of Materials by R. K. Rajput

ENGINEERING GEOLOGY

Paper Code CE-203	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To study the origin, development and ultimate fate of various surface features of the earth/lithosphere.
- To understand the nature of geographic distribution of rocks and engineering properties of rock.
- To understand the nature of geological structures and their importance in civil engineering structures.

Course Learning Outcome

- Students shall be familiar with physical and structural geology as well as the basics of mineralogy and petrology.
- The course aims that student will understand the basics and application of engineering geology technology.

Course Description

Unit-I

Introduction: Definition and Scope of Engineering Geology with its importance in Civil Engineering. Physical properties of Rock forming Minerals, introduction of Rocks, mode of formation and classification of sedimentary and igneous rocks, agents of metamorphism and zone of metamorphism, physical and engineering properties of some important rocks.

Unit-II

Weathering: Mechanical and chemical weathering, erosion; erosion by running water and wind fold; study of various types of folds, faults; study of various types of faults, joint; study of various types of joints, civil engineering significance of folds, faults and joints.

Unit-III

Materials: Application of rocks as an engineering materials, building stone, groundwater, concepts of zone of aeration and saturation, land slides, land subsidence, earthquake,

classification of earthquake zones in India and its civil engineering significance.

Unit-IV

Properties of rocks: Physical properties of Rock Forming Minerals, Engineering Properties of Igneous Sedimentary and Metamorphic Rocks. Impact of Rock properties on properties of concrete. Mineral Composition of Rocks affecting the properties of Concrete at its Fresh Stage.

Unit-V

Geological investigation techniques: Geological investigations of Dam site and reservoir, bridges, highways, buildings and tunnels. Application of software for the solution of engineering geologic problems. Application of software for interpretation of sub-surface geological strata.

Text Books

- A Text Book of Geology by P. K. Mukharji
- Geology for Engineers By Dr. D.S. Arora
- Engineering Geology Pabeen Singn
- Geology for Engineers by Krenin & Judd

Reference Books

- Geology and Engineering, by Legeet, McGrawHill Book Company, 1998.
- Geology for Engineers, by Blyth, ELBS, 1995.

NUMERICAL METHODS

Paper Code AS-201	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To familiarise with numerical solution of equations.
- To get exposed to finite differences and interpolation.
- To be thorough with the numerical Differentiation and integration.
- To find numerical solutions of ordinary differential equations.
- To find numerical solutions of partial differential equations.

Course Learning Outcome

Through this course students shall gain analytical ability in solving mathematical problems as applied to the respective branches of Engineering.

Course Description

Unit-I

Roots of equation, Bracketing Methods: Graphical methods, bisection method, false-position method, open methods: simple one point iteration, Newton Raphson method, secant method, multiple roots, system of non-linear equations.

Unit-II

System of linear algebraic equations: Gauss elimination method, matrix inversion method, error analysis and system condition, Jacobi method, Gauss Seidel method, LU Decomposition methods, Crout Decomposition, Banded systems, Cholesky Decomposition, eigen values and eigen vectors problems.

Unit-III

Curve fitting: least squares regression: linear regression, polynomials, lagrange interpolating polynomials, spline interpolation, Newton's Forward, Backward and Central Difference formula, Sterling's formula. Fourier approximation.

Unit-IV

Numerical differential and Integration: Newton-Cotes integration formulas: Trapezoidal rule, Simpson's rule, integration with unequal segments, open integration formulas, Integration of equations: Romberg integration, Gauss Quadrature, improper integrals. Numerical Differentiation: High- Accuracy Differentiation formulas, Richardson extrapolation, Derivatives of unequally spaced data.

Unit-V

Ordinary Differential equations: Euler's method, modification and improvements of euler's method, Runga – Kutta methods, taylor's series method, boundary value problems.

Partial Differential Equations: Finite Difference – Elliptic equations; Laplace equation; Parabolic equation, explicit method, implicit method, Crank – Nicolson method, Parabolic equations in two spatial dimensions.

Text Books

- Numerical Methods for Scientific and Engineering Computations; Jain, Iyengar and Jain; New Age International Pvt. Ltd.
- Introductory Methods of Numerica Analysis; S S Shastri; Prentice Hall of India Pvt. Ltd.
- Numerical Methods for Engineers; S C Chapra, R P Canale, Tata McGrawHill
- Numerical Methods in Engineering and Science, B S Grewal, Khanna Publishers

Reference Books

- Numerical Methods in Science and Engineering by M.K. Venkataraman, National Publishing Co.
- Computer Oriented Statistical and Numerical Methods by Balagurusamy .E,

SURVEYING

Paper Code CE-205	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To measure the land area by chaining, compass and plane table.
- To measure the elevation of points using dumpy level.
- To measure the height and distance by theodolite.
- To know about the application of tacheometric surveying.
- To know about the curves, contouring and setting out works for construction purposes.

Course Learning Outcome

The course aims to prepare students to measure the land area, to prepare map and to find out the elevation of a point for constructional purpose.

Course Description

Unit-I

General Introduction: Plane and geodetic surveying; classification of surveying; basic principles; measurement of horizontal distance by conventional methods; taping on sloping ground, offsets, errors and sources of errors, field book. Levelling: definition of terms, levelling principle, levelling instruments, types of spirit leveling, methods of booking and reduction of levels, sensitiveness of level tube, errors in leveling, curvature and refraction correction.

Unit-II

Compass Survey: Introduction, types of bearings and Compasses, conversion of bearings, magnetic declination. Theodolite Traversing: introduction, types of theodolite, definitions of terms, temporary and permanent adjustments, measurement of horizontal angles, methods of repetition and reiteration, measurement of vertical angles, traverse measurement and computation of coordinates, omitted measurements.

Unit-III

Plane Table Surveying: Instruments employed in plane table survey, working operation like fixing, levelling, centering and orientation, methods of orientation, various methods of plane table survey; errors in plane table survey. Tacheometry: introduction and importance, stadia and tangential methods, use of subtense bar.

Contouring: importance, contour interval, characteristics, direct and indirect methods, uses of contours

Unit-IV

Area and VolumeComputation: Computation of area by different methods, estimation of volume of earthwork by means of sections and contour lines. Setting out of building and tunnel reconnaissance, preliminary and detailed Survey for canals, highways, railways, sewer lines

Unit-V

Horizontal curves: Elements and geometry of horizontal curve, setting out of simple curves by linear and angular methods; compound, reverse and transition curves; Vertical curves: introduction, types of vertical curve, setting out of vertical curve.

Text Books

- Surveying and Leveling, T. P. Kanetkar and S.V.Kulkarni Vol.1 & 2, Vidhyarthi Griha, Prakashan,Pune
- Plane and Geodetic Surveying for Engineers, David Clark and Jackson J. E., CBS Publications and distributors, New Delhi.
- Surveying, B. C. Punmia and Jain Vol.1 , 2 Laxmi Publications, New Delhi
- Advanced Surveying, Agor, Khanna Publications,Delhi.

Reference Books

- Surveying-Bannister, Raymond and Baker, Pearson Education
- Surveying, S. K. Duggal Vol 1& 2, Tata Mcgraw Hill Publications,New Delhi.

Software or other Requirement

- SKI GPS 3.2 data processing software
- AUTO CAD

CIVIL ENGINEERING MATERIALS

Paper Code CE-206	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To study details regarding properties and testing of building materials
- To study details regarding the construction of building components
- To study the properties of concrete and concrete mix design and basic concepts in planning of buildings
- To make the students understand characterization of various materials used for making concrete and their interaction

Course Learning Outcome

- Student will be familiar with different types of building material and the proportions of ingredients of concrete based on desired properties.
- Student will be able to assess the properties of ingredients, their influence on properties of concrete

Course Description

Unit-I

Cement: Compounds & propositions, types of Portland cement, pozzolanic cement, high alumina cement and other types, hydration mechanism and hydration products, setting and hardening, curing, strength of hardened cement, grade of cement, tests on cements, relevant BIS codes.

Unit-II

Aggregates: properties of coarse & fine aggregates, tests on aggregates, relevant BIS codal provisions; Concrete: Ingredients of concrete, properties of fresh and hardened concrete, strength of concrete, W/C ratio & porosity, additives and their types, concrete mix design.

Unit-III
Special Concretes: Reinforced cement concrete, polymer concrete, fiber reinforced concrete, ferrocement, light weight concrete, roller compacted concrete, ready mix concrete, self compacting concrete, high performance concrete, bacterial concrete.
Unit-IV
Bricks & Stones: Forms of bricks, properties of bricks and stones, tests on bricks and stones, relevant BIS codes; Timber: structure of wood, defects in timber, seasoning, preservation; Plywood and its manufacturing.
Unit-V
Other materials: Flyash, paints & varnishes, gypsum, tar, bitumen & asphalt, nano materials, smart materials, composit materials, geosynthetics, heat & sound insulating materials, water proofing materials.

Text Books

- Building Materials by S K Duggal
- Engineering Materials by S C Rangwala
- Concrete Technology by M L Gambhir
- Properties of Concrete by A M Neville

Reference Books

- Engineering Materials by R K Rajput
- Civil Engineering Materials by Neil Jackson
- Design of Concrete Mixes, by Krishna Raju N, CBS publishers.
- Concrete Technolgy, by Neville A.M.and Brooks.J.J, Pearson Education.
- Concrete: Properties & Manufacture, by Akroyd T.N.W, Pergamon Press.

FOURTH SEMESTER

STRUCTURAL ANALYSIS - I

Paper Code CE-210	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To calculate loads for structural analysis.
- To identify determinate, indeterminate, stable and unstable structures.
- To determine forces and deflections in determinate trusses, beams and frames.
- To determine forces in indeterminate trusses, beams and frames by the force method.

Course Learning Outcome

Upon compilation of this course students should have acquired adequate knowledge of advanced concepts in strength of materials like deflection, energy principles, stability criteria, theories of failure, unsymmetrical bending, behaviour of curved bars and locating shear centre.

Course Description

Unit-I

Forms of Structures: beams, trusses, arches, cables, industrial frames, multistory building frames, shell structure etc.; Loads: DL, imposed loads (LL, WL, seismic load, snow load, erection load etc.); Idealization of structures; types of supports; stability and static determinacy & indeterminacy to beams & frames; free body diagram; Arch structures: 3-hinged parabolic & circular arches, thrust, radial shear and bending moment diagram, spandrel braced arches.

Unit-II

Deflection of beams: Moment area method, conjugate beam method, application of these methods to statically determinate beams & frames; Flexural stiffness of beam with far end pinned & fixed, carry over factor, fixed beams, propped cantilever beam.

Unit-III

Energy methods: Forms of elastic strain energy, axial stress, shearing stress, multi-axial state of stress; Impact load, suddenly applied load, gradually applied load, static load, quasi-static load; Strain energy in members: axial loaded members, under bending, under shearing, circular members under torsion; Law of conservation of energy: virtual work, virtual work on

rigid body, virtual work on elastic body; Betti's law and Maxwell's law of reciprocal deflection, application of virtual work on beams (application of product integral table); flexural stiffness of beam with far end pinned; Deflection of statically determinate rigid frames.

Unit-IV

Deflection of pin jointed plane trusses: Method of virtual work; Unit load method; Castigliano's theorems, application of Castigliano's theorems to brackets, lamp posts & curved members; Deflection of truss due to temperature variation; fabrication error and camber.

Unit-V

ILD and its application to determinate structures: Beams, trusses & 3-hinged arches, uses of ILD to statically determinate beams, trusses & arches.

Text Books

- Mechanics of Materials by R. C. Hibbeler, Pearsons
- Structural Analysis by C. S. Reddy, Tata McGrawHill
- Intermediate Structural Analysis by C. K. Wang, Tata McGrawHill
- Structural Analysis by Pandit & Gupta, Tata McGrawHill

Reference Books

- Engineering Materials by R K Rajput
- Civil Engineering Materials by Neil Jackson
- Strength Of Materials, by Ramamrutham .S, Narayan .R, Dhanpat Rai Publishing Company Pvt. Ltd.
- Strength Of Material", Khurmi .R.S, 23rd" edition, S. Chand Limited, New Delhi.
- Mechanics for Engineers, "Beer and Johnson , Statics and Dynamics", McGraw Hill.
- Advanced Mechanics of Materials, Fred B. Seely, James Ohrea Smith, Wiley.

GEOINFORMATICS

Paper Code CE-211	**(Lectures-Tutorial-Practical)/Week(3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To understand advanced concepts of surveying by using basic instruments to study modern trends in surveying.
- To study the various Hydrographic Surveying Techniques.
- To know the basics, importance, and methods of Triangulation and Trilateration.
- To understand the working principle of advance surveying Instruments like EDM, Total Station and GPS.
- To learn the importance and different aspects of remote sensing.

Course Learning Outcome

- After completion of this course student will gain adequate knowledge of different aspects and advancements in Geoinformatics.
- The course will enable the students to understand hydrographic surveying, EDM, Global Positioning System and Photogrammetry and Remote Sensing.

Course Description

Unit-I

Field Astronomy: Astronomical terms, coordinate systems, solution of astronomical triangle; kinds of time, conversion of time; corrections to the observed altitude; determination of azimuth and latitude.

Unit-II

Triangulation: Principle & classification, triangulation figures and systems, selection of stations; inter-visibility and height of stations; satellite station and reduction to centre.

Trigonometrical Levelling: plane and geodetic observations.

Unit-III

Electronic Distance Measurement (EDM): Importance, principle, classification; Applications of total station

GPS: Introduction, principle and applications

Errors and Adjustments: Kind of errors, weight of observation, general principles of least

square; conditioned equation and normal equation; triangle and station adjustments.

Unit-IV

Photogrammetry: Introduction, geometric characteristics of aerial photograph, scale of a vertical and tilted photograph; determination of horizontal ground length from photo-coordinates; relief displacement; flight planning; image parallax and stereoscopy.

Unit-V

Remote Sensing: Introduction, principles, electromagnetic energy and its interaction with matter; sensors and platforms, image interpretation.

Geographic information system (GIS): Overview, definition, components, data models.

Text Books

- Surveying and Leveling, T. P. Kanetkar and S.V.Kulkarni Vol. 2, Vidhyarthi Griha, Prakashan,Pune
- Surveying-Bannister, Raymond and Baker, Pearson Education
- Surveying, B. C. Punmia and Jain Vol. 2 & 3 Laxmi Publications, New Delhi
- Advanced Surveying, Agor, Khanna Publications, Delhi.

Reference Books

- Plane and Geodetic Surveying for Engineers, David Clark and Jackson J. E., CBS Publications and distributors, New Delhi.
- Surveying, S. K. Duggal Vol 2, Tata Mcgraw Hill Publications,New Delhi.
- An Introduction to Geographical Information System, Ian Hewood, Sarah Cornelius, Steve Carver and Srinivas Raju, Pearson Publication
- Remote Sensing: Principle and Introduction, Sabins, Floyd F. ; W. H. Freeman and Company

Software or other Requirement

- ERDAS Imagine
- ArcGIS
- Arcview

HYDRAULICS

Paper Code CE-212	**(Lectures-Tutorial-Practical)/Week (3-1-3)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce students with working principle of pumps and turbines.
- To study the properties of a moving fluid like velocity and acceleration, and the forces on fluid through the continuity equation, Euler's and Bernoulli's equations.
- To study laminar and turbulent flow in pipes, major and minor losses in pipes.
- To study the fundamentals of dimensional analysis and model studies.

Course Learning Outcome

This course will enhance knowledge in context to the fundamentals of fluid flow and its behaviour and to equip students to conveniently handle hydraulic engineering problems.

Course Description

Unit-I

Dimensional and Model Analysis: Dimensional analysis and its utility; Buckingham's pi-theorem and Raleigh's method and their application to fluid flow problems; Dimensionless parameter in fluid flow and their relevance; Similarities: Application of dynamic similarity to model investigations, scale ratio for distorted model.

Unit-II

Laminar flow: Flow through circular pipes, flow through parallel plates and coaxial cylinders, power absorbed in viscous flow, concept of friction factor, measurement of viscosity, Reynolds's number and its significance;Boundary Layer:Boundary layer along a thin plate and its characteristics, laminar and turbulent boundary layer, laminar sub- layer; Displacement, energy and momentum thickness, separation of boundary layer and its control, drag and lift.

Unit-III

Turbulent Flow: Nature of turbulent flow and its origin, Reynolds's stress, Prandtl's mixing length hypothesis; Momentum integral equation; Hydro dynamically smooth and rough boundaries; Establishment of laminar and turbulent flow in a pipe; Velocity distribution for turbulent flow in smooth and rough pipes; Friction factor in smooth and rough pipes,

Moody's diagram, Colerbrooks equation.

Unit-IV

Pipe flow: Hazen William & Darcy Weisbasch equation, minor and major losses, hydraulic gradient and total energy line; Pipes in series and parallel; Concept of equivalent length, Dupuits equation; Siphon, water hammer, two & three reservoir problem, pipe network, Hardy cross method, Time of emptying a reservoir through a pipe, power transmission through pipes.

Unit-V

Pumps: Reciprocating Pumps, working principal of both double and single reciprocating pump, indicator diagram frictional loss, centrifugal pump, their advantages over reciprocating pump, classification of centrifugal pump, operation of centrifugal pump in series and parallel.

Turbine: General layout of hydroelectric power plant, impulse and reaction turbines, efficiency of turbines, classification based on discharge, head and specific speed, unit power and unit discharge.

Text Books

- Fluid Mechanics by Daugherty, Robert L., McGraw Hill
- Fluid Mechanics by R.J. Garde., New Age International Publishers
- Fluid Mechanics by A.K.Jain, Khanna Publishers
- Hydraulics by Modi & Seth, Standard Publishers

Reference Books

- A Text Book of Fluid Mechanics and Hydraulic Machines, by Bensal R K, Laxmi Publications
- Fluid Mechanics, by Streeter V.L., McGraw Hill
- Theory and Applications of Fluid Mechanics, by Subramanya K., Tata McGraw HillDuncan, Tom & Young, Fluid Mechanics, ELBS

Software or other Requirement

- LOOP 4
- FLOWNET

BUILDING CONSTRUCTION

Paper Code CE-213	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

The purpose of this course is to impart students the basic knowledge about building construction materials, types of roofs and floors, stairs and escalators and overall standardization of structure.

Course Learning Outcome

Student will be well versed in selecting cost effective construction material and essential components of any type of building.

Course Description

Unit-I

Foundation: Functions of foundations, essential requirements of a good foundation. Types of foundations: shallow foundations, deep foundations.

Unit-II

Masonry: Stone masonry and brick masonry, different terms used in masonry, bond and its types; Composite masonry; panel walls, load bearing walls, compound walls, cavity walls, partition walls.

Unit-III

Floors and Roofs: Flooring: general considerations, different types of floorings. Flat–Floor and Flat-Roof construction: different types of upper floors.

Sloped roofs: types of sloped roofs.

Stairs and escalators: requirements of a good stair, location and types.

Unit-IV

Doors and windows: Doors, windows and ventilators: location, size, classification and details.

Lintels and arches: Different types.

Building Finishes : Plastering, pointing, painting and polishing, white / colour washing, plastic paints.

Formwork: Shuttering and scaffolding.

Unit-V

Damp proofing and water proofing: Treatment to floors, walls and basement. Miscellaneous topics -Fire protection, thermal and sound insulation of buildings.

Text Books

- Building Construction by BC Punmia, Ashok Kumar Jain, Arun Kumar Jain Laxmi Publications (P) Ltd, New Delhi
- Building Construction by P.C. Varghese, Prentice Hall of India Pvt.Ltd, New Delhi
- Building Construction & Material by Gurcharan Singh Rajsons Publication Pvt. Ltd, New Delhi.
- Building Construction by Sushil Kumar Standard Publishers Distributors, Delhi

Reference Books

- Jagman Singh – Heavy Construction – Planning, Equipment an Methods, Oxford & IBH Publishing Co.
- Construction Equipment, by James E. Russell, Reston Publishing Company, Inc.,Virginia.

COMPUTER SYSTEM AND APPLICATIONS

Paper Code AS-214	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

To enable the students to familiarize with mathematical models and numerical tools for solving and optimizing engineering problems through C and C++ language.

Course Learning Outcome

Upon completion of this course, students will be able to solve mathematical and optimization problems with C and C++ programming language and data handling.

Course Description

Unit-I

Review of C-language and simple mathematical programs: Programming preliminaries, C-tokens, numeric constants and variables, arithmetic expression, input/output statement, control/conditional statements, looping, while loop, do-while loop, for loop and nested loops, breaking control/jump statements, arrays, functions, strings, recursion and pointers.

Unit-II

Fundamental of C++ programming and its applications to mathematical and engineering problems: Introduction, programming preliminaries, features available in C++ over C, concept of object oriented programming, differentiate with structured programming, similar statements of C and C++, I/O statement, continuing, looping and breaking statements, header files, stream manipulators, functions, arrays, introduction to objects and classes, constructors and destructors.

Unit-III

Computer programs for the following methods using c/c++: Newton forward and backward interpolation formulae, Newton divided difference interpolation formula, Lagrange interpolation formula and its inverse interpolation, operation on matrices, sorting and searching problems, fitting straight lines and a parabola using principle of least squares

Unit-IV

Computer programs for the following methods using c/c++: Numerical integration using trapezoidal Simpson's 1/3 and 3/8 rules, and Weddle's rule, solution on non-linear algebraic

and transcendental equations in one variable using bisection method, Regula False Position method and Newton Raphson method.

Unit-V

Computer programs for the following methods using c/c++: program for the solution of a system of simultaneous linear equations in four variables (extended upto n-variables) using – Gauss elimination method, Gauss Jordan method, Gauss Seidal method, programs for the solution of ordinary differential equations using Rung-Kutta fourth order method, Rung – Kutta Fehlberg method, Modified Euler's method and Milne method.

Text Books

- Numerical Methods for Scientific and Engineering Computation, Jain and Iyengar, New Age International (P) Ltd.
- Introductory Methods of Numerical Analysis, S S Sastri, Prentice Hall of India Pvt. Ltd.
- Numerical Methods for Engineers, Chapra and Canale, Tata McGraw Hill Book Co.
- Computer Oriented Numerical Methods, V Rajaraman, Prentice Hall of India Pvt. Ltd.

Reference Books

- Numerical Algorithms, by Krishnamoorthy E.V. and Sen S.K., Affiliated East West Press
- Numerical Mathematical Analysis, by Scarborough J.B., Oxford and IBH
- Engineering Optimization-Theory and Applications, by Rao S.S., New Age International Publishers

Software or other Requirement

- Turbo C and C++ programming
- MATLAB

CIVIL ENGINEERING DRAWING AND ESTIMATING - COSTING

Paper Code CE-215	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To make the students aware about the basic principles of Building Drawing.
- Make the students to draw plan, elevation and section of buildings.
- To make the students to know Basic commands of a popular drafting package.
- To understand the fundamentals of estimation and specification and costing of an engineering project.

Course Learning Outcome

- Students will gain indepth understanding in planning and construction details and will be able to prepare functional and aesthetic designs.
- Students will be capable to prepare RCC structural detailing using AutoCAD.

Course Description

Unit-I

Introduction: Vertical section of a brick wall from foundation to parapet wall, a single room building. Details of doors, windows, Damp proof course and flooring.

Unit-II

Fundamentals of drawing: Plan, front elevation and sectional elevation of a residential building with foundation details. Different type of stair case. Plan and section elevation of a Dog-legged stair-case.

Unit-III

Drawing detailing: To draw a double line plan of a given single line plan of a residential building with front elevation, sectional elevation, side elevation and terrace plan.

Unit-IV

Estimation of quantities: Types of estimates, items of work, measuring units, Long wall – Short wall methods and Centre line methods. Analysis of rates, schedule of rates and costing

Text Books
• Estimating and Costing by B N Datta , S S Dutta and Co. • Estimating and Costing for Civil Engineering by G S Birdie • Building Drawing by Shah, Kale and Patki . • Estimating and Costing in Civil Engineering Theory and Practice, by Dutta .B.N.

Reference Books
• Building drawing and detailing, by Balagopal T.S. Prabhu, Spades Publishers • Elements of Estimating and Costing, by Rangwala .S.C., Charotar PublishingHouse, Anand, 1987. • Civil Engineering Drawing and housing Planning, by B.P. Verma, Khanna Publishers

Software or other Requirement
• PRIMAVERA • AUTO CAD

FIFTH SEMESTER

SOIL MECHANICS

Paper Code CE-301	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- Provide the description, classification and to know about properties of soil.
- Familiarize the students an understanding of permeability and seepage of soils
- To know about the consolidation and compaction effect on soil in lab and field.
- To develop an understanding of the principles of effective stress in saturated soils,and its application to various soil condition and to know about the shear strength of the soils.

Course Learning Outcome

This will enable students to develop analytical skills in dealing with soil as a medium of water flow, a medium for structural supports and a primary building material.

Course Description

Unit-I

Introduction: Origin and formation of soils, various soil deposits in India and their characteristics. Identification and classification of soils; particle size and plasticity of soils, mechanical and hydrometer analysis, limit of consistency and their determination, Unified and I.S. Soil classification system, 3-phase system of soils; weight, volume and unit weight relationships and their inter-relationships. Effective stress principle; stress distribution with depth, influence on effective stress due to shift in water table and capillarity.

Unit-II

Soil characteristics: Permeability; factors affecting permeability; Darcy's law, laboratory tests and their suitability, Field method for determination of Permeability, Laplacian equation, flow nets for confined and unconfined flows, effective stress under hydrodynamic conditions, quick sand condition, Filters and Drains.

Unit-III

Stress distribution: Stress below point load (Bousinessq's and Westergaard's equations), stresses below uniformly loaded circular and rectangular areas (exact method), approximate

methods – point load and 2: 1 methods, Newmark's chart. Compaction; filed and laboratory compaction devices, filed compaction controls; core-cutter, sand replacement & Proctor needle methods to determine in-situ density of soils, moisture-density relationship, effects of compaction on properties of soils.

Unit-IV

Compressibility of soils: Factors affecting compressibility, 1-D consolidation theory, consolidation test and determination of a_v, c_c, m_v i c_v, pre-consolidation pressure and over consolidation ratio, square root of time and logarithmic time fitting methods, secondary consolidation, predicting settlements and time rates.

Unit-V

Shear strength: Concept of shear strength in soils, Mohr's stress circle, Coulomb's failure envelope, stage of failure and plane of failure, cohesion intercept, angle of shearing resistance, shear strength equation in terms of principal stress, measurement of shear strength of soils by direct shear test, triaxial compression tests, unconfined compression test, vane shear test and presentation of their results. Performing shear strength tests under different drainage conditions (drained, undrained and consolidated undrained), basic features of triaxial compression test apparatus, pore water pressure parameters. Sensitivity of clays, Thixotrophy and critical void ratio.

Text Books

- Soil Mechanics and Foundation Engineering by K R Arora, Standard Publishers Distributor
- Soil Mechanics and Foundation by Punmia, Jain and Jain; Laxmi Publications (P) Ltd.
- Engineering Properties of Soils by S K Gulati, Tata McGrawhill

Reference Books

- Mechanics of Soils, by Raju .K.V.B .and Ravichandran .P.T, Ayyappaa Publications, 2000
- Soil Mechanics and Foundations, by Punmia .B.C, Laxmi Publications Pvt. Ltd., 2005
- Basic and Applied Soil Mechanic", by Gopal Ranjan and Rao .A.S.R, New age international(p) Ltd.,2007

STRUCTURAL ANALYSIS - II

Paper Code CE-302	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To understand indeterminate structures.
- To determine forces and deflections in determinate trusses, beams and frames using different methods.
- To determine forces in indeterminate trusses, beams and frames by the force method.

Course Learning Outcome

- To enable the students to have a comprehensive idea of structural analysis with emphasis on the relative advantages of the flexibility method and the stiffness method.
- Students will have adequate knowledge of approximate analysis of statically indeterminate structures including trusses, mill bents, portal frames etc.

Course Description

Unit-I

Introduction: Force/ flexibility/ compatibility/ consistent deformation method of analysis; Superposition, compatibility & equilibrium, flexibility coefficients, flexibility matrices, application of the method to indeterminate beams, frames and trusses to degree one & two.

Unit-II

Unsymmetrical bending : Introduction, double symmetric beams with skew loads, pure bending, shear flow and shear center; Analysis of cables; Analysis of suspension bridges with three & two hinged stiffening girders.

Unit-III

Indeterminate Structures: Continuous beam- Three Moment Theorem; Slope deflection method and its application to analysis of indeterminate beams & frames, yielding of supports, sway problems.

Unit-IV

Column analogy method: Approximate analysis of statically indeterminate structures: Trusses, Mill Bents, portal frames, continuous beams and plane building frames, cantilever

method and portal method.

Unit-V

Stiffness/ Displacement method: Development of stiffness matrix for pin jointed structure and frames, development of method for a structure having forces at all degrees of freedom, development of method for a general case, direct stiffness method.

Text Books
• Intermediate Structural Analysis by C. K. Wang, Tata McGrawHill • Structural Analysis by Pandit & Gupta, Tata McGrawHill • Strength of Materials by B C Punmia • Structural Analysis by B C Punmia

Reference Books
• Structural Analysis by Norris, Wilbur • Basic concepts of structural analysis by Beaufait. F.W., • Basic structural analysis, by Reddy C.S., Tata McGraw Hill

DESIGN OF STRUCTURES – I (STEEL)

Paper Code CE-303	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- Analyse indeterminate frames and trusses using approximate methods of analysis
- Define and contrast the material properties of steel
- Determine the ultimate tensile capacity of steel members considering both yielding and tensile fracture
- Determine the ultimate bending moment capacity of steel members considering both yielding and lateral buckling.

Course Learning Outcome

- Ability to analyze and design of tension members
- Ability to analyze and design of columns
- Ability to analyze and design of beams
- Ability to analyze and design of beam-columns
- Ability to analyze and design of simple bolted and welded connections

Course Description

Unit-I

Design of Connections: Common steel structure, advantages and disadvantages of steel structures, type of steel, rolled steel sections, special considerations in steel design, design philosophy, limit state design, design strength, deflection and serviceability limits, stability checks; Riveted, bolted and welded connections, classification of bolts and types of bolted connections, **IS 800-2007** specifications for design of bolted connections, worked examples on design of bolted joint, shear capacity and tension resistance of bolts **(IS-1364)**, design examples of fillet and butt weld connections, design of eccentric bolted and welded connections.

Unit-II

Design of Tension members: Design strength of tension member due to yielding of gross section, rupture strength of critical section and block shear, tension splices and lug angles;

design of bolted and welded connections for ties subjected to both bending and axial tension.

Unit-III

Design of Compression members: Shape of compression members, buckling class of cross–section, slenderness ratio, design compressive stresses and strengths, use of IS800-2007 tables for design stresses, design of compression members, design of laced and battened columns, design of column splices; Column bases: design of slab base and gusseted base.

Unit-IV

Design of Beams: Behavior of beam in flexure, section classification, plastic moment carrying capacity of a section, bending and shear strengths of laterally supported beams, design of laterally supported beams, deflection limits, web buckling and web crippling, design of built-up beams, design strength of laterally unsupported beams, effective lengths for lateral torsional buckling, design of laterally unsupported beams.

Unit-V

Stiffness/ Displacement method: Development of stiffness matrix for pin jointed structure and frames, development of method for a structure having forces at all degrees of freedom, development of method for a general case, direct stiffness method.

Text Books

- Limit State Design of Steel Structures, SK Duggal, Tata Mac-Graw-Hill Publication-2010.
- Limit-State-Design of Steel Structures by N. Subramanium, Oxford University Press-2009
- Strength of Materials by B C Punmia
- Structural Analysis by B C Punmia

Reference Books

- Structural Analysis by Norris, Wilbur
- IS 456-2000: Code of practice for plain and R. C. BIS, New Delhi.
- I.S.800:2007,"Code for general construction in steel structures," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
- I.S.875 (part I to part V)," Code Of Practice For. Design Loads," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
- I.S.808:1989,"Code for Classification of Hot Rolled Steel ," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
- I.S.808:1989,"Code for Classification of Hot Rolled Steel ," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.

DESIGN OF STRUCTURES – II (CONCRETE)

Paper Code CE-304	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To bring about an exposure to advanced topics in structural design for flexure of singly and doubly rectangular and flanged beam sections using limit state design philosophy.
- To introduce the complete design of cantilever and simply supported beams.
- To design one way simply supported and continuous slabs.

Course Learning Outcome

At the end, the students would be able to apply the theory of limit state design for designing RCC structural members using first principles and relevant Indian standards.

Course Description

Unit-I

Introduction: Characteristic strength, stress-strain relationship for concrete and steel, IS specifications (IS 456, 875 & 1893), characteristic imposed loads, DL, EL & WL. Design philosophies – Working stress method and limit state method. Strength and serviceability requirements, Analysis and design for flexure of singly / doubly rectangular and flanged beam sections – by working stress method.

Unit-II

Analysis and design for flexure of singly / doubly rectangular and flanged beam sections: Limit state method. Serviceability limit states for deflection and cracking, requirements for curtailments and detailing of reinforcement, minimum / maximum tension and compression reinforcement, minimum & maximum spacing of bars; Introduction and use of design aid (SP-16), calculation of deflection.

Unit-III

Bond stress: Flexural & anchorage bond stress, design bond stress, development length, anchorage length; Behaviour of beams in shear, design for shear & torsion as per limit state method; Reinforcement detailing.

Unit-IV

Design and analysis: Complete design of a cantilever and simply supported beam with and without overhang; Design of continuous beams with Rectangular, T & L sections; Introduction to slabs: rectangular slab, one way simply supported & continuous slab and their design; Comparison of manual design with the software available.

Text Books

- R. C. C. Design by Pillai and Menon, Tata McGraw Hill
- Reinforced Concrete Design by S. N. Sinha, Tata McGraw Hill
- Limit State Design by P. C. Verghese, Prentice Hall

Reference Books

- Structural Analysis by Norris, Wilbur
- "Code of Practice for Plain and Reinforced Concrete", BIS, New Delhi, IS456-2000.
- "Design Aids for Reinforced Concrete to IS 456", Special Publication (SP16), BIS New Delhi,1980.
- "IS: 1343- 1980, IS Code Of Practice For Prestressed Concrete", BIS, New Delhi, 1980

Software or other Requirement

- STAAD Pro
- AUTO CAD

OPEN CHANNEL FLOW

Paper Code CE-305	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce the concept of geometric shapes of channel sections, pressure distribution and application of Manning's and Chezy's formulae.
- To study the specific energy concept with channel transitions and conveyance.
- To understand the various flow profiles in gradually varied flows.
- To study the formation of hydraulic jump in rapidly varied flows.

Course Learning Outcome

Upon completion of this course, students will learn, understand and develop conceptual knowledge regarding the different types of surface flows and their applications for the design of various hydraulic structures.

Course Description

Unit-I

Introduction: Classification of open channel flow, geometric properties of channel section, velocity and pressure distribution in channel flow, kinetic energy and momentum correction factors; Uniform flow, Application of Manning's and Chezy's formulae.

Unit-II

Specific Energy: Critical flow, specific energy and force, transitions in channels, channel with a hump, transition with change in width, choking flow; Channel conveyance, section factor for critical flow and uniform flow computations, most economical section of a channel.

Unit-III

Gradually varied flow: Gradually varied flow equation, assumptions and different forms of the equation, characteristics and classification of flow profiles; Analysis of flow profiles on mild, steep, horizontal and adverse slopes; Solution of the gradually varied flow equation, graphical integration method, direct step method and standard step method.

Unit-IV

Rapidly varied Flow: Hydraulic Jump, its definition and types; Momentum equation for the jump, characteristics of jump in horizontal rectangular channel, computation of energy loss

and its length, location of jump, and pressure distribution, energy dissipaters.

Unit-V

Measuring Devices in Open Channel: Flow in channels with sharp & broad crested weir, flow measurement with non rectangular weirs; Triangular, circular and parabolic weirs, discharge using linear proportional weir, Sutro weirsq Quadratic weir, Ogee spillway and sluice gate.

Text Books

- Open Channel Flow by V.T. Chow, McGraw Hill
- Flow in Open Channels by K.Subramanya, Tata McGraw Hill
- Flow Through Open Channels by K.G.Ranga Raju, Tata McGraw Hill

Reference Books

- Open Chanel Flow, by Hanif Choudhary M., Prentice Hall of India
- Open Channel Hydraulics, by Richard French H., McGraw Hill
- A Treatise on Applied Hydraulics, by Addison H., Asia Publishing House

Software or other Requirement

- HEC RAS
- MIKE - 11

ENVIRONMENTAL ENGINEERING-I

Paper Code CE-306	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

The course aims at imparting knowledge about planning and design of water supply systems for a town/city. It emphasizes upon estimation of water demands, selection of source of water, design of various unit processes/operations provided in water treatment plants, as well as design of water distribution systems.

Course Learning Outcome

After completion of this course student will be able to forecast the future water demands for a water supply projects to identify a suitable source of water as well as to design various components of water supply system.

Course Description

Unit-I

Water demand: Types of demands, factors affecting per capita demand, variations in demand; Population forecasting; Sources of water supply: estimation of water quantity, factors governing the selection of source; Water conservation measures.

Unit-II

Intakes: Types of intakes, factors governing the location of intake; Reservoirs: types of reservoirs, capacity of reservoir; Water distribution system: requirements of a good distribution system, methods of distribution, layout and design of water supply systems; Pipes: types of pipes for transporting water, pipe appurtenances, testing of pipelines.

Unit-III

Water Quality: Physical chemical and microbiological water quality parameters and their significance; Water borne diseases and their control; drinking water quality criteria and standards; Natural processes occurring for self-cleansing of water bodies; Engineered systems of water treatment

Unit-IV

Aeration: Mechanics of gas transfer, types of aerators, applications of aeration; Sedimentation: theory of sedimentation, design of sedimentation tank, types of sedimentation tanks;

Coagulation: theory of coagulation, types of coagulants and coagulant aids, and flocculation, design of flocculation tank.

Unit-V

Water softening: Chemical precipitation, ion exchange; reverse osmosis; Filtration: theory of filtration, types of filters and their classification, filter operations; disinfectioning: types of disinfectants, chlorination; Site selection for treatment plant; layout considerations for treatment plant; Operation and maintenance of treatment plants.

Text Books

- BIS, SP 35: Handbook on Water Supply and Drainage, Bureau of Indian Standards
- CPHEEO, Manual on Water Supply and Treatment, Min. of Urban Dev., Govt. of India
- Water and Wastewater Engineering, Fair, and Geyer, Vol-I and II, Wiley
- Water Supply Engineering, Garg,Khanna Publishers

Reference Books

- Gray Water Technology, Buttorworth-Heinemann (Elsevier)
- Water and Wastewater Technology, Hammer and Hammer, Jr., Prentice-Hall
- Text Book of Water Supply and Sanitary Engineering, Husain, Oxford & IBH
- Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill

SIXTH SEMESTER

GEOTECHNICAL ENGINEERING

Paper Code CE-310	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To make students understand the concept of lateral earth pressures and stability analysis of infinite slopes using standard methods.
- To introduce fundamentals of foundations and estimation of bearing capacity of soils.
- To enable students to carry out soil investigation program independently.
- To introduce geotextiles and their applications in geotechnical engineering problems.

Course Learning Outcome

Completion of this course will assist in developing analytical skills in dealing with soil as a medium of water flow, a medium for structural supports and a primary building material. Student will be able to suggest soil improvement techniques for different types of civil engineering structures.

Course Description

Unit-I

Lateral earth pressures: Rankine's Theory for lateral earth pressure computation (active and passive cases), effect of surcharge loading, water table fluctuations and soil stratification, computation of total lateral thrust and location of resultant earth pressure on earth retaining wall, estimation of depth of unsupported vertical cut in Cohesive backfills.

Unit-II

Stability of slopes: Basis of analysis, different factors of safety, finite and infinite slopes, types of slope failures, stability analysis of infinite slopes of cohensionless and cohesive soils, stability analysis of finite slopes with Swedish circle method and Taylor's stability chart/number and improving stability of slopes. Causes of landslides and remedial measures.

Unit-III

Introduction to foundations and bearing capacity of soils: Basic definitions-ultimate, net-ultimate, net safe and safe bearing capacities, allowable bearing pressure, load-settlement curve, types of shear failures of foundation soils, Terzaghi's bearing capacity theory for a

shallow strip footing, ultimate bearing capacity for local shear failure, comparison of Terzaghi's & Meyerhof's Theories, effect of water table fluctuations, shape size and depth of footing, eccentric and inclined loading on bearing capacity of shallow foundation.

Unit-IV

Purpose extent and methods of site investigation: Boring and sampling techniques, Samplers Boring records – Ground water observations, Plate load test, Penetration tests (standard penetration test Static & Dynamic Cone penetration test IS Codes: 1888 (Pt-I), 2131, 4968 (Pt-I, III) Geophysical methods; Seismic and soil resistivity method.

Unit-V

Geotextiles: Types, applications in separators, reinforcement, filtration/drainage, erosion control etc. Construction methods of retaining walls with reinforced backfill. Shallow foundations on reinforced earth (improving bearing capacity and reducing settlement).

Text Books

- Soil Mechanics and Foundation Engineering by K R Arora, Standard Publishers Distributor
- Geotechnical Engineerig, S K Gulati and M Datta, Mc Graw Hill
- Modern Geotechnical Engineerig by Alam Singh, CBS Publishers
- Foundation Analysis and Design by J E Bowles, Mc Graw Hill

Reference Books

- Modern Geotechnical Engineering by Alam Singh.
- Geotechnical Engineering by P. Purshothamaraj
- Soil mechanics and foundation Engg. by Arora.
- Relevant Indian Standard Specification & Codes.
- Soil Mechanics by Craig R. F. Chapman and Hall
- Theoretical Soil Mechnics by Terzaghi.

STRUCTURAL ANALYSIS - III

Paper Code CE-311	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To make students understand the behavior of beams subjected to various loading conditions through SFD and BMD.
- To introduce the concept of plastic analysis of steel structures and study of stress strain curves.
- To introduce the fundamentals of structural dynamics.
- To make students understand the behavior of two hinged and fixed arches.

Course Learning Outcome

- Students will be able to understand and analyse the behavior of beams under varying loads by drawing SFD and BMD.
- The student will be able to analyse beams using plastic theory.
- Students will gain adequate knowledge on structural dynamics and hinged/fixed arches.

Course Description

Unit-I

Rolling Load: Single concentrated load, UDL (shorter and longer than span), two concentrated loads, series of concentrated loads for maximum shear force at a section, BM under a given load, maximum BM at a given section, Absolute maximum shear & moment in beams; Muller Breslau principle and its application to indeterminate beams and frame for their I.L.D.

Unit-II

Moment distribution method: Application to continuous beams & frames (with and without sway); Symmetrical and unsymmetrical multi-storied frames; Gable frames; Moment distribution by Matrix Method.

Unit-III

Plastic Analysis of steel structures: Stress-strain curves, plastic moment, method of analysis, Gable frames or frames with inclined members, two bay portal frames.

Unit-IV

Structural Dynamics: Introduction, various terms used in the vibration analysis: Simple

harmonic motion, free or natural vibrations, damping, damping coefficient, mass and stiffness.
Unit-V
Two hinged and fixed arches: support settlement and temperature stresses.

Text Books
• Intermediate Structural Analysis by C. K. Wang, Tata McGrawHill • Structural Analysis by Pandit & Gupta, Tata McGrawHill • Strength of Materials by B C Punmia • Structural Analysis by B C Punmia

Reference Books
• Structural Analysis by Norris, Wilbur • Structural Dynamics by M Mukhopadhyaya • Dynamics of Structures by Chopra • Earthquake Resistant Design of Structures By Pankaj Agarwal and Manish Shrikhande, Publication, Prentice Hall of India Pvt. Ltd. • Seismic Analysis of Structures by T K Datta, Wiley

Software or other Requirement
• STAAD Pro

DESIGN OF STRUCTURES - III

Paper Code CE-312	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To expose the students to analysis and design of two way slabs, stairs and columns.
- To introduce different types of roof trusses subjected to varying loading conditions.
- To introduce the design considerations of gantry girders.

Course Learning Outcome

- Students will be able to assess the load criteria and design RCC structures using appropriate analysis methods.
- Students will be able to prepare RCC structural detailing using AutoCAD and recent IS codes.

Course Description

Unit-I

Design of slabs and stairs: Various type of slabs and their behavior, design of two- way rectangular slabs with different boundary conditions, use of moment coefficients, provision for corner reinforcement; Design of stairs.

Unit-II

Design of Columns: Columns, various cross sections, effective length, slenderness ratio, short and long columns, design of columns under axial compression, uni-axial and bi-axial compressions, uses of interaction curves of SP16 for column design.

Unit-III

Plate girder: Elements of plate girder, self weight of plate girder, economical depth, size of flanges, shear buckling resistance of web, end panel design, anchor forces, design of connections between flanges and web plates, design of bearing and intermediate stiffeners, and their connections with web; Design of plate girders.

Unit-IV

Roof Trusses: Types of roof trusses, loads on trusses: wind load estimation, snow load, live load and load combinations, bracings, spacing of trusses, purlins, sheetings, analysis of trusses, grouping of members, design of members, bolted joints and end bearings.

Unit-V

Gantry Girder: Loads for gantry girders, position of moving load for maximum effect, profile of gantry girders, limitation on vertical deflection, design procedure of gantry.

Text Books

- Limit State Design of Steel Structures, SK Duggal.Tata Mac-Graw-Hill Publication-2010.
- Limit-State-Design of Steel Structures by N.Subramanium-2009, Oxford University Press.
- Limit State Design of Concrete Structures by Verghees, Vol. 1.

Reference Books

- Reinforced Concrete Design, by S U Pillai and Devdas Menon, Tata-McGraw-Hill Publishing Company Limited, New Delhi.
- Comprehensive Design of RCC Structures, by B C Punmia, A K Jain and A K Jain, Laxmi Publications (P) Ltd, New Delhi
- Design of Reinforced Concrete Structures, by S Ramamrutham, Dhanpat Rai Publishing Company, New delhi,
- Limit State Theory and design of reinforced Concrete, by V L Shah and S R Karve, Structures Publications, Pune, 2011
- Reinforced Concrete Structures, by Park R and Paulay T, John Wiley & Sons, Inc., New York, 1975
- IS 456: 2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi

Software or other Requirement

- AUTO-CAD
- STAAD Pro

HYDROLOGY

Paper Code CE-313	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce the concept of hydrologic cycle and national and international water balance.
- To study various forms of precipitation, frequency analysis, adequacy of rain gauges, evaporation process, transpiration and infiltration.
- To learn about the evaporation process and estimation, surface runoff estimation, modelling and estimation of surface runoff using different methods.
- To understand estimation, forecasting and control of flood using statistical method.

Course Learning Outcome

- Students will get acquainted with the basic underlying concepts of hydrology and related governing phenomenon's.
- Students will gain understanding of rainfall-runoff relationship and governing empirical equations.

Course Description

Unit-I

Precipitation: Hydrologic cycle, India's water balance, world's water balance, types and forms of precipitation, measurement of precipitation, adequacy of rain gauges, adjustment and filling in of missing data, consistency of rainfall record, average rainfall over an area, frequency analysis.

Unit-II

Evaporation: Evaporation process, and its estimation, transpiration, evapotranspiration, measurement of evapotranspiration - Penman, Thornwaite and Balney-Criddle methods. Evaporation control.

Infiltration: Infiltration process, factors affecting infiltration, measurement of infiltration, infiltration indices.

Unit-III

Surface Runoff: Factors affecting runoff. Rainfall - runoff relationships, empirical equations. Flow duration curves. Mass curves.

Stream Gauging: Measurement of stage, velocity, direct and Indirect methods of stream flow measurement, Rating curve, Stage discharge relationship.

Unit-IV

Hydrographs: Factors affecting hydrograph, base flow separation. Unit Hydrograph.Derivation of unit hydrograph for simple & complex storms, Unit hydrograph of different durations synthetic unit hydrograph.

Unit-V

Flood: Flood flow formulae, frequency analysis using external type and log Pearson type III distribution, limitations of frequency studies, Design flood.

Flood routing: Basic equations. Hydrologic storage routing, Hydrologic channel routing through reservoirs and channels.

Text Books

- Hydrology by V.T. Chow, McGraw Hill
- Engineering Hydrology by K.Subramanya, Tata McGraw Hill
- Hydrology by J.Ram Redy, Laximi Publishers

Reference Books

- Hydrology: Principles, Analysis and Design, by Raghunath .H.M, New Age Publications, 2006.
- Water Resources Systems, by Vedula .S and Mujumdar .P.P, McGraw Hill International Book Company, 2005.

Software or other Requirement

- HECRAS
- MODFLOW
- Surface Water Data Entry software (SWDES)

TRANSPORTATION ENGINEERING - I

Paper Code CE-314	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To understand transportation engineering as multi-faced.
- To understand the fundamentals of transportation engineering such as highway geometric design, traffic systems analysis, pavement analysis and design.
- To enable students apply these skills in the planning, modeling and designing highway systems.

Course Learning Outcome

- Obtain an understanding of the fundamentals of transportation engineering.
- Learn basic techniques in highway engineering and traffic analysis.
- Apply the principles of transportation engineering to solve highway related problems that are most likely to be encountered in engineering practice.

Course Description

Unit-I

Introduction: Importance of Transportation, Different modes of transportation, Brief history of road development around the world. Twenty year road development plans, Necessity of highway planning, Road patterns, Preparation of Master Plan and its phasing, Highway alignment, Engineering and other surveys for highway location, Highway projects evaluation.

Unit-II

Highway Geometric Design: Introduction Design speed, Highway cross – section elements, Analysis of sight distances, Design of horizontal and vertical alignments – all pertinent elements, Types of intersection, Principles of intersection design.

Unit-III

Traffic Engineering: Traffic characteristics, traffic studies – volume, speed, origin and destination, parking and accident studies, Traffic controls- traffic signs, marking and traffic signals, Highway capacity, Signal design.

Unit-IV

Highway Materials: Subgrade soil, aggregates and bituminous material; different tests on these materials. Bituminous mix design, pavement types, Soil stabilized roads. Pavement design: Introduction, Design parameters, Design of flexible pavement (IRC method).

Unit-V

Design of rigid pavement (IRC method): Construction of WBM road, bituminous pavements and cement concrete pavement, Highway maintenance and drainage.

Text Books

- Highway Engineering by Khanna and Justo, Nem Chand and Bros, Roorkee.
- Transportation Engineering by Chakroborty and Das, PHI.
- Transportation Engineering and Planning by Papacostas and Prevedouros, PHI.
- Relevant IRC codes.

ENVIRONMENTAL ENGINEERING - II

Paper Code CE-315	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce the concepts of waste water generation, collection and characterization.
- To explain the principles of waste water treatment and design of various unit operations and processes.

Course Learning Outcome

After completion of this course student will be able to estimate the quantity of waste water generated by a community, characterize the quality of waste water and also to design various types of waste water treatment systems.

Course Description

Unit-I

Wastewater Engineering: An Overview, Constituents in Wastewater; Different wastewater sources: domestic and storm water; Types of sewerage and drainage system; Estimation of flow rates and its variations: Estimation of peak drainage discharge; Hydraulics of sewers; Design of wastewater collection systems; Design of storm-water drain; Rain-water harvesting system and its design.

Unit-II

Wastewater characteristics: Physical, chemical and microbiological characteristics of wastewaters, typical characteristics of domestic sewage; Decay of sewage; Relative stability, population equivalent; Eutriphication; Effluent discharge standards; Response of streams to biodegradable organic waste: Dissolved oxygen balance and its modeling; Factor affecting steam flow rejuvenation.

Unit-III

Classification of treatment process: Primary secondary and tertiary treatment; Types of Screen and its design, Assessment of head loss through screen; Classification of Grit chambers, their application and its design; Oil and grease removal tank, theory and its design; Design of Primary and Secondary sedimentation tank.

Unit-IV

Secondary treatment of sewage: Theory of biological treatment, Growth and food utilization, Suspended and attached culture system, Aerobic Treatment: Activated sludge process, Trickling filter, Bio Tower and Rotating biological contactors. Anaerobic Treatment: upflow anaerobic sludge blanket reactor.

Unit-V

Sludge management and its disposal: sludge thickening and digestion. Low cost sanitation, Decentralized wastewater treatment, stabilization pond, aerated lagoon, oxidation ditch; Reuse of treated effluents, concept of zero discharge.

Text Books

- Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill
- Introduction to Environmental Engineering, Davis & Cornwell, McGraw Hill
- Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, McGraw Hill
- Environmental Engineering – A Design Approach, Sincero & Sincero, Prentice Hall of India

Reference Books

- BIS, SP 35: Handbook on Water Supply and Drainage, Bureau of Indian Standards
- CPHEEO, Manual on Wastewater and Treatment, Min. of Urban Dev., Govt. of India
- Water and Wastewater Engineering, Fair, and Geyer, Vol-I and II, Wiley
- Sewage Disposal and Air pollution, Garg, Khanna Publishers
- Water and Wastewater Technology, Hammer and Hammer, Jr., Prentice-Hall
- Text Book of Water Supply and Sanitary Engineering, Husain, Oxford & IBH

SEVENTH SEMESTER

FOUNDATION ENGINEERING AND DESIGN

Paper Code CE-401	**(Lectures-Tutorial-Practical)/Week(3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

This course acquires the capacity for students to access the soil conditions at any given location and to analyse and design suitable type of foundation as well as in depth understanding to design various types of foundations under different situations.

Course Learning Outcome

- Student shall be able to design any foundation type including pile foundation, shallow foundation etc.
- Students will gain competent knowledge about earth pressure theory as well as introductory soil dynamic concept.

Course Description

Unit-I

Types and general requirements of shallow foundation: Bearing capacity consideration, effect of ground water table, modes of failure, settlements of foundations, I.S. Code recommendations. (I.S. 6403, 8009). Design aspects of shallow foundation. Improvement of bearing capacity (sand drains, compaction and dewatering of soils).

Unit-II

Types, purpose and classification of pile foundations: Construction of piles, pile load test, load capacity and settlement of piles, design of under reamed files; (individual pile & group of piles); Design of Pile foundation, use of relevant I.S. Code (I.S. 2911: Part I-IV); Well foundation: Types, element and construction well foundation, principles of design.

Unit-III

Earth pressure theory: Introduction to Coulomb's earth pressure theory for cohesive and granular soil, graphical methods. Classification of earth retaining structures (Rigid and Flexible). Analysis & Design of Sheet pile wall, bulk head anchored sheet pile (by free earth support method & fixed earth support method).

Unit-IV

Introduction to soil dynamic: Definitions, spring mass system, single degree of freedom system, free and forced vibration of damped and undamped systems; Types & criteria for design of machine foundations. Analysis and design of block foundation; Vibration isolation (active and passive method).

Text Books

- Design of foundation and Retaining Structures By S. Prakash, G Ranjan & S Saran; Sarita Pracashan, Meerut
- Soil Dynamics By Shamsher Prakash; McGra Hill, London
- Soil Mechanics and Foundations By B C Punmia & Ashok Kumar Jain; Laxmi Publications, DelhiEnvironmental Engineering – A Design Approach, Sincero & Sincero, Prentice Hall of India

Reference Books

- Basic and applied soil mechanics, Gopal Ranjan and Rao A.S.R., New Age International Publishers
- Geotechnical Engineering, Venkatramiah, New Age International Publishers
- Geotechnical Engineering, Shashi K. Gulhati and Manoj Dutta, Tata McGraw-Hill Publishing Company Limited, New Delhi.
- Foundation Engineering, Leonards G.A., McGraw Hill
- Foundation Design, Teng W.C., PHI

IRRIGATION ENGINEERING

Paper Code CE-402	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To learn the needs and various components of irrigation engineering.
- To learn about irrigation planning and design of canal systems.
- To learn the theory of sub-surface flow and design of hydraulic structures.
- To understand the adverse impact of irrigation and their remedies.

Course Learning Outcome

- Students will be able to comprehend irrigation needs and planning.
- Students will be able to design the canal systems and identify the needs of various hydraulic structures.
- Will have adequate understanding for the design of weir, canal falls, cross drainage works etc.
- Will be able to take remedial measures for water logging and design of lined canal.

Course Description

Unit-I

Introduction: Irrigation in India – Scope of irrigation, irrigation schemes, ongoing projects, engineering aspects of project planning.

Water application: crop types, water requirement and its estimation, water application efficiencies and techniques of field irrigation.

Unit-II

Silt theories: Problems of silting and scouring, Kennedy's silt theory, design procedure, drawbacks, Lacey's silt theory, channel design procedure, comparison, drawback, design according to Lacey's non-regime equation, Design of L-Section of a channel, Balancing depth, Use of Garrets diagrams, cross-section of irrigation channel.

Unit-III

Weirs and Barrages: Component, functions and causes of failure of Barrages, Blight's creep theory, Lane's weighted creep theory, Khosla's theory, pressure calculations, Design of slopping glacis weir and protection works.

Unit-IV
Water Logging: Effects of water logging, causes of water logging, remedial measures, Canal lining- advantages, types of lining and design of lined channels, regulation works, regulation of channel systems.
Canal Falls: Types of falls and design of Sarda type fall.
Unit-V
Cross drainage works: Types of works, factors affecting suitability, classification of aqueducts and syphon aqueducts, Design of maximum flood discharge, waterway, transitions, head loss, uplift pressures etc.

Text Books
• Irrigation Water Resources and Power Engineering by P. N. Modi, Standard Book House Delhi-6 • Irrigation Engineering And Hydraulic Structures by S. K. Garg, Khanna Publishers • Irrigation Engineering by N. N. Basak Tata McGraw Hills • Irrigation and Water Resources Engineering by G L Asawa, New Age International Publishers

Reference Books
• Irrigation and water power Engineering by B C Punmia, Luxmi Publication (P) Ltd • Theory and Design of Irrigation Structures VOL I & II By Varshney and Gupta, Nemchand and Bros Roorkee

Software or other Requirement
• HEC-RAS river modeling software • MIKE-SHE and MIKE-11 river modeling software • Surface Irrigation Design Software (SIDES)

TRANSPORTATION ENGINEERING - II

Paper Code CE-403	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce the fundamentals of public transportation engineering.
- To understand the interrelationship among different modes of transportation.
- Enable students to implement these skills in the planning, modeling and designing of public transit, railways and airports.

Course Learning Outcome

- Obtain an understanding of the role of different modes of transport..
- Students will be able to understand the role of public transit in solving unban transportation problems.
- Students will be able to apply the principles of transportation engineering to solve the problems that are most likely to be encountered in railways, airports and public transit design practice.

Course Description

Unit-I

Urban transportation problems: Transportation and urban growth, Mass transit system, Comparison of different transit modes, Transit and environment, Transit and urban sustainability, Route design and scheduling of transit system.

Unit-II

Railway Engineering: Introduction, Railway Track, gauge, Track components – Rail, rail fittings, fixtures, Sleepers and ballast requirements and specification per kilometer of track, Formation and cross- section details, drainage, track defects.

Unit-III

Design analysis: Geometric design of track, Points and Crossing, Station and Yards, Level crossing, Signaling and control, Suburban Railways, Metro railways system, Modernization of railways, Underground Railways and Tunneling.

Unit-IV

Airport Engineering: Aircraft Characteristics, airport planning, site selection and configuration, Obstruction and zoning, Runway and taxiway design, Basic runway length and corrections, geometric design elements, Visual aids – marking and lighting, air traffic control and aids, Airport capacity.

Unit-V

Water Transportation: Sea Port, Harbors, Types and selection of site, Break-waters, Jetties, Wharves, Navigation aids: Buoys and light houses, Inland water transportation.

Bridges: Components and classification, site investigation, waterway design.

Text Books

- Urban Mass Transportation Planning, A. Black, McGraw Hill.
- Railway Engineering by Chandra and Agarwal, Oxford University Press.
- Air Transportation Planning and Design by Saxena, CBS Publisher.

Reference Books

- Planning and Design of Airports by Horonjeff and McKelvey, McGraw Hill.
- Dock and Harbour Engineering, Oza and Oza, Charotar Publisher.
- Bridge Engineering, Ponnuswamy, Tata McGraw Hill.
- Railway Engineering by Saxena and Arora, Dhanpat Rai Publications.

DESIGN OF STRUCTURES - IV (CONCRETE)

Paper Code CE-404	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- Students will be able to learn the fundamental topics in reinforced concrete design based on limit state philosophy.
- To familiarize the fundamental aspects of structural behaviour and design of water tanks, bridges and pre-stressed concrete satisfying the requirements such as safety, feasibility and economy.

Course Learning Outcome

- Students will learn the detailed design of various types of footings, water tanks and bridges based on the philosophy of limit state design.
- Students will get acquainted with the analysis and design of sections for flexure based on the philosophy of working stress method.

Course Description

Unit-I

Foundation and their types: Detailed design of Isolated and combined footing, design of wall footings. Retaining walls: Cantilever and Counter fort type, their design using limit state method.

Unit-II

Water tanks: Design criteria, material specifications and permissible stresses; IS 3370 (Pt. 1, Pt.2, Pt. IV) 2009; Design of circular and rectangular water tanks resting on ground & underground using working stress approach, cracking width in immature concrete and mature concrete in flexure and direct tension.

Unit-III

Bridges: Introduction, various types, super-structures, sub-structures, IRC loadings; Design of deck slab; Design of T-beam Bridge. Introduction to prestress concrete bridge.

Unit-IV

Prestressed concrete: Methods and systems, anchorages, prestress losses, analysis and design of sections for flexure based on working stress.

Text Books
• R.C.C. Design by Pillai & Menon, Tata McGrawHill • Essentials of Bridge Engineering by Johnson Victor D, India Book House Pvt Ltd • Prestressed Concrete by Rajagopalan, Narosa Publisher • Prestressed Concrete by V. Krishna Raju, Tata McGrawHill

Reference Books
• Limit State Theory and design of reinforced Concrete, V L Shah and S R Karve, Structures Publications, Pune, 2011 • Reinforced Concrete Structures, Park R and Paulay T, John Wiley & Sons, Inc., New York, 1975 • IS 456: 2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi • Handbook on Concrete Reinforcement and detailing, Special Publication SP 34, Bureau of Indian Standards, New Delhi, 1987

Software or other Requirement
• 3 D Structural Modeling Software (3D+) • S-FrRAME (Structural Analysis tool)

ENGINEERING ECONOMY AND CONSTRUCTION MANAGEMENT

Paper Code CE-405	**(Lectures-Tutorial-Practical)/Week (3-0-2)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- The need for engineering economy is primarily motivated by the work that engineers do in performing analysis, synthesizing, and coming to a conclusion as they work on projects of all sizes. Engineering economy is at the heart of making decisions. These decisions involve the fundamental elements of cash flows of money, time, and interest rates. The objective of the course is to introduce the basic concepts, terminology and comparison methods necessary for an engineer to combine these three essential elements in organized, mathematically correct ways to solve problems that will lead to better decisions.
- To introduce various aspects of construction project management which includes project organization, planning and scheduling techniques, construction equipment management and introduction of Primavera Project Planner.

Course Learning Outcome

- The students will be able to apply these techniques to select the most economical alternative in any project environment.
- In construction industry, the project management is traditionally learnt "on-the-job", this course will help the students to enter the construction Industry with adequate knowledge about project management and thereby expediting the process of getting mastery over project management skills.

Course Description

Unit-I

Introduction: Basic concepts of engineering economics, cash flow diagram, minimum attractive rate of return, single payment, uniform series and gradient series factors – their derivation and use, nominal and effective interest rates, use of multiple factors, depreciation and depletion, present worth comparison of equal and different lived alternatives.

Unit-II

Cost analysis: Capitalized cost calculation, annual worth (AW) evaluation using salvage sinking fund, salvage present worth and capital recovery plus interest method, comparing alternatives by AW, rate of return evaluation by present worth and AW method , benefit/ cost ratio analysis.

Unit-III

Overview of construction industry: Structure of construction organization and its functions, management functions and responsibilities, labour relations, construction equipments: power shovel hoe, bulldozer, dumper, trailers, and tractors, rollers, sheep foot roller, batching plants.

Unit-IV

Planning and scheduling: Basic network techniques, Gantt charts, PERT, time estimates, probability distribution, time computations, earliest expected time, latest allowable occurrence time, network analysis, slack, float, critical path.

Unit V

CPM network: Floats, crashing a network, introduction to precedence networks.

Text Books

- Engineering Economy by Leland T. Blank, Anthony J. Tarquin, McGraw-Hill Book Company, New Delhi.
- PERT and CPM by L.S.Srinath ,Affilated East-West Press Pvt. Ltd, New Delhi.

Reference Books

- Construction planning, equipments and methods by Robert L. Peurifoy, William B. Ledbetter, Clifford J. Sehexnayder, McGraw Hill Book Company, New Delhi.
- Fundamantals of Construction management and Organisation by Kwaku, A. Tenah Jose M., Guevara Reston Publication Co., Inc., A Prentice Hall Company Reston, Verginia..

Software or other Requirement

- PRIMAVERA

WATER RESOURCES ENGINEERING - I

Paper Code CE-406	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce students with Indian and global water resources potential and impact of climate change on water resources.
- To understand the financial analysis of hydropower projects through optimization using linear and dynamic programming.
- Students will be able to understand the concept and basic arrangement of hydroelectric power projects.
- Students will be able to learn various river training works and flood estimation methods.

Course Learning Outcome

- Students will be able to carry out economic analysis of hydropower projects.
- Students will have adequate understandings for the design of river training works.
- Students will have understandings for economics of flood control and management strategies.
- Students will have firm knowledge related to hydropower potential and development of India.

Course Description

Unit-I

Introduction: Water resources of India, global water resources, consumptive and non-consumptive use, planning and purposes served by water resource development projects, impact of climate change on water resources, reservoir yield, demand patterns for different types of reservoirs.

Unit-II

Financial Analysis of Projects: Returns from irrigation and hydropower projects, reservoir operating rules, water resource systems, optimization using linear programming and dynamic programming, illustrative examples

Unit-III

Flood control: Classification of methods of flood control, flood plain management, economics of flood control, estimating the benefits of flood control, national policy on flood control.

Unit-IV

General arrangement of hydroelectric projects: Hydropower development of India and the world, major hydroelectric projects in India, comparison with thermal and nuclear plants, environmental issues related to hydropower production, firm and secondary power, power duration curves, reliability of hydropower production, illustrative examples

Unit-V

River Engineering: Classification of rivers and river training works, methods of river training works, marginal embankments, guide bunds, groynes, cutoff, bank pitching and launching aprons, pitched islands, design of guide bunds.

Text Books

- Irrigation Water Resources and Water Power Engineering, P. N. Modi
- Water Resources Engineering, Larry W Mays
- Water Resources Engineering, R. K. Linsley et al.
- Water Resources Engineering, S K Garg

Reference Books

- Irrigation Engineering, B C Punmia
- Water Resources Engineering, Principles and Practices, Satya Narayana Murty Challa
- Applied Hydrology, V. T. Chow et al.
- Water Resources Systems Planning and Management",Chaturvedi, M.C. (1987), Tata McGraw HillPub. Co., N Delhi
- Water Resources Systems",Hall. W.A. and Dracup, J.A. (1975), Tata McGraw Hill Pub. N Delhi

Software or other Requirement

- WaterCAD
- HEC RAS
- ARTS Hydraulic Design Software

EIGHTH SEMESTER

WATER RESOURCES ENGINEERING - II

Paper Code CE-410	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To introduce the fundamentals of distribution functions and implication of statistical models in water resources engineering problems.
- To study the stability analysis and hydraulic design of gravity dams, earth and rock fill dams and spillways.
- To introduce ground water hydrology and steady flow analysis for confined and unconfined aquifer.
- To introduce the fundamental concepts of fluvial hydrology.

Course Learning Outcome

- Students will learn the application of statistical models and distribution functions in water resources problems.
- Students will be acquainted with the understanding of various forces exerted on gravity and earth and rock fill dams.
- Students will gain adequate knowledge about stability analysis of earth and gravity dams.

Course Description

Unit-I

Distribution functions: Normal distribution, P.D.F and C.D.F, Correlation, Regression analysis, Linear Regression, Curve Linear Regression, Multiple Linear Regression.

Model: Introduction, Nash model, Clark model, AR model, ARMA Model.

Unit-II

Gravity Dam: Investigation and planning for reservoir, selection of dam site, type of dams, stability analysis and hydraulic design of gravity dam.

Unit-III

Earth Dam and Spillways: Causes and failure of earth dams, criteria and design of earth dam, pheratic lines in embankment, seepage analysis, types of spillways, design of Ogee spillway and bucket type energy dissipaters.

Unit-IV
Ground Water: Forms of sub-surface water, aquifer, aquitrad, aquiclude and aquifuge, Darcy law, confined and unconfined aquifer, porosity, coefficient of permeability, transmissibility, specific yield, stratification,
Well Hydraulics: steady radial flow to a confined and unconfined aquifer.
Unit-V
Sedimentation: sediment transport, sediment yield, reservoir sedimentation, sediment load, bed load, suspended load, trap efficiency, capacity inflow ratio, useful life of the reservoir.

Text Books

- Irrigation Water Resources and Water Power Engineering, P. N. Modi
- Water resources engineering: principles and practice By Challa Satya Murthy, New Age International Publishers
- Water Resource Engineering By Jai Ram Reddy, Laxmi Publication
- Water Resources Engineering, S K Garg

Reference Books

- Irrigation Engineering, B C Punmia
- Water Resources Engineering, Principles and Practices, Satya Narayana Murty Challa
- Applied Hydrology, V. T. Chow et al.
- Irrigation Water resource and water power engineering By By P. N. Modi Standard Book House Delhi
- Water resources management: principles, regulations, and cases By Neil S. Grigg, Tata McGraw Hills

Software or other Requirement

- SPSS for water resources applications
- HEC-6 model
- River CAD software

EARTHQUAKE RESISTANT DESIGN

Paper Code CE-411	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- Introduces the concept of strong seismic motion and dynamics of structure
- To understand the effects and behaviour of structures under earthquake
- To acquaint with the ductile detailing of RCC structures, earthquake resistant design of masonry buildings as well as retrofitting

Course Learning Outcome

- Students will gain adequate knowledge on seismic terminology and lateral forces on structures
- Students will be able to design and implement earthquake resistant structures
- Students will gain in depth knowledge of behavior of structures under seismic loadings

Course Description

Unit-I

Strong motions and Dynamics of Structure: Introduction, Terminology of Strong Motion, nature of ground motion: source effect, path effect, site effect, amplitude, peak ground acceleration, vertical acceleration, seismometer and other seismic instruments., modelling of structure, lumped mass approach, equation of motion, mathematical and structural modelling, system of multiple degrees of freedom, responses Spectrum.

Unit-II

Effects and behavior of structures under earthquake: Introduction, natural time period of site and structure, liquefaction of soil, restoring force, damping, effects of structural irregularities (vertical, plan and mass). Seismo-resistant building architecture, building characteristics, introduction to IS 1893:2002, design philosophy, Use of IS 1893:2002 and determination of design lateral forces: equivalent static lateral force method.

Unit-III

Determination of Lateral Forces: Use of IS 1893:2002, determination of design lateral forces: response spectrum method, time history method.(eigen values and eigen vectors, modal participation factors, modal mass, use of ABS, SRSS, CQC methods).

Unit-IV

Ductile detailing of RCC Structures, Earthquake Resistant Design of Masonry Buildings and Retrofitting: ductility considerations: introduction, assessment of ductility, factors affecting ductility, ductility factors, ductile detailing as per use of is 13920: 1993, load transfer mechanism of joints, earthquake resistant design of masonry buildings and retrofitting: behavior of masonry building under earthquake, lateral load analysis of masonry buildings. design of brick masonry wall under vertical and laterals loads, concepts of repair, restoration and strengthening of existing buildings, methods of retrofitting.

Text Books

- Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
- Elements of Structural Dynamics by Glen V. Berg, Prentice Hall Englewood Cliffs, New Jersey
- Dynamics of Structures by Anil K. Chopra, Pearson Education
- Geotechnical Earthquake Engineering by Steven L. Kramer, Pearson Education

Reference Books

- Elements of earthquake engineering, Jaykrishna, Saritha Prakasan, Naunchandi, Meerut Irrigation
- Dynamics of structures, R W Clough and J Penzien, McGraw Hill

Software or other Requirement

- SeismoSOFT
- EQPACK

ENVIRONMENTAL ENGINEERING-III

Paper Code CE-412	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To provide students with balanced information regarding different elements of pollution and its control measures
- To make students aware of statutory controls for pollution control measures
- To introduce with the concept of environmental impact assessment
- Students will be able to understand the importance of clean and green environment

Course Learning Outcome

- Students will be acquainted with physical and chemical characteristics of solid waste and suitable remedies for its safe disposal
- Students will identify suitable methods of air and noise pollution monitoring and their efficient control measures

Course Description

Unit-I

Air pollution: Meteorology, plume rise, plume behavior, dispersion of pollutants, factors affecting dispersion, Gaussian dispersion model, assumptions, applications and limitations.

Unit-II

Introduction to air pollution control devices: Particulate and gaseous contaminants, constructional features, working principle, design of control devices for particulate and gaseous contaminants.

Unit-III

Solid wastes: Physical and chemical characteristics of solid waste, generation, collection and disposal of solid waste, land filling operations.

Unit-IV

Noise pollution: Definition, fundamental concepts, sources and effects of noise, measurement techniques, noise pollution control and current standards.

Unit-V

Introduction to environmental impact assessment: Objectives, attributes of EIA, different techniques of EIA, impact assessment and environmental management plan.

Text Books

- Air Pollution: Its Origin And Control by Wark Kenneth Jr. , Wayne T. Davis, Cecil F. Warner Printice Hall
- Air Pollution Control Engineering, 2nd Edition by Neol De Nevers, Mc Graw Hill
- Environmental Engineering, Howard S Peavy , Donald R Rowe , George Tchobanoglows, Published by Tata McGraw-Hill, New Delhi
- Environmental Pollution Control engineering by CS Rao, Published by Wiley Science

Reference Books

- Introduction To Environmental Engineering And Science by Glibert M. Masters published By Dorling Kinderslay India
- Environmental Impact Assessment by PR Trivedi, PHP Publisher
- An Introduction to Ecology and Environmental Science by P.C. Prabhu, C. Udayasoorian, G. Balasubramanian by Abhijit Publications
- Textbook Of Noise Pollution And Its Control by S.C. Bhatia, Atlantic Publisher

GROUND WATER ENGINEERING

Paper Code CE-413	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To learn different terminologies related with groundwater hydrology.
- To introduce ground water exploration techniques.
- To understand the principle and design of rain water harvesting structures.
- To understand the techniques of drilling techniques.

Course Learning Outcome

- Students will gain adequate knowledge about ground water terminology and hydrology.
- Will help exploring and understanding the design concept of rain water harvesting techniques for sustainable management of ground water resources.

Course Description

Unit-I

Introduction: Hydrologic cycle, concept of groundwater in hydrologic cycle, sub surface strata analysis as aquiclude, aquitord , aquifuge and aquifers explanation of unconfined, semi – confined and confined aquifers, perched aquifers. geophysical methods for groundwater exploration, resistivity system, application of Schlumberger and Wenner's configurations.

Unit-II

Groundwater balance study: Concept of gross recharge, recoverable recharge, draft and status of groundwater analysis using Nabard's norms and local norms, numerical problems on groundwater balance equation and status of groundwater stage of development, analysis of catagories of groundwater as white, grey and black category.

Unit-III

Principle and definition of rainwater harvesting: Classification and determination of rainwater harvesting, numerical problems on rainwater harvesting, feasibility and design of rainwater harvesting, case studies on rainwater harvesting.

Unit-IV

Introduction of Drilling techniques: Drilling in alluvium and soft rock area, reverse rotary drilling and direct rotary drilling methods, Calayx method, driiling in hard rock area, DTH method and Woodex method, percussion drilling, geophysical logging and tube well design.

Text Books

- Groundwater Hydrology: Devid Keith Todd,
- Hydrogeology : K.R. Karanth
- Groundwater : H. M. Ragunath

Reference Books

- Ground Improvement Technique, Purushotham S. Raju, Laxmi Publications
- Text Book on Ground Improvement, Moseley,Blackie Academic Professional, Chapman & Hall
- Construction & Geotechnical Methods , Korener, In Foundation Engineering, McGraw Hill

Software or other Requirement

- BOSS International
- MODFLOW

GROUND IMPROVEMENT TECHNIQUES

Paper Code CE-414	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To develop an awareness of problematic soils and selection of ground improvement techniques based on soil conditions
- To understand drainage, dewatering, grouting technique in ground improvement method.
- To aware of the ground improvement techniques.
- To study the applications of geo-synthetics.

Course Learning Outcome

This course will enable students to develop the understanding of the ground improvement techniques and use of new materials and its behaviour for ground improvement techniques.

Course Description

Unit-I

Compaction Purposes and Strategies, Laboratory Compaction: Dynamic compaction, kneading compaction, static compaction, compaction using stress path simulation; shallow field compaction, static rollers, impact and vibratory equipment, operational aspects, deep compaction techniques, precompression and use of vertical drains, explosion, heavy tamping & dynamic consolidation, vibro-compaction & vibro-replacement.

Unit-II

Evaluation of Shallow Compaction: Direct density and water content determination, Hilf Rapid method, nuclear meters, proctor penetrometer, plate bearing tests, impact tests; evaluation of deep compaction: SPT, CPT, Menard pressure meter, self boring pressure meter, flat dilatometer tests, shear wave velocity tests.

Unit-III

Modification by Admixtures: Granular admixtures, portland cement, lime, calcium chloride, flyash, bitumen & tar; grouting: categories, grout materials, rheological properties, techniques & control.

Unit-IV

Thermal Modification: Thermal properties of soils; heat treatment of soils (changes in mineral structure at high temperature; in-situ methods of heating: ground surface heating and heating through boreholes); ground freezing, properties of frozen ground, 4-phase system, strength characteristics, freezing techniques (circulating brine freezing system and expandable gas freezing system).

Unit-V

Reinforced Soil: Concept, economy & durability, mechanical models, flexible geosynthetic sheet reinforcement, strip-, bar-, mesh-, & grid- reinforced soil; ground anchorages, rock bolting and soil nailing; modification by confinement: soil confined by form work.

Text Books

- Engineering Principles of Ground Improvement by Manfred R. Hausmann; McGraw-Hill Publishing Company
- Ground Improvement Techniques by Dr. P. Purushotama Raj; Laxmi Publications
- Ground Improvement by Mike Mosely; Taylor and Francis Group
- Ground Improvement by Buddhima Indraratna; Elsevier Science and Technology

Reference Books

- Ground and Soil Improvement by C. A. Raison; Thomas Telford
- Soil Protection and Soil Improvement by James E.; General Books
- Designing with Geosynthetics by Robert M. Koerner; Pearson Prentice Hall

OPTIMISATION TECHNIQUES

Paper Code CE- 421	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To make students aware with the engineering applications of various optimization techniques
- To provide students with the basic knowledge of linear and non linear programming
- To introduce students with non parametric techniques such as ANN, genetic algorithm, and simulated annealing

Course Learning Outcome

- Students will be able to implement various optimization techniques in engineering based problems
- Students will be able to solve linear, non linear as well as dynamic programming
- Students will be able to understand the concept of stochastic and deterministic Algorithms

Course Description

Unit-I

Introduction to optimization: Historical development, engineering application of optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems, introduction to stochastic and deterministic Algorithms.

Unit-II

Linear Programming: Graphical method, Simplex method, duality in linear programming, post-optimality analysis, LP for multi period decision process, application of LP to civil engineering problems, use of spreadsheets for solving LP problems.

Unit-III

Non Linear Programming: Single-variable and multi-variable unconstrained optimization techniques, direct search methods, descent methods, constrained optimization, multivariable optimization with equality and inequality constraints, direct and indirect methods, Kuhn-Tucker conditions for constrained optimization.

Unit-IV

Dynamic Programming: Characteristics of dynamic programming problems, computational procedure, multi-decision processes, concept of sub optimization and the principle of optimality, discrete differential dynamic programming, application of DP to civil engineering problems.

Unit-V

Non-parametric techniques: Introduction to Artificial Intelligence techniques, Introduction to Genetic Algorithm, Real value representation, Approaches to crossover schemes, Variations of Mutation Scheme, Simulated Annealing.

Text Books

- Linear Programming, G. Haddley, Reading, Mass., Addison-Wesley, 1962
- Intoduction to Operations Research, Hillier, F. S., and G. J. Lieberman, McGraw Hill, 2001
- Optimisation Methods for Engineering Design, R.L. Fox, Addison Wesley USA, 1971
- Optimisation for Engineering Design, Deb, K., Prentice Hall of India, 2000.

Reference Books

- Optimisation Theory and Applications, Taha, Hamdy. , S.S. Rao, Wiley Eastern, New Delhi, 1978.
- Operations Research, Pearson, USA.
- Genetic Algorithm in Search, Optimisation and Machine Learning, D.E. Goldberg, Reading,Mass., Addison-Wesley, 1989.

Software or other Requirement

- LINGO, LINDO
- Tiberius data mining software
- Turbo c and C++

BRIDGE ENGINEERING

Paper Code CE- 416	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To study the essentials of bridge engineering.
- To design RCC slab bridges.
- To design RCC girder bridges.
- To design prestressed concrete slab and girder bridges.
- To design bearings.

Course Learning Outcome

Upon completion of this course students will have an exposure to the essentials of bridge engineering with the focus on structural design.

Course Description

Unit-I

Introduction: Bridge components and classification, conceptual bridge design, investigations for bridges, standard specifications for bridges, IRC loadings.

Unit-II

Piers and abutments: Piers and abutment caps, materials for piers and abutment, types of piers, loads on piers, analysis of piers, types of abutments, stability analysis of abutments, backfill behind abutments.

Unit-III

T-beam bridges: Effect of concentrated loads on deck slab, load distribution methods for concrete bridges, components of t-beam bridges, number and spacing of main girders, cross beams, deck slab, cantilever portion, longitudinal girders.

Unit-IV

Prestressed concrete bridges: Pre-tensioned prestressed concrete bridges – applications and principles of design, post-tensioned prestressed concrete bridges – applications and principles of design.

Text Books

- Concrete Bridge Practice Analysis, Design and Economics by V K Raina, Tata McGrawhill
- Bridge Engineering by S Ponnuswamy, Tata McGrawhill
- Essentials of Bridge Engineering by D. J. Victor, Oxford and IBH Publishing Co. Pvt. Ltd.
- Design of Bridges by N. Krishna Raju, Oxford and IBH Publishing Co. Pvt. Ltd.

Reference Books

- Design of Bridge Structures by T. R. Jagadeesh and M. A. Jayaram, Prentice Hall of India Pvt. Ltd.
- IRC:112-2011," Code of Practice for Concrete Road Bridges", Indian Road Congress, New Delhi, 2011.
- IRC:22-2010, "Standard Specifications and Code of Practice for Road Bridges", Indian Road Congress, New Delhi, 2011.
- IRC:82 (Part 2) – Part IX- 1987, "Standard Specifications And Code Of Practice For Road Bridges", Elastomeric Bearings, IRC, 1987.
- IRC:82 (Part 1) – section IX – 1999, "Standard Specifications And Code Of Practice For Road Bridges", Metallic Bearings, IRC, 1999.

ARCHITECTURE AND TOWN PLANNING

Paper Code CE- 414	**(Lectures-Tutorial-Practical)/Week (3-1-0)**
Credits 4	**Course Marks (Mid-End-Total) (40-60-100)**

Course Objectives

- To study the brief history and basic principle of architecture.
- To study the basic concepts of town planning.

Course Learning Outcome

- Students will be able to understand basic principle of architecture.
- Students will be able to understand basic concepts of town planning.

Course Description

Unit-I

Introduction: Brief history of architecture, Egyptian, Greek, Roman and Indian architecture, evolution of various structural forms, impact of materials on building forms and construction techniques.

Unit-II

Philosophy of architectural design: Scale, form, texture, balance, skyline, unity, harmony, contrast, proportion, colour in architecture, site selection and orientation of residential buildings.

Unit-III

Evolution of human settlements: Factors and forces, Utopian concepts of city planning, garden city, vertical city, broad acre city, linear city, Super Block and neighbourhood unit concepts.

Unit-IV

Concepts for spatial arrangement of land uses: Concentric zones, sector and multiple nuclei concepts and their applicability to Indian conditions, density in residential and non-residential areas, land use classification system, Surveys for town planning.

Unit-V

Master plans; case studies: one for a new town plan and one for master plan of an existing city. Zoning and sub-division regulations and building byelaws. Agencies for implementation of master plans. Public participation, problem of slums, approaches for environmental improvement of slums.

Text Books

- A history of Architecture by Sir Banister Flechure.
- A General History of Architecture by Bruce All Sopp.
- Architecture by John Gloag.
- The principles of Architecture Composition by Howard Robertson.

Reference Books

- Indian Architecture by Percy Brown.
- The Urban Pattern. City Planing and Design by Arthur B. Galion and Simon Eisner.
- Town Planning, S.C. Rangwala Charotar Publishing House, Court Road, Anand, Edition, 1998
- Planning and Designing Buildings, Y.S.Sane Engineering Book Publishing Co., Pune – 16, Edition 1996

Software or other Requirement

- PRIMAVERA

List of Software's to be learnt during Training Period. Any software that enhances professional capability in civil engineering practice a partial indicative list is mentioned below:

1. PRIMA VERA
2. GEOTECH
3. ARCVIEW GIS
4. GEO 5
5. GEO STUDIO PROF 2004
6. AUTOCAD CIVIL 3D
7. GEOMATIC A
8. STAAD PRO
9. ANSIS
10. Fluid Flow software
11. KANAL ++ water resources software
12. GRAM++ software
13. MATLAB and its toolboxes
14. Arc GIS & SWAT model for water resources
15. LINGO environment for water resources application
16. SPSS for water resources application
17. HEC-6 model
18. Aquifer Well test
19. Ground water vistas
20. DAMBRK software
21. River CAD model
22. LOOP 4 water distribution network design
23. MATHEMATICAL EXPLORER

IMPORTANT CONTACT NUMBERS

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Professor Incharge Examination	011-26984127
Faculty of Engineering Library	011-26981717-2207

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