

# SYLLABUS

Bachelor of Engineering

Civil Engineering

**BE**  
**(Evening)**



**Department of Civil Engineering**

**Faculty of Engineering & Technology**

**Jamia Millia Islamia**

**New Delhi - 110025 (INDIA)**

**[www.jmi.ac.in](http://www.jmi.ac.in)**

## 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.

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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 1 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

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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.

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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.

## **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 PROGRAM**

The Department of Civil Engineering is one of the oldest and the largest department in the Faculty of Engineering & Technology and offers two (Full time & part time) undergraduate program in Civil Engineering. The B.E. (Civil) course started under the scheme of continuing education programme of MHRD in year of 1979, before the establishment of Faculty of Engineering. Rather this course became the foundation for starting the Faculty of Engineering in Jamia. This program is designed to help the practising diploma engineers to pursue the graduate degree. Civil Engineering involves the exploration, research, planning, analysis, design, construction, and operation of facilities essential to modern life. The academic activities of the Department lays emphasis on deep understanding of fundamental concepts, development of creative ability to handle the challenges of Civil Engineering, and the analytical ability to solve problems which are interdisciplinary in nature. The program provides excellent technical knowledge in all the emerging areas of Civil Engineering that deals with the construction and design of public and private sector works such as bridges, roads, dams and buildings. The curriculum is updated from time to time as per the recommendations of the Board of Studies in order to keep in pace with the latest developments in the area.

The department has been planned on modern lines with state of art facilities to be utilized for research and consultancy in addition to the training of students. Civil Engineering graduates well trained in all aspects of civil engineering and adequately prepared to be acceptable globally.

The department offers a setup of ultramodern laboratories that include:

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- Structural Lab
- Building Materials and Concrete Lab
- Soil Mechanics & Geotechnical Lab
- Hydraulics & Water Resources Lab
- Environment Engineering lab
- Transportation Engineering Lab
- Surveying Lab
- Geology Lab
- Computer Aided Design (CAD) Lab

Modern soft ware's like MATLAB, PRIMAVERA, STAAD PRO, AUTOCAD, ANSIS, ArcGIS, ERDAS IMAGINE Image Processing software are being acquired so that students can match their talents with those graduating from other centres of excellence.

## **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.E. 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.E. Civil Engineering program conform to result oriented teaching learning process. In general, **ELEVEN PROBLEM 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.

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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

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**First Year**

Course	Course Title	Marks			
		Sessional	Practical	Final Exam	Total
BE-101	COMMUNICATION SKILLS	50	50	50	150
BE-102	MATHEMATICS	50	1	100	150
BE-103	APPLIED SCIENCE	50	1	100	150
BE-104	GEOLOGY & BUILDING MATERIALS	50	50	100	200
BE-105	SOLID MECHANICS	50	50	100	200
BE-106	HYDRAULICS I	50	50	100	200
<b>Grand Total</b>		<b>300</b>	<b>200</b>	<b>550</b>	<b>1050</b>

**Second Year**

Course	Course Title	Marks			
		Sessional	Practical	Final Exam	Total
BE-201	NUMERICAL ANALYSIS & COMPUTER APPLICATIONS	50	50	100	200
BE-202	WORKS MANAGEMENT	50		100	150
BE-203	ARCHI. & TOWN PLANNING	50		100	150
BE-204	THEORY OF STRUCTURES I	50	50	100	200
BE-205	HYDRAULICS II	50	50	100	200
BE-206	SURVEYING	50	50	100	200
<b>Grand Total</b>		<b>300</b>	<b>200</b>	<b>600</b>	<b>1100</b>

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Course	Course Title	Marks			Total
		Sesssional	Practical	Final Exam	
BE-301	SOIL MECHANICS	50	50	100	200
BE-302	DESIGN OF CONC. STRUCTURES	50		100	150
BE-303	ENVIRONMENTAL ENGG. I	50	50	100	200
BE-304	TRANSPORTATION ENGG	50	50	100	200
BE-305	THEORY OF STRUCTURES II	50		100	150
BE-306	ENGG HYDROLOGY	50		100	150
<b>Grand Total</b>		<b>300</b>	<b>150</b>	<b>600</b>	<b>1050</b>

**Fourth Year B.E. (Evening) Civil**

Course	Course Title	Marks			Total
		Sesssional	Practical	Final Exam	
BE-401	FOUNDATION ENGG	50		100	150
BE-402	DESIGN OF STEEL STRUCTURES	50		100	150
BE-403	ENVIRONMENTAL ENGG. II	50		100	150
BE-404	IRRIGATION ENGG	50		100	150
BE-405	ELECTIVE	50		100	150
BE-406	PROJECT	150		100	250
<b>Grand Total</b>		<b>400</b>		<b>600</b>	<b>1000</b>

## COMMUNICATION SKILLS

<b>Paper Code</b>	BE – 101	(Lectures-Tutorial-Practical)/Week	(2 – 1 – 3)
<b>Course Marks (Mid-End-Total)</b>	(50 – 50 – 50 – 150)		

### 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 : Essential Grammar

The Unit will strengthen the understanding and clarity of grammar items listed below which will be taken up rigorously vide a series of Cloze gap-filling passages for practice .

- Articles, prepositions
- Conjunction and connectors
- Tenses
- Voices
- prefixes/ Suffixes
- synonyms and antonyms

#### Unit -II : Comprehension Skills

The unit is aimed at bringing about clarity of words, eliminating confusion, identifying ambiguities and English vocabulary building. Unseen passages will be administered

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for reading aloud to build confidence to face an audience, improve pronunciation and comprehension

- Confusing words,
- Idioms and phrases
- One word substitution
- Common errors
- Vocabulary building
- Unseen passages

#### Unit - III : Composition Skills

This unit is devoted to enhancing writing skills and familiarity with formats of different correspondence

- Para writing
- Drafting
- Précis/ Briefs
- Business correspondence: (letters, applications, reports and responses, press releases)

#### Unit – IV: Computer Skills

15

sessions

This unit aimed at practical communication where the students are required to do correspondence through emails, write reports using MS Word, do equations and plotting/drawings using MS Excel, research themes on web, make a power - point presentation.

#### 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.

**MATHEMATICS**

<b>Paper Code</b>	<b>BE – 102</b>	<b>(Lectures-Tutorial-Practical)/Week(3 – 0 – 0 )</b>
		<b>Course Marks (Mid-End-Total) (50 – 100 – 150)</b>

<b>Course Objectives</b>
<ul style="list-style-type: none"><li>• Students should be proficient in the application of the laws of logic to mathematical statements.</li><li>• 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.</li><li>• To equip themselves familiar with the functions of several variables.</li><li>• To familiarize with the applications of differential equations.</li></ul>

<b>Course Learning Outcome</b>
<ul style="list-style-type: none"><li>• The course aims to impart student with the analytical ability in solving mathematical problems as applied to the respective branches of Engineering.</li></ul>

<b>Course Description</b>
Unit - I DIFFERENTIAL CALCULUS

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Successive differentiation and Leibnitz theorem, partial differentiation and total differentiation, homogeneous function (Euler's theorem), and change of independent variable (Transformation formulae). Errors and approximations, Radius of curvature, Taylor's and Maclaurin's expansion for one, two, and for more than two variables, Maxima-Minima, Method of Lagrange's undetermined multiplier.

Unit - II

**INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS**

Multiple integral; double and triple integrals, change of order in double integration, Jacobian transformation and application to transform double and triple integrals to polar, spherical polar and cylindrical coordinates, application to volume.

General linear differential equations with constant coefficients and their application to Civil Engineering problems.

Unit - III

**SOLID GEOMETRY, VECTOR CALCULUS**

Direction cosines and direction ratios, plane and systems of planes, straight line, plane and a line, shortest distance, sphere, and tangent plane.

Review scalars and vector product of two and three vectors, applications to work done, moment of a force and angular velocity of a body, vector and scalar point functions, level surface, vector differential operator, Normal and tangent to level surface, Direction derivative, Grade of scalar point function. Divergence and curl of vector point functions, group formulae on Grad, Divergence and curl.

Line integral, surface integral, Volume integral, Green's Stoke's and Gauss's divergence theorem.

Unit - IV

**FOURIER SERIES, LAPLACE TRANSFORMATION AND ITS APPLICATIONS**

Fourier series definition, Euler-Fourier formulae, full range series, full range series in arbitrary interval, even-odd functions, half range sine and cosine series.

Laplace and inverse Laplace transformations and their applications in solution of linear differential equations with

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constant coefficients.

Laplace transform of period, unit impulse, delta-Darac and Heaviside functions with problems.

Unit - V

MATRICES, COMPLEX ANALYSIS AND STATISTICS

Transpose, adjoint and inverse of matrix, solution of equations by matrix method.

De-Moivre's theorem and its applications, review to complex numbers, function and analytic functions (C-R equations), conjugate harmonic functions, orthogonal system of curves, conformal mapping-Bilinear transformation and cross-ratio, residue theorem.

Measure of central tendency, measure of dispersion; Probability –Additive Multiplication theorem, Binomial, Poisson and Normal probabilities.

**Text Books**

- A Text Book of Engineering Maths and Advanced Engineering Mathematics, Mathur & Jaggi, Khanna Publishers
- Elementary Engineering Mathematics and Higher Engineering Mathematics, 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 et al.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.

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**APPLIED SCIENCE**

<b>Paper Code</b>	<b>BE – 103</b>	<b>(Lectures-Tutorial-Practical)/Week(3 – 0 – 0)</b>
		<b>Course Marks (Mid-End-Total) (50 – 100 – 150)</b>

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### **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.
- 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**

- 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.
- 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**

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### **Unit - I**

Water Chemistry: Expressing Concentrations in solutions, Standard Solutions, pH concepts, Dissociation of water, acids and bases, Titrations of acids and bases. Acid and base Indicators. Buffer Solutions. Impurities and their origin, ill-effects .Softening methods and Disinfection techniques. Diffusion of gases in water, Volumetric Analysis.

### **Unit - II**

Iron, Steel and Corrosion: Ores of iron and other metals, Manufacturing Of pig iron, Cast iron, Wrought iron. Steel Composition and manufacturing. Classification of Steel. Effects of impurities in steel. Corrosion reactions, Dry and wet corrosion, Prevention of corrosion.

### **Unit - II**

Cements and Plastic: Cements, Composition and Classification, Manufacturing of ordinary portland cement. Chemical reactions involved in setting and hardening action. Plastics, classification of plastics, Polyvinyl chloride, Teflon

### **Unit - IV**

Laser and its applications, Diffraction of Fraunhofer glass, optical grating polarization, double refraction, electromagnetic theory of waves. Thermal resistances and affections.

### **Unit - V**

Acoustic waves, ultrasonics, non-destructive testing of materials, Mechanical and acoustic impedances of conductors and semi conductors, semi-conductor devices and super conductors. Nuclear energy and power reactor, Radioactivity with applications.

### **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.

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New Delhi.

- Engineering Chemistry, by P.C.Jain & Monica Jain.,“Dhanpat Rai Publications, New Delhi.
- 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 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 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.

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**GEOLOGY AND BUILDING MATERIALS**

**Paper Code**      **BE – 104**

**(Lectures-Tutorial-Practical)/Week(3 – 0 – 3)**

**Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)**

**Course Objectives**

- To study the origin, development and ultimate fate of various surface features of the earth
- To understand the basic building units of which the solid crust of the earth
- To understand the nature of geographic distribution of rocks and engineering properties of rock on the earth
- To understand the nature of geological structures and their importance on the civil engineering structures
- To know the importance of geology in civil engineering practices

**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

Internal Constitution of the Earth. Basic Concept of material constituents of Crust, Mantle and Core. Plate Tectonic theory and concept of Major and Minor Plate movements of the Earth. Continental Drift theory and Isostasy. Elastic

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rebound theory and Movement of the Earth. Earthquake, Classification of Earthquakes. Concept of Earthquake Zoning in India.

**Unit – II**

Weathering Physical and Chemical weathering erosion, Erosion by Running Water and Wind. Fold. Study of various types of Folds. Faults, study of various types of Faults, Joints, Study of various types of Joints. Civil Engineering application of Folds, Faults and Joints.

**Unit – III**

Geophysical Study. Application of Geophysical Study using Single, Double and Three point's problem. Hydrogeological Investigation for Groundwater Resource Evaluation using Numerical Problems. Geological Investigation for Dam Site and Reservoir, Bridges, Tunnels, High Ways and Buildings.

Groundwater, Concept of Zone of Aeration and Saturation, Land Slide, Land Subsidence.

**Unit – IV**

Application of Rocks as Engineering Materials. Physical and Engineering properties of Igneous Rocks Their uses in Civil Engineering projects. , Physical and Engineering properties of Sedimentary Rocks Their uses in Civil Engineering projects., Physical and Engineering properties of Metamorphic Rocks Their uses in Civil Engineering projects.

. Application of Rocks as Building Stones and Tiles.

**Unit – V**

Basic Concept of Acidic and Alkaline rocks. Physical and Engineering properties of Course and Fine Aggregates of Igneous rocks. Physical and Engineering properties of Course and Fine Aggregates of Sedimentary rocks. Physical and Engineering properties of Course and Fine Aggregates of Metamorphic rocks. Assessment of various rock Aggregate materials on the properties of Concrete in its Fresh and Harden stage.

**Text Books**

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- Engineering Geology by Krenin and Judd
- A Text Book of Geology by P. K. Mukharjee
- Geology for Engineers by Dr. D. S. Arora
- Principles of Engineering Geology by Dr. Praveen Sing.
- Engg. Material by Rangwala

**Reference Books**

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

**SOLID MECHANICS****Paper Code**      **BE-105****(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)****Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)****Course Objectives**

**B.E. (Civil Engineering)**

- 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**

Mechanical properties of Materials, Analysis of stress and strain, stress and strain tensors, transformation of stresses and strains, octahedral shear, invariants of stress and strain tensors (without derivation), 2D stresses and strains.

**Unit - II**

Graphical methods (Mohr's circles for stresses and strains); Strains Rosettes; Yield criteria; Principle of superposition, Saint Venant's principle. Uniaxial deformations: uniform, varying cross sections, composite bars, and temperature stresses.

**Unit - III**

Torsion: assumptions, equation, solid and hollow shafts, horse power, power transmitted by circular shafts.

**Unit - IV**

Shear force & Bending moment diagrams, Relation between load, Shear force & Bending moment; Bending stresses;

**B.E. (Civil Engineering)**

Deflection of beams: Macaulay's, moment area & conjugate beam methods.

**Unit - V**

Shear stress distribution in various sections, shear flow, shear centre; Simple, compound and complex 2D trusses: stability, static indeterminacy (internal and external), Analysis; Analysis of 3 hinged arches (circular and parabolic); spandrel braced arches.

**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

**HYDRAULICS – I**

<b>Paper Code</b>	<b>BE 106</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)</b>
<b>Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)</b>		

**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**

**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 fluids, Surface tension, Capillarity, Concept of viscosity, Effect of temperature on viscosity. **Fluid statics:** Hydrostatic Law, Pressure variation in isothermal and adiabatic condition, Simple and differential manometers. **Hydrostatic forces on surfaces:** Forces on submerged plane, inclined and curved surfaces.

**Unit- II**

**Buoyancy and Equilibrium:** Buoyancy, Centre of buoyancy, Stability of submerged and floating bodies, Meta centre and meta-centric height, Experimental method for determination of meta-centric height. **Fluid kinematics:** Kinematics of fluid motion, Eulerian and Lagrangian description, Type of motion, continuity equation in Cartesian coordinates, One, two and three dimensional flows, Acceleration of fluid elements, Normal and tangential accelerations, Velocity potential and stream function, Stream line, Path line, Streak line and stream tube.

**Unit - III**

**Fluid dynamics:** Navier-stroke's equation, Euler's equation of motion and integration along stream line, Bernoulli's equation; physical significance of different heads, Bernoulli's equation for isothermal and adiabatic flow, Applications of Bernoulli's equation, Momentum equation and its applications, Flow measuring devices, Flow through an Orifice, Flow over a weir and notch.

**Unit - IV**

**B.E. (Civil Engineering)**

**Laminar flow:** Flow through circular pipes, Flow through parallel plates, Power absorbed in viscous flow, Concept of friction factor, Measurement of viscosity, Reynolds number and its significance. **Turbulent flow:** Nature of turbulent flow and its origin, Reynolds stress, Prandtl's mixing length hypothesis, 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, Boundary layer theory.

**Unit - V**

**Pipe flow:** Hazen William & Darcy Weisbach equation, Minor and major losses, Pipe flow in networks, Concept of equivalent length and its applications, Dupuits equation, One and two reservoir problems, Hardy cross method, Water hammer phenomena, Rigid and elastic water column theories.

**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

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**Reference Books**

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

**B.E. (Civil Engineering)**

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**NUMERICAL ANALYSIS AND COMPUTER APPLICATIONS**

<b>Paper Code</b>	<b>BE-201</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)</b>
<b>Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)</b>		

**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.
- 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**

- Through this course students shall gain analytical ability in solving mathematical problems as applied to the respective branches of Engineering.
- Upon completion, students will be able to solve mathematical and optimization problems with C and C++ programming language and data handling.

**Course Description**

**B.E. (Civil Engineering)****Unit – I**

Computer Basics, History and evolution of computers, Generations of computers, Types of computers and their classification, Application of computers in office automation, science, engineering and technology, Basic computer organization, Computer hardware, Computer software, types of software, Basic concepts of data handling and storage, Number system, Data representation, Programming languages, Assembly and machine language, Flowcharts.

**UNIT – II**

An overview of C++ language, Data types, Constants, Variable types, Input and output operators, Characters and string literals, Operators and expressions, Hierarchy of operations, ASCII Codes, Binary and Decimal Representation, Conditional statements, Loops, Functions, Arrays, Pointers, Common programming errors, Introduction to debugging

**UNIT – III**

Truncation and round-off errors, Solution of algebraic and transcendental equations, Bisection method, Iteration method, Method of false position, Newton-Raphson method, Interpolation, Finite differences, Newton's formulae, Gauss's and Sterling's formulae, Lagrange's formulae

**UNIT – IV**

Matrices, Basic operations, Solution of linear system of equations, Matrix inversion method, Gauss elimination method, Jacobi and Gauss-Seidel methods, Eigen vectors, Eigen values, Numerical differentiation

**UNIT – V**

**B.E. (Civil Engineering)**

Numerical integration, Trapezoidal rule, Simpson's rule, Romberg integration, Numerical solution of ordinary differential equations by Taylor's series, Euler's method, Modified Euler's method, Runge-Kutta method of second and fourth order

**Text Books**

- Numerical Methods for Scientific and Engineering Computations; Jain, Iyengar and Jain; New Age International Pvt. Ltd.
- Introductory Methods of Numerical 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
- Computer Oriented Numerical Methods, V Rajaraman, Prentice Hall of India Pvt. Ltd.

**Reference Books**

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

**Software or other Requirement**

- Turbo C and C++ programming

**B.E. (Civil Engineering)**

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**WORKS MANAGEMENT**

<b>Paper Code</b>	<b>BE-202</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
	<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>

**Course Objectives**

**B.E. (Civil Engineering)**

- To introduce the basic concepts, terminology and comparison methods in engineering economics.
- To acquaint students with the overview of cost analysis of construction industry.

**Course Learning Outcome**

- Students will gain adequate knowledge about the structure of construction organization.
- Students will learn the capitalized cost calculations and benefit cost ratio analysis of any engineering project.
- Students will learn the basic network techniques like PERT and CPM for efficient project management.

**Course Description****Unit – I**

- (a) Management Core of Management, Primary Function, motivating, commanding communicating, coordinating, Forecasting, Pyramid of Management , Decision making, Programmed, Pragmatic, Stimulation Activity Ratio, Efficiency Ratio, Capacity Ratio. Types of management.
- (b) Scheduling, Types, Bar Charts, Fulkerson's Rule, C.P.M., PERT, Comparison of net work analysis, Resources mobilization, Line of Balance, Limitation, Definitions of Gert, Computer Simulation, PDM, DCPM, LEST, Criticality index Elementary idea of Latest Analysis only. Numerical for CPM and PERT only.

**Unit – II**

**B.E. (Civil Engineering)**

Construction Equipment, Selection of Equipments, Classification of Earth moving, Hoisting, Conveyance, Excavators, Crawlers, Dumpers, Bulldozers', Tower cranes, Horizontal jigs, Whirler crane. Definitions of Coefficients of Traction, Rolling Resistance, % of Swell, Rimpull.

**Unit – III**

P.W.D. Accounts Systems, Documents of Accounts, Contractor's Ledger, Cement Register, Register of Work, Head of Accounts, Technical sanction, Administrative approval, Muster Roll. Measurement Books, Imprest account, Pretender and post tender Planning, Material and Site Account, Mode of Payment, Escalation, Liquidated and Unliquidated damages, Site order Book, Earnest Money, Security.

**Unit – IV**

- (a) Works Management-Planning and management of Civil Engineering Projects, Organization, Types, Vertical, Horizontal, Lateral, Site Organization, Optimum utilization, Cost slopes, Utilization, Conceptual and financial constraints. Cost Analysis, role of Engineer, Architect, and Planner.
- (b) Contracts and Trunk Key Contracts – Types of Contracts and systems, Bids, international Bidding, Lump sum Contracts, Contract documents, Arbitration, Contract act and Arbitration act. Turn Key Contracts, Technical Specification, Zero Date Contract, Field Engineering Support, Terminal Points control from inception to conception, Field oriented examples.

**Unit – V**

Engineering Economics. Role of Private & Corporate Sector, Planning, Inducement and direction, Various type of cost, Income, Working capital, Depreciation straight line, diminishing return, Sinking funds, financial statement of Project,

**B.E. (Civil Engineering)**

Cash flow statement, Break even statement Funding, Return of investment. Econometrics erosion of Values.

**Text Books**

- Engineering Economy by Leland T. Blank, Anthony J. Tarquin, McGraw-Hill Book Company, New Delhi.
- PERT and CPM by L.S.Srinath ,Affiliated East-West Press Pvt. Ltd, New Delhi.
- Construction Planning, Equipment and Methods by Robert L. Peurifoy, William B. Ledbetter, Clifford J. Schexnayder, McGraw-Hill Book Company, New Delhi.
- Fundamentals of Construction Management and Organization by Kwaku A. Tenah Jose M. Guevara Reston Publication Co., Inc.,A Prentice-Hall Company Reston, Virginia

**Reference Books**

- Construction planning, equipments and methods by Robert L. Peurifoy, William B. Ledbetter, Clifford J. Schexnayder, 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**

**B.E. (Civil Engineering)**

- ANSYS

**B.E. (Civil Engineering)**

**ARCHITECTURE AND TOWN PLANNING**

<b>Paper Code</b>	<b>BE- 203</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
<b>Course Marks (Mid-End-Total)</b>		<b>(50 – 100 – 150)</b>

**Course Objectives**

- To introduce the basic concepts of town planning
- To study the History of architecture
- To study principles of architecture and various byelaws of local bodies for the preparation of building drawing
- To study the planning of building, considering various principles of planning including furniture arrangement

**Course Learning Outcome**

- Students will be able to understand basic concepts of town planning
- Students will be able to understand basic concepts of Building planning

**Course Description**

**Unit - I**

Brief history of Architecture, Egyptian, Greek, Roman and Indian architecture. Evolution of various structural forms.

**B.E. (Civil Engineering)**

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. Urban problems of contemporary cities. Utopian concepts of city planning: garden city, vertical city, broad acre city, linear city, Super Block and neighborhood unit concepts. Concepts for spatial arrangement of land uses: concentric zone, sector and multiple nuclei concepts, and their applicability to Indian conditions.

**Unit - IV**

Density in residential and non-residential areas. Land use classification system. Surveys for town planning. Master plans; case studies: one for a new town plan and one for master plan of an existing city.

**Unit - V**

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.

**B.E. (Civil Engineering)**

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**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

<b>Paper Code</b>	<b>BE-204</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)</b>
<b>Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)</b>		

**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 completion 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**

DEFLECTION: Virtual work, deflection by method of virtual work; Betti's law, Maxwell's law, unit load method, strain energy, Castigliano's theorems – Application to the displacement in beams, brackets, frames, trusses and curved members.

**B.E. (Civil Engineering)****UNIT - II**

Combined bending and direct stresses, middle third rule, middle quarter rule, core / kernel;

Cables and suspension bridges with 3 Hinged and 2 Hinged stiffening girders.

**UNIT - III**

Influence lines: Influence line diagrams for reactions, shear force and bending moment for determine structures; Uses of ILDs (single concentrated load, u. d. l. longer and shorter than span); Uses of I.L. for forces in truss members of bridges, Maxima and absolute maxima.

**UNIT - IV**

Intermediate structures: Method of consistent deformation, propped cantilever beam, carryover factor, flexural stiffness of a beam when far end is fixed/pinned; Aanalysis of fixed and continuous beams.

**UNIT - V**

Plastic Analysis of structures: introduction, yield moment, plastic moment, shape factor, collapse loads, collapse mechanisms, upper and lower bound theorems.

**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**

**B.E. (Civil Engineering)**

- 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.

<b>Paper Code</b>	<b>BE-205</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)</b>
<b>Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)</b>		

<b>Course Objectives</b>
<ul style="list-style-type: none"><li>• To introduce students with working principle of pumps and turbines.</li><li>• 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.</li><li>• To study laminar and turbulent flow in pipes, major and minor losses in pipes.</li><li>• To study the fundamentals of dimensional analysis and model studies.</li></ul>

<b>Course Learning Outcome</b>
<ul style="list-style-type: none"><li>• 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.</li></ul>

<b>Course Description</b>
<p><b>Unit - I</b></p> <p><b>Dimensional and Model Analysis:</b> Dimensional analysis and its utility, Buckingham's Pi theorem and Raleigh's method and their application to fluid flow problems, Dimensionless numbers and their applications, Similarities, Application of</p>

## **B.E. (Civil Engineering)**

dynamic similarity to model investigations, Scale ratio for distorted models.

### **Unit - II**

**Flow through Open Channels:** Introduction, Classification of open channel flow, Geometric properties of channel section, Velocity and pressure distribution in channel flow, Kinetic energy and momentum correction factors, Energy equation, Momentum equation, Uniform flow derivation from basic principle and computations, Hydraulically efficient channel sections, Application of Manning's and Chezy's formulae.

### **Unit - III**

**Specific energy:** Critical flow, Specific energy and specific force, Transitions in channels, Channel with hump, Transitions with change in width, Choking flow, Channel conveyance, Section factor for critical flow and uniform flow computations.

### **Unit - IV**

**Gradually varied flow:** Gradually varied flow equation, Assumptions and different forms of equation, Characteristics and classification of flow profiles, Analysis of flow profiles on mild, steep, horizontal and adverse slopes, Solution of gradually varied flow equation, Graphical integration method, Direct step method and standard step method.

### **Unit - V**

**Turbines:** General layout of hydroelectric power plant, Impulse and reaction turbines, Efficiency of turbines, Classifications based on discharge, Head and specific speed, Velocity triangle, Similitude in turbines, Unit power, Unit discharge. **Pumps:** Reciprocating pumps, Working principle of both double and single pump, Indicator diagram, Frictional loss, Roto-dynamic pumps, Velocity triangles, Classification and characteristics curves, Disadvantages of roto-dynamic pump over reciprocating pump, Operating of roto-dynamic pumps.

**B.E. (Civil Engineering)**

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**Text Books**

- Hydraulics and Fluid Mechanics By Modi & Seth Publisher: Standard Publishers
- Open Channel Hydraulics By V. T Chow Publisher: McGraw Hill
- Flow in Open Channel By K. Subrimanya Publisher: Tata McGraw Hill

**Reference Books**

- Flow through Open Channel By K. G. Ranga Raju Publisher: Tata McGraw Hill
- Flow through Open Channel By R Srivastava Publisher: Oxford University Press
- Theory and Applications of Fluid Mechanics, by Subramanya K., Tata McGraw HillDuncan, Tom & Young, Fluid Mechanics, ELBS

**SURVEYING**

**Paper Code** BE-206

**(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)**

**Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)**

**Course Objectives**

**B.E. (Civil Engineering)**

- 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 study the Advance Surveying Instruments like EDM Total Station and GPS
- To study the 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 shall gain in depth understanding of different aspects of Geomatics surveying and the advancement in the different types of Surveying. The course will enable the students to the new frontiers of science like Hydrographic surveying, EDM, Global Positioning System and Photogrammetry and Remote Sensing.

**Course Description****Unit-I**

Triangulation and Trilateration, - Principle of Triangulation; Classification; figure in triangulation; Ideal Figures for triangulation, step in field work. Trigonometric leveling: Plane and geodetic observations.

**B.E. (Civil Engineering)****Unit-II**

Error and Adjustment - Most probable value, method of error adjustment.

Electronic distance measurement (EDM) - Introduction, Principles and techniques: total stations. GPS - introduction, principles and applications.

Hydrographic surveying; uses, sounding - making and methods.

**Unit-III**

Map Projection: Spherical coordinates: classification and characteristics of map projection: sheet numbering. Field astronomy: astronomical terms: coordinates systems: solution of astronomical triangle: kind of time: measurement of time, latitude, longitude azimuth.

**Unit-IV**

Photogrammetric: introduction: geometric characteristics of aerial photographs: scale of photograph; determination of horizontal ground length from photo-coordinates; relief displacement; image parallax; ground control for aerial photographs; stereoscopy; flight planning; photo interpretation.

**Unit-V**

Remote sensing: introduction and principles; spectral signature; spatial and spectral resolution; Sensors- supervised and unsupervised classifications. Geographic information system (GIS): Introduction and basic functions.

**B.E. (Civil Engineering)**

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**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

**B.E. (Civil Engineering)**

**SOIL MECHANICS**

<b>Paper Code</b>	<b>BE-301</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)</b>
<b>Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)</b>		

**Course Objectives**

This course introduces fundamental concepts, advance principles and its application in analysis and designing of all types of foundations, filters, hydraulic structures etc. To the undergraduate students of civil engineering.

**Course Learning Outcome**

After undergoing this course, students gain adequate knowledge on engineering properties of soil, which will be required in understanding advance course i.e., foundation, geotechnical and earthquake engineering.

**Course Description**

**UNIT - I**

Origin, formation, identification & classification of soils; 3-phase system of soils; Effective stress: principle, under hydrostatic & hydrodynamic conditions; Flow through porous media; Flow net & quick sand condition.

**UNIT - II**

Stress distribution in soil mass; Soil Compaction; Soil Compressibility, Consolidation: phenomenon, consolidation test, determination of various coefficients, determination of pre-consolidation pressure & over consolidation ratio, Square

**B.E. (Civil Engineering)**

root time and log-time fitting methods, prediction of settlement and time rate.

**UNIT - III**

Shear Strength: Concept, failure envelopes, shear strength equation in terms of principle stresses, Direct shear test, Triaxial compression test, Unconfined compression test and Vane shear test, drainage conditions; Pore water pressure parameters, strength parameters, Sensitivity of Clays, Thixotropy and critical void ratio.

**UNIT - IV**

Lateral earth pressure: Rankine's and coulomb's theories for all type of backfills, estimation of depth of unsupported vertical cut in cohesive soils.

Stability of slopes: basics, type of slope failures, finite and infinite slopes, stability analyses of finite slopes with Swedish circle method and Taylor's stability chart/number, improvement of stability.

Geotechnical application of Geosynthetics.

**UNIT - V**

Bearing capacity of soils: basic definitions, load settlement curve, general and local shear failures, Terzaghi's theory for a shallow footing, Effect of water table, shape, size and depth of footings, eccentricity & inclination of loading, I S Code provisions, analytical methods (IS 6403, IS 8009), plate load test (I S 1888), SPT, static and dynamic cone penetration tests (I S 4968).

**Text Books**

**B.E. (Civil Engineering)**

- 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, Ayyappa 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

**DESIGN OF CONCRETE STRUCTURE**

<b>Paper Code</b>	<b>BE-302</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
	<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>

**Course Objectives**

**B.E. (Civil Engineering)**

- 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**

Working Stress Design Method: Flexure, shear, compression and torsion; Liquid retaining structure, on the ground circular and rectangular water tank, underground water tank, over head tank, design of intze (super structure only)

**Unit - II**

Flexure, shear and torsion on beams and one way slab and two way slabs subjected to Udl and concentrated loads; flat slabs.

**Unit - III**

Compression member: short and long columns, axially loaded short column, short column subjected to uniaxially and

**B.E. (Civil Engineering)**

biaxial loading, long column subjected to uniaxial and biaxial bending.

**Unit - IV**

Isolated column square, rectangular and circular footing subjected to axial load, uniaxial and biaxial bending; combined footing.

R.C.C cantilever and counter fort retaining walls

**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



**B.E. (Civil Engineering)**

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**WATER SUPPLY ENGINEERING**

<b>Paper Code</b>	<b>BE-303</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)</b>
<b>Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)</b>		

**Course Objectives**

- To introduce the concept of water demand and water conservation measures.
- To explain design concept of different water treatment units
- To identify suitable methods of treatment to be used for removal of impurity.
- To analyze and design efficient water distribution system.

**Course Learning Outcome**

- Completion of this course would enable students to acquaint the fundamental concepts in the field of water supply and environmental engineering and design of water supply schemes and treatment units.

**Course Description**

**Unit - I**

Water demand, types of demand, factors affecting per capita demand, variation in demand, population forecasting, sources of water supply, factors governing the selection of sources. Systems of water supply – design of gravity supply system, pumping system, and combined gravity & pumping system. Design of pumps for water supply.

**B.E. (Civil Engineering)****Unit - II**

Water quality – physical, chemical and microbiological water quality parameters and their examinations, sampling and analysis of water quality parameters, water quality standards, natural purification of water in rivers and streams, introduction to mathematical modeling of water quality in streams.

**Unit - III**

Engineered system for water purification; screens, types, design of screens, aeration, types of aerators and their applications, design of different aeration systems. Sedimentation – theory, types of sedimentation tanks, design of primary sedimentation tank. Coagulation and flocculation – theory, types of coagulants and coagulant aids, design of flocculation tank.

**Unit - IV**

Water softening, design of water softening and demineralization processes, chemical precipitation, ion exchange, reverse osmosis, filtration – theory, types of filters, gravity and pressure filters, slow sand and rapid sand filters, filter operations, design of filter media.

**Unit - V**

Disinfection, types of disinfectants, disinfection mechanism, chlorination, super chlorination, pre and post chlorination, de-chlorination. Computation of hydraulic profile of water treatment plant. Site selection for water treatment plant, layout considerations, operation and maintenance. Computer aided design of water treatment units.

**Text Books**

**B.E. (Civil Engineering)**

- Water and Wastewater Engineering, Fair, and Geyer, Vol-I and II, Wiley
- Water Supply Engineering, Garg, Khanna Publishers
- Text Book of Water Supply and Sanitary Engineering, Husain, Oxford & IBH
- Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill

**Reference Books**

- Gray Water Technology, Butterworth-Heinemann (Elsevier)
- Water and Wastewater Technology, Hammer and Hammer, Jr., Prentice-Hall
- 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

**TRANSPORTATION ENGINEERING**

**Paper Code**      **BE-304**      **(Lectures-Tutorial-Practical)/Week (3 – 0 – 3)**  
**Course Marks (Mid-End-Total) (50 – 50 – 100 – 200)**

**Course Objectives**

- Understand transportation engineering is multi-faced.
- To introduce the fundamentals of transportation engineering such as highway design, railways and airport design.

**B.E. (Civil Engineering)**

- Students should be able to start applying these skills in the planning, modeling and designing transportation systems.

**Course Learning Outcome**

- Obtain an understanding of the fundamentals of transportation engineering
- Learn basic techniques in transportation engineering and traffic analysis.
- Apply the principles of transportation engineering to solve the 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 intersections.

**B.E. (Civil Engineering)**

Traffic Engineering: Traffic characteristics, traffic studies – volume, speed, origin and destination, parking and accident studies.

**Unit - III**

Highway Materials: subgrade soil, aggregates and bituminous material; different tests on these materials. Pavement design: Introduction, Design parameters, Design of flexible pavement (IRC method); Design of rigid pavement (IRC method). Construction of WBM road and bituminous pavements.

**Unit - IV**

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, Geometric design of track, Points and Crossing, Station and Yards, Level crossing, Signaling and control.

**Unit - V**

Airport Engineering: Aircraft Characteristics, airport planning, site selection and configuration, Runway and taxiway design, Basic runway length and corrections, geometric design elements.

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

**Text Books**

- Highway Engineering by Khanna and Justo, Nem Chand and Bros, Roorkee.
- Relevant IRC codes.
- Railway Engineering by Chandra and Agarwal, Oxford University Press.
- Air Transportation Planning and Design by Saxena, CBS Publisher.

**B.E. (Civil Engineering)**

- Bridge Engineering, Ponnuswamy, Tata McGraw Hill.

**Reference Books**

- Transportation Engineering by Chakroborty and Das, PHI.
- Railway Engineering by Saxena and Arora, Dhanpat Rai Publications.
- Planning and Design of Airports by Horonjeff and McKelvey, McGraw Hill.

**THEORY OF STRUCTURE – II**

<b>Paper Code</b>	<b>BE-305</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
	<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>

**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**

**B.E. (Civil Engineering)**

- 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. by implementing column analogy method.

**Course Description****Unit - I**

Slop deflection Method, Moment distribution Method for Beam and Frames, Short cuts in these methods.

**Unit - II**

Two hinged arches, fixed arches; Muller Breslau principle; Influence line diagrams for intermediate beams and frames using Muller Breslau principle.

**Unit - III**

Analysis of indeterminate trusses.

**Unit - IV**

Flexibility/ force method for intermediate beams and frames.

**Unit - V**

Stiffness/ displacement method for indeterminate beams and frames.

**B.E. (Civil Engineering)**

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**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

**ENGINEERING HYDROLOGY**

<b>Paper Code</b>	<b>BE-306</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>	

**Course Objectives**

- To know the basic concepts in hydrology.
- To study the features of precipitation, frequency analysis, rain gauge density, DAD curve, evaporation, transpiration and infiltration.
- To learn about the evaporation process and estimation, runoff estimation, modelling of runoff, and hydrograph (UH, SUH).
- To understand estimation, forecasting, control of flood, and concept of Log Pearson type 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**

## **B.E. (Civil Engineering)**

### **Unit - I**

**Precipitation:** Hydrologic cycle, India's water balance, World's water balance, Types & 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.

**Surface Abstractions:** Evaporation process and its estimation, Transpiration, Evapotranspiration, Measurement of evapotranspiration, Evaporation controls.

### **Unit - II**

**Surface Runoff:** Factors affecting runoff, Rainfall - runoff relationships, Empirical equations, Flow duration curves, Mass curves. **Infiltration:** Infiltration process, Factors affecting infiltration, Measurement of infiltration, Infiltration indices.

### **Unit - III**

**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, S-curve, Uses and limitations of unit hydrograph. **Stream Gauging:** Measurement of stage velocity, Direct and Indirect methods of stream flow measurement, Rating curve, Stage discharge relationship.

### **Unit - IV**

**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.

### **Unit - V**

**B.E. (Civil Engineering)**

**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, Well interference.

**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.

**FOUNDATION ENGINEERING****Paper Code**      **BE-401****(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)****Course Marks (Mid-End-Total)****(50 – 100 – 150)****Course Objectives**

### **B.E. (Civil Engineering)**

- This course acquires the capacity 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**

**SITE INVESTIGATION;** - Purpose, methods, boring & sampling, samplers.

**SHALLOW FOUNDATIONS;** - Types, general requirements, bearing capacity field & laboratory methods, Consolidation and settlement, Isochrones, sand drains, soil stabilization, Use of I S code.

#### **Unit - II**

**DEEP FOUNDATIONS;**- Types, purpose and classification of pile foundations. Construction of piles, pile load test, Load capacity and settlement of piles, under reamed Piles; ( individual pile & group of piles).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**

### **B.E. (Civil Engineering)**

**LATERAL EARTH PRESSURE**;- 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 piles, bulk head anchored sheet pile ( by free earth support method & fixed earth support method ).

#### **Unit - IV**

**SOIL DYNAMICS** ;- Introduction to soil dynamic, definitions, spring mass system, single degree of freedom system, free and forced vibration of damped and undamped systems.

**MACHINE FOUNDATIONS** ;- Type & criteria for design of machine foundation. Analysis and design of block foundation.

**VIBRATION ISOLATION** ;- Active and passive methods of isolation.

#### **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

**DESIGN OF STEEL STRUCTURE**

<b>Paper Code</b>	<b>BE-402</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
	<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>

**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

## B.E. (Civil Engineering)

- 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

**B.E. (Civil Engineering)**

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**

**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.

**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.

**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**

**B.E. (Civil Engineering)**

- Limit State Design of Steel Structures, SK Duggal, Tata Mac-Graw-Hill Publication-2010.
- Limit-State-Design of Steel Structures by N. Subramaniam, 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.226," Steel for general structural purposes," 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.226," Steel for general structural purposes," 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.816:1969," Code of practice for use of metal arc welding for general construction in mild steel," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.

**AIR AND WASTEWATER POLLUTION CONTROL**

<b>Paper Code</b>	<b>BE-403</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
	<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>

**Course Objectives**

- The course aims at imparts knowledge about air quality, impacts, modeling and the design of air pollution control systems for industries
- It emphasizes upon estimation of wastewater generation, sewerage systems, design of various unit processes/operations provided in wastewater treatment plants

**Course Learning Outcome**

- After completion of this course student will be able to design air pollution control system, sewerage system and wastewater treatment plants.

**B.E. (Civil Engineering)**

<b>Course Description</b>
<p><b>Unit - I</b></p> <p>Air pollution – an overview, air pollution meteorology, stability of atmosphere, plume behavior, mixing height, plume rise, effective stack height, air quality modeling, Gaussian plume dispersion modeling, reduction of Gaussian model to centerline and ground level concentrations, reduction to line source, applications of air quality models in air quality management</p>
<p><b>Unit - II</b></p> <p>Air pollution control devices, particulate control devices; gravity settling chambers, cyclone separators, fabric filters, electrostatic precipitators and wet scrubber, working principle, design, advantage, disadvantages and limitations. Gaseous pollutants control devices and their working principle, catalytic converters.</p>
<p><b>Unit - III</b></p> <p>Wastewater, sources of wastewater; municipal and industrial, variation in wastewater generation and its estimation, characteristics of wastewater – physical, chemical and microbiological, BOD removal, kinetics and BOD test limitations, collection of wastewater.</p>
<p><b>Unit - IV</b></p> <p>Sewerage system and its components, sewer and sewer appurtenances, hydraulics of sewer, design of sewerage system and their appurtenances, design of sewage collection system, design of screens chambers, grit chambers, oil and grease chamber, wastewater treatment processes – primary, secondary and tertiary.</p>
<p><b>Unit - V</b></p> <p>Biological treatment of wastewater, theory, application and design of conventional treatment systems: activated sludge process, trickling filter, stabilization pond, rotating biological contactors; anaerobic digestion, tertiary treatment of</p>

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wastewater and reuse of treated effluent.

**Text Books**

- Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill
- Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, McGraw Hill
- Introduction to air pollution by MN Rao
- Air pollution control engineering by R. Crawford

**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, S.K. Garg, Khanna Publishers
- Water and Wastewater Technology, Hammer and Hammer, Jr., Prentice-Hall
- Text Book of Water Supply and Sanitary Engineering, Husain, Oxford & IBH

**Software or other Requirement**

- AirMoview, CalRoadview, SewerCAD, SewerJEM

**B.E. (Civil Engineering)**

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<b>Paper Code</b>	<b>BE-404</b>	<b>(Lectures-Tutorial-Practical)/Week (3 – 0 – 0)</b>
	<b>Course Marks (Mid-End-Total)</b>	<b>(50 – 100 – 150)</b>

**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**

**Irrigation in India:** Scope of irrigation, Irrigation schemes, Ongoing projects, Engineering aspects of project planning, Planning of water resources, Economic analysis of water resources, Benefit and cost analysis, Review of water requirements of crops, Soil water plant relationship.

**Unit - II**

**Alluvial channels:** Design of alluvial channels, Lacey's and Kennedy's silt theories, Comparison, Drawbacks, Design

### **B.E. (Civil Engineering)**

according to Lacey's non-regime equations, Design of L section of a channel, Balancing depth, Use of Garret's diagrams, Cross section of irrigation channel, Canal irrigation system, Alignment of canals, Distribution system for canal irrigation.

**Sediment transport:** Mechanics of sediment transport, Sheild's equation.

#### **Unit - III**

**Weirs and Barrages:** Component, Functions and causes of failures of barrages. **Theories of sub-surface flows:** Bligh's creep theory, Lanes weighted creep theory and Khosla's theory, Uplift pressure calculations, Design of sloping Glacis weir and protection works.

#### **Unit - IV**

**Cross drainage works:** Types of works, Factors affecting suitability, Classification of aqueducts and siphon aqueducts, Design of maximum flood discharge, Waterway, Transitions, Head loss, Uplift pressures. **Canal Falls:** Types of falls, Design of Sarda type fall.

#### **Unit - V**

**Gravity dam:** Selection of dam site, Type of dams, Stability analysis and design of gravity dam. **Earth dam:** Causes and failure of earth dams, Criteria and design of earth dams, Flow net, Phreatic lines in embankment, Seepage analysis.

**Water Logging:** Effects of water logging, Causes of water logging, Remedial measures, Estimation of depth and spacing of drains, Drainage coefficient, Canal lining – advantages, Types of lining and design of lined channels.

#### **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

**B.E. (Civil Engineering)**

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**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

**URBAN UTILITY SERVICES**

Paper Code	BE-405	(Lectures-Tutorial-Practical)/Week (3 - 0 - 0)
		Course Marks (Mid-End-Total) (50 - 100 - 150)

**Course Objectives**

- Disseminate knowledge and skill for proper design of water supply and sewerage system as well as rainwater harvesting.
- To inculcate the understanding on selection of location and engineering design of landfill sites for municipal solid is also taught..

**Course Learning Outcome**

- To obtain a trained and skilled environmental engineer having sufficient knowledge on design and application of sewerage system.

**Course Description**

**UNIT - I**

Water-intakes – an overview, design principle and design of various types of intakes such as river, reservoir and lakes. Ground water resources development, its type, design of tube well, Interferences of Wells, Effect of partial Penetration on yield of well.

**UNIT - II**

Water distribution systems – an overview, design criteria and principles, various technique for design of water distribution network. design of water distribution systems (upto two loops) using Hardy Cross method and standard nomo-grams, Major appurtenances of water distribution networks.

**UNIT - III**

Design principle of water-main and assessment of optimum size of water-main; Different types of Water Storage Tank,

**B.E. (Civil Engineering)**

water storage tanks, assessment of balancing and evaluation of total capacity of water storage tank. Design of Sewage Pumping Station. Different Types of Pumps used for water supply, Sewage and Sludge.

**UNIT - IV**

Urban drainage systems – an overview, estimation of flow rates of storm water and its variations, assessment of concentration time and its impact on drainage estimation of peak drainage discharge. design criteria of urban drainage system, design of urban drainage system, rainwater harvesting, computer application for design of urban drainage system

**UNIT - V**

Solid waste, physical and chemical characteristics of solid waste, generation rate, codal provisions, municipal solid waste management, collection of solid waste, transportation and disposal of solid waste, treatment of solid waste, incineration, composting, vermin-composting of solid waste and sanitary land fills

**Text Books**

- Peavy, Rowe & Tchobanoglous, "Environmental Engineering", McGraw Hill
- S. K. Garg, "Sewage Disposal and Air pollution", Khanna Publishers
- S. K. Garg, "Water Supply Engineering", Khanna Publishers

**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
- CPHEEO, "Manual on Water supply and Treatment", Min. of Urban Dev., Govt. of India
- CPHEEO, "Manual on Solid Waste Management", Min. of Urban Dev., Govt. of India
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