



Department of Civil Engineering

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About the Institute

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (formerly known as Dr. Sudhir Chandra Sur Degree Engineering College) was established under the auspices of JIS Foundation under Section 2(f) of the UGC Act, 1956.

This Institute, which was founded in 2009, is now well-known for its innovative and rigorous curriculum, which has produced experts in a variety of businesses and sectors in India and beyond.

The Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex, which has been known for its research culture and excellence in imparting Engineering, Science, and Management education for the past 12 years and is located near the Dum Dum Metro Railway Station and International Airport, is known for its research culture and excellence in imparting Engineering, Science, and Management education.

The institute is a virtual paradise of pristine environment and beautiful beauty, nestled in a rural setting of lush green fields. The beautiful avenue of trees and flowers on campus, aptly titled "Green Field," attest to the importance of ecology and the environment. The atmosphere on campus is ideal for academic endeavours.

SurTech has taken a worldwide approach to research and teaching, focusing on foreign viewpoints and knowledge. The Institute is dedicated to greatness and strives for it constantly, accepting nothing less than the best. Its faculty, which includes intellectual giants from India and internationally, is the Institute's bedrock.

SurTech is in the forefront of using cutting-edge technology and preparing students for a globalised economy while also promoting holistic learning, unbiased knowledge, industry-focused skills, ethics, a cosmopolitan outlook, and accountability for actions.

SurTech is establishing a national and international footprint through partnerships with world-class universities, study abroad programmes, and overseas internships and research.

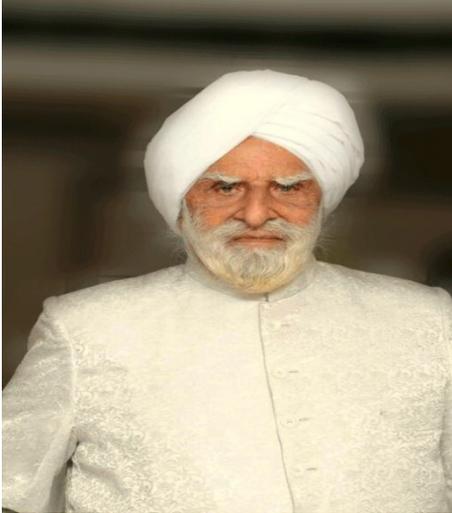
It provides a comprehensive curriculum across a wide range of engineering degree programmes. These programmes provide students with a variety of academic options.

The Institute provides great educational opportunities for youth from all over the world at a reasonable cost. Through its social responsibility efforts, the Institute also provides unwavering support for community services.



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Message of the Founder Chairman Sir



I always experienced a yearning to acknowledge my responsibilities and reciprocate by contributing to the growth and development of our society.

Years ago, when I visited my son's school, I perceived that the best way to advance society is by fostering education and it was at that moment that the dream and vision of JIS Group Educational Initiatives was conceived.

Now, when this vision of duty, aspiration and faith has become a reality, it is a proud moment for me and my team to see thousands of students pursuing higher education in JIS Group of Colleges and equipping themselves to become industry ready professionals for successful careers.

"Vision looks inward and becomes duty. Vision looks outward and becomes aspiration. Vision looks upward and becomes faith."

---Late Sardar Jodh Singh

In this process the Group intends to unite all dimensions of Education from Undergraduate to Post Graduate Programmes in Engineering and Technology, Computer Applications, Dental Science, Pharmacy, Hospitality, diverse streams of Management and so on under the same umbrella to optimize the reach of Educational Initiatives comprehensively and collectively in every stratum and corner of society towards a better future.

Our educational Initiatives believes that creating an academic foundation for social, cultural, scientific, economic, and technological development in our Nation can mature into Global Interface by giving way to education exchange in the international territory as well.

Therefore, our focus is to achieve unparalleled excellence that will bring development to our society and mankind by optimizing their potential, thereby establishing the observation of the renowned Journalist Sydney J. Harris on the role the purpose of education which is to "turn mirrors into windows".

---Late Sardar Jodh Singh
Founder Chairman, JIS Group



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Message of the Managing Director Sir



In its broadest meaning, education is any act or experience that shapes a person's mind, character, or physical abilities.

Technically, education is the deliberate transmission of society's acquired knowledge, skills, and values from generation to generation.

Thus, education is the basic fulcrum that drives societal growth.

The quality of education is clearly the priority in this era of globalization. Quality is not a single metric.

A good educational institution works to maintain and improve quality in all areas of operation.

I believe that a teacher may shape an educated and socially responsible human being by instilling two traits in students: curiosity and determination. Second, a teacher's noble life becomes a light for students when they establish strong values and put them into practice.

SurTech's objective to provide the best studying, teaching, and research possibilities for students and academics is to provide students with modern knowledge and strong values.

Our students find the thrill and rigor of new discoveries, and develop skills of investigation, evaluation, and communication that will serve them well in their jobs and lives.

Students' creativity, teamwork, and international competition thrive. SurTech is committed to academic independence and cultural diversity to attract students and teachers.

At Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech), we try to establish an environment that inspires personal and professional progress. Our efforts are focused on recognizing and understanding human talent and enthusiasm. SurTech is thus about “how we can best educate our students to confront the future's challenges”.

With a 160-year tradition of academic achievement, scientific advancements, and high-tech innovation. I urge you to seize this fantastic chance and join us actively contributing to the globalization of our society.

With these remarks, I welcome everyone to SurTech and wish them every success on their new adventure with us.

**---Sardar Taranjit Singh
MD, JIS Group**



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Message of the Principal Sir



I am honoured and greatly privileged to lead Dr. Sudhir Chandra sur Institute of Technology & Sports Complex (SurTech) and continue the ambitious strategy of addressing the challenges and opportunities of future to benefit our communities more widely.

On the global platform, India has the responsibility of transforming itself into a developed nation with a strong ethical system- this; however, is a great challenge, as this can only be achieved through the youth of today who have the power of ideas, ambition, ability and most importantly passion.

I believe passionately that we are all born with tremendous capabilities, but unfortunately, we lose these as time goes by and ironically this can be directly attributed to the current system of education which stifles the creative senses rather than enhancing it.

Stepping into the JIS Group of Institutions is stepping into a brighter world of education and a knowledge hub. It is worthwhile to take advantage of the opportunity to see the difference and enjoy the "joy of learning."

Dr. Sudhir Chandra Sur Institute of Technology and Sports Complex (Formerly known as Dr. Sudhir Chandra Sur Degree Engineering College) is one of India's top educational institutions, providing high-quality education to students with the goal of becoming a world-class technical education and scientific research institution.

Since its inception in 2009, SurTech under the aegis of JIS Group has continued in subtle ways to pour fresh knowledge, human capital, and innovation into the engines of our society and nurturing a new generation of young professionals who are prepared to face the ever-changing social, economic, and technological landscape of our country to build a more inclusive and sustainable society on a national and international scale.

Over the last decade, the Institute has evolved into a strong blend of cutting-edge infrastructure and tightly connected human resources dedicated to providing professional education with a focus on creativity and innovation.

In a short span SurTech has become an ensemble of a multi-layered educational system which covers all aspects of diploma, under-graduate, and post-graduate education with smartly crafted and industry compliant course curricula using state-of-art infrastructure in a climate of possibility and transform lives and enhance communities.

The research activities of our faculty lead to an extraordinary enrichment of the experience of our students that is realized at both the graduate and undergraduate levels. The research training provided to our graduate students creates the next generation of scholars well-prepared to advance knowledge and transfer technology. The extension of research opportunities to an ever-increasing group of undergraduate students adds a dimension of experience to the undergraduate education that simply cannot be duplicated in the classroom.



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SurTech heralds the latest and newest but never allows itself to be consumed by the intellectual fads of the day. Our graduates are smart, collaborative, and entrepreneurial. They use creative space of SurTech to actualize their potential. We are encouraging entrepreneurship and innovation on the campus.

We are facilitating campus recruitments and connecting our students to the world. The College strives for quality in training to instil a feeling of professional responsibility, social and cultural awareness, and to prepare students for leadership roles.

Campus life here emphasises the value of extracurricular activities in addition to academic learning, exposing students to a variety of fresh opportunities. All of this contributes to our student's development as a thoroughbred professional, well-suited to contribute to his chosen field while keeping an open mind to new ideas and concepts in industrial and technical breakthroughs through conducting Guest Lectures, Industrial Visits, Vocational Training (internships), student chapters of international professional groups, sponsored projects, and other means, students can meet with industry experts.

I can say with legitimate pride that the College has achieved far more than just the modest target set at the time of its inception by producing a trained human resource to serve the country in all walks of life and by contributing to the knowledge base.

I am glad to have this opportunity to serve as the Principal of this glorious institution. SurTech pledges to the state, the nation, and the world that our endeavours will benefit all citizens. I invite you to join and strengthen this venture.

---Prof. (Dr.) Saradindu Panda
PhD-Tech (NIT, DGP), M. Tech (VLSI, J.U), BE (UIT, BU)
Chair, IEEE CASS Kolkata Section
IQAC Member of Swami Vivekananda College, RKM, Rahara
MIEEE, MIASSE, MIEI, MIETE, MIAENG, MCSTA, MIREN, MIAE, MITEEA



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Institutional Vision

To be a top global technology institute that creates leaders & innovators and generates new knowledge for society & industry via transformative education.

Institutional Mission

Excellence in Education: Education of world-class quality, based on ethics and critical thinking, for the betterment of life.

Innovative Research: An innovation ecosystem to advance knowledge and tackle pressing issues.

Impactful People: Happy, accountable, compassionate, and effective employees and pupils.

Productivity Enhancement: Active engagement with national and international companies, as well as institutions, to increase productivity and economic development.

Service to Society: Providing knowledge and compassion to the region and the planet.

Core Values

Integrity, Excellence, Accountability, Transparency, and Empathy are the abiding ideals established by the Institute.

Integrity & Honesty:

Research and teaching must take place in an atmosphere of academic freedom and honesty. In all its efforts, the Institute shall uphold the highest ethical standards.

Equality:

We are dedicated to establishing an institution and a community in which everyone is valued and judged based on their contributions and accomplishments rather than their gender, race, religion, physical abilities, sexual identity, or socioeconomic status. We shall raise awareness of individual and institutional racism, as well as fight to abolish it, through the activities of this institution.

Pursuit of Excellence:

The Institute is dedicated to excellence in all aspects of its operations and will strive for continuous improvement through internal and external reviews. Awards and honours will be given out by the Institute to recognize remarkable contributions.



Synergy through Teamwork:

To become synergistic and succeed, the institute concentrated on four key characteristics: a clear team purpose, effective communication, empowerment so that the team can lead itself, and ensuring that everyone is committed to the goal.



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Accountability:

The Institute is dedicated to creating an atmosphere in which each member of the community recognizes and accepts responsibility for upholding and strengthening our principles.

Empathy:

The Institute's research and education programs will include an awareness of the conditions of our society's poorer members, as well as contributions to solving their problems.

Transparency:

The Institute will follow established procedures and rules, which will be communicated to all stakeholders. All valuable information about the Institute's operations will be made available.

Quality Policy

Dr. Sudhir Chandra Sur Institute of Technology & Sports Complex (SurTech) is dedicated to academic excellence, providing high-quality technical education, training, and expertise in a variety of industries, and engineering programmes, enhancing students' inherent abilities, capabilities, and thought processes while also promoting their engineering and technological skills. We are committed to meeting the criteria and improving the efficacy of our quality management system on a continuous basis.

Quality Objectives

- To focus on the students' total development by increasing their technological and managerial skills, as well as their leadership talents, and to guarantee that they are well-rounded.
- To foster an environment that promotes effective teaching, active learning, and purposeful research for economic progress.
- Incorporating value-added programmes into the curriculum and increasing students' job chances.
- To review the effectiveness of the institute's programmes on a regular basis, considering the demands of the industry and other areas of employment, and responding positively to those needs.
- To expose students to the difficulties of the twenty-first century while also giving opportunities for them to think creatively and display entrepreneurship abilities to contribute effectively to the nation's growth.
- To provide research creation, consulting, testing, and customised training to satisfy the industry's specific demands, thereby encouraging students to pursue self-employment and entrepreneurship.
- To provide cutting-edge technological infrastructure and to inspire students to reach their full potential.
- To foster mutually beneficial collaboration with industry, other institutions, and organisations.
- To ensure that the Quality Management System is continually improved.
- Benchmarking the institution against top institutions on a regular basis to adopt best practises for quality improvement.



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BOG Members

Sl No.	Name and Designation	Post
1	The Regional Director, AICTE, Eastern Regional Office	Member
2	The Regional Director, AICTE, Eastern Regional Office	Member
3	Mr. Partha Ghosh, State Govt. Nominee	Member
4	Prof. Narayan Banerjee, MAKAUT Nominee	Member
5	Mr. Taranjit Singh, Managing Trustee, JIS Foundation	Member
6	Mr. Haranjit Singh, Trustee Member, JIS Foundation	Member
7	Mr. Amrik Singh, Trustee Member, JIS Foundation	Member
8	Mr. Simarpreet Singh, Trustee Member, JIS Foundation	Member
9	Mr. Harjot Singh, Trustee Member, JIS Foundation	Member
10	Mr. Amanjot Singh, Trustee Member, JIS Foundation	Member
11	Mr. U. S. Mukherjee, Deputy Director, JIS Group	Member
12	Mr. Amit Srivastava, Managing Director, Hash Technology	Member
13	Dr. Asit Guha, Advisor , JIS Group (Educationist)	Member
14	Dr. Shefalika Ghosh Samaddar, Professor, Dept. of CSE, DSCSITSC	Member
15	Mr. Vivek Shaw, Asst. Prof of BSHU & In-charge, Exam Cell	Member
16	Dr. Saradindu Panda, Principal, DSCSITSC	Member Secretary



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Academic Council

Sl. No.	Name	Designation
1	Prof. (Dr.) Saradindu Panda, Principal	Chairman
Three Nominees of MAKAUT, WB		
2	Prof. (Dr.) Manojit Mitra, Dept. of ECE, IEST Shibpur	University Nominee
3	Prof.(Dr.) Subhasish Bhowmik, Dean R&D IEST Shibpu	University Nominee
4	Prof.(Dr.) Amitava Chatterjee, Dept. of EE, JU	University Nominee
Experts / Academicians from Outside the College Nominated by Governing Body		
5	Prof.(Dr.) Goutam Sutradhar, Director, NIT Manipur	External Academic Expert
6	Prof. (Dr.) Debashis De, Professor, MAKAUT	External Academic Expert
7	Prof. (Dr.) Sibapriya Mukherjee, Professor, Jadavpur University	External Academic Expert
8	Mr. Atanu Chowdhury, Deputy General Manager- HR & IR, Electrosteel Castings LTD	Industry Expert
9	Mr. Turjasu Pyne, Senior Embedded Engineer, Silicon Validation for NXP	Industry Expert
Dean (Academics), IQAC Coordinator & Controller of Exam		
10	Mr. Vivek Shaw, Asst. Prof., Dept. of BSH	Member Secretary
11	Ms. Amrita Chadha, PA to Principal ,Dept. of Admin	Member
All the Heads of Department		
12	Mr. Baibaswata Das, Asst. Prof (TIC), Dept. of CE	Member
13	Ms. Rinku Supakar, Asst. Prof. (TIC), Dept. of CSE	Member
14	Mr. Anirbit Sengupta, Asst. Prof. (TIC), Dept. of ECE	Member
15	Mr. Arindam Mukherjee, Asst. Prof. (TIC), Dept. of AUE	Member
16	Mr. Anirban Chowdhury, Asst. Prof. (TIC), Dept. of EE	Member
17	Dr. Ruma Sen, Asst. Prof. (HOD), Dept. of ME	Member
Four Teachers representing different categories		
18	Dr. Shefalika Ghosh Samaddar, Professor, Dept. of CSE	Member
19		Member
20	Dr. Abhijit Kundu, Asst. Prof, Dept. of CE	Member
21	Dr. Biswajit Gayen, Asst. Prof.(HOD), Dept. of BSH	Member



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Internal Quality Assurance Cell (IQAC)

Sl. No.	Name	Designation
1	Prof. (Dr.) Saradindu Panda, Principal	Chairman
2	Mr. Vivek Shaw, Asst. Prof., Dept. of BSH	Coordinator
3	Mr. Simarpreet Singh, Director, JIS Group	Management Representative
4	Prof. (Dr.) Asish K Mukhopadhyay, "Margadarshak-AICTE", Professor (Emeritus), IET, Bundelkhand University, Jhansi, U.P	Academic Expert
5		Faculty Representative
6	Dr. Shefalika Ghosh Samaddar, Prof. Dept. of CSE	Faculty Representative
7	Mr. Arindam Mukherjee, Asst. Prof.(TIC) Dept. of AUE	Faculty Representative
8	Mr. Anirban Chowdhury, Asst.Prof.(TIC), Dept. of EE	Faculty Representative
9	Mr. Anirbit Sengupta, Asst. Prof., (TIC) Cum Admission Coordinator, Dept. of ECE	Faculty Representative
10	Mr. Subhasish Halder, Asst. Prof., Dept. of ME	Faculty Representative
11	Ms. Debina Dey, Manager, Industry Alliance	Dept. of T&P
12	Ms. Amrita Chadha, PA to Principal	Admin Representative
13	Ms. Dazy Rani, Asst. Registrar, Dept. of Admin	Admin Representative
14	Mr. Arunava Kundu, Asst. Treasurer, Surermath Association DumDum	Nominee from Local Society
15	Mr. Rivu Ghosh, System on Chief Design Engineer Intel Corporation	Nominee from Employers
16	Mr. Debasish Mazumdar, Associate Director, CDAC, Kolkat	Industry Representative
17	Dr. Dipra Bhattacharya	Parents Representative
18	Mr. Dipi Ranjan Rauth, 3rd Year, Dept. of CSE	Student Representative
19	Ms. Debosmita Ganguli, Dept. of ECE	Alumni Representative



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Administrative Offices

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About the Department

The department of Civil Engineering of Dr. Sudhir Chandra Sur Institute of Technology and Sports Complex was established in the year of 2012. It offers 3 years Diploma Engineering Course & 4 years B. Tech engineering course. Intake capacity of Diploma is 60 & B.Tech is 60 students. Diploma holder Students can take admission in B.Tech courses, from 2nd year as Lateral Students.

Civil engineering is the oldest engineering stream & it is considered as mother of all engineering. Excellent & adequate apparatus or machines are real assets of Civil Engineering Department. This department is also equipped with high quality faculties from IEST, JU, IIT (KGP) & others. The department faculties & TAs are always available within & also beyond class hours for interactions with students.

As per the demand and supply assessment of specialized skill sets in built environment carried out by Royal Institution of Chartered Surveyors (RICS), the report on 'Real Estate and Construction Professionals in India by 2020' indicates the requirement of approx. 4.27 million civil engineers per year to meet the real estate and infrastructure requirements of the country.

Smart Cities Mission, Green & Sustainable Infrastructure, Expressways, Metro Rail Projects, Sea Link, Sky Bridge are few infrastructure development of the country. Do you want to be a part of such infrastructure modernization and development?

As the country gears up for infrastructure upgrade, demand for quality civil engineers is on the increase. This calls for an optimum blend of industry exposure and technical know-how in the students-to-be-engineers. At department of civil engineering, we groom the students to be industry ready professionals. It is our continuous endeavour to produce system thinkers and problem solvers. The course curriculum is a mix of analytical insights, quantitative abilities and experiential learning which is updated regularly, based on recent advances and demands of the industry. The department has well equipped laboratories with modern sophisticated instruments.



Department of Civil Engineering

Departmental Vision

To be recognized as an internationally acclaimed technical department by achieving excellent standards of quality technical education, keeping pace with the rapidly changing technologies, research and innovations and to produce Civil Engineers of global standards with the capability of accepting new challenges.

Departmental Mission

M1: To impart fundamental knowledge of engineering and its practical application by developing state-of-the-art facilities for the department of Civil Engineering.

M2: To nurture and build people in a rewarding and inspiring environment by fostering creativity, empowerment, innovation and entrepreneurship.

M3: To build Industry – Institute linkage for quality improvement by promoting participation of industries in the area of consultancy

M4: To encourage the students towards higher education through research and development activities.

Program Educational Objectives

PEO1: To empower the students with the knowledge of Basic Engineering Science & Technical Skill.

PEO2: To develop the skill of methodological approach for decision making and designing.

PEO3: To prepare students for different fields like industries, Research & Development, teaching etc. through which society will be served

PEO4: To create awareness towards social and environmental issues and emphasize on effective communication skill and professionalism.



Department of Civil Engineering

Program Outcome (PO)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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Program Specific Outcome

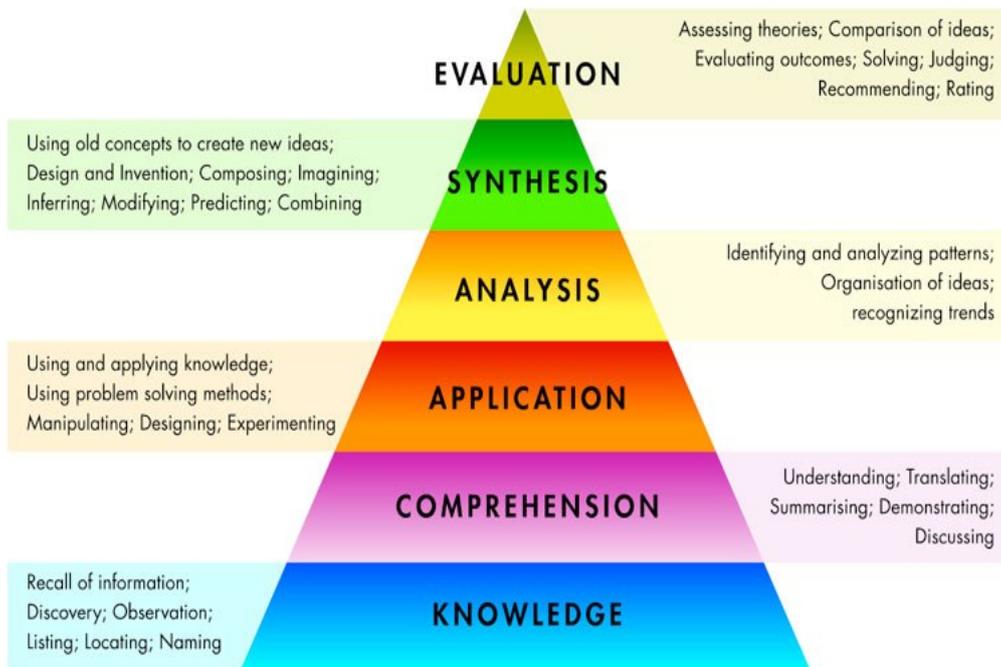
PSO1: *The graduates will be able to apply general technical skills and Civil Engineering knowledge to meet the needs of the public in the design and execution of quality construction work considering the health, safety, cultural, societal, and environmental needs.*

PSO2: *The graduates will be able to participate in to help the students develop the ability to critically think critical thinking through the analysis and designing of conventional and complex Civil Engineering problems by using modern Civil Engineering tools, which include building analysis/information modelling software packages, drafting software packages, GI and Cloud-based software packages, and various other design software packages..*

PSO3: *The graduates will be able to pursue lifelong learning and work effectively as an individual – entrepreneur – or in a team through interpersonal and professional development to execute medium- to large-scale Civil Engineering projects that address the challenging and emerging needs of our society.*

Bloom's Taxonomy of Learning Domains

B L O O M S T A X O N O M Y

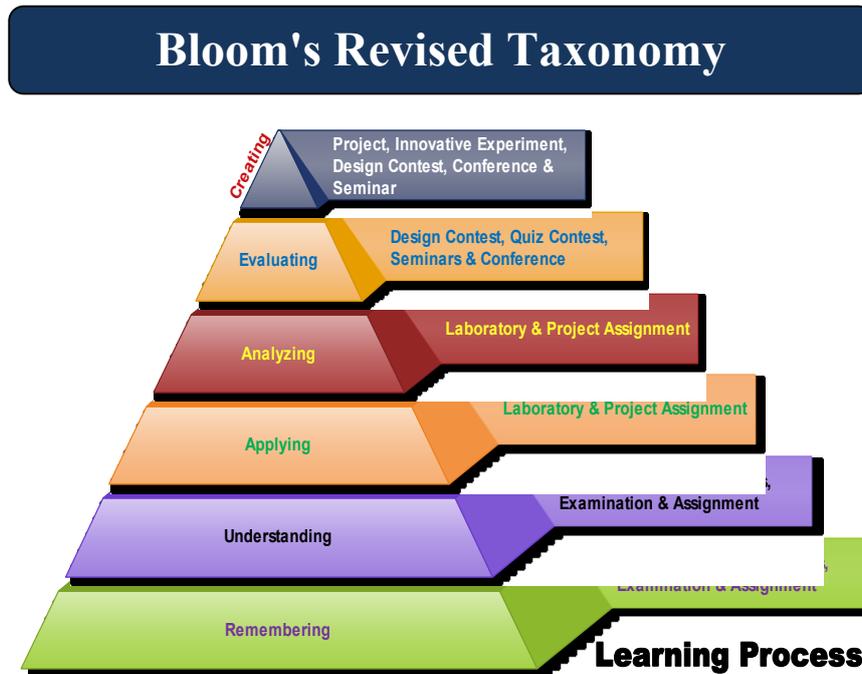


Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Dr Benjamin Bloom to promote higher forms of thinking in education, such as analysing and evaluating concepts,



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processes, procedures, and principles, rather than just remembering facts (rote learning). It is most often used when designing educational, training, and learning processes.



Lorin Anderson, a former student of Bloom, and David Krathwohl revisited the cognitive domain in the mid-nineties and made some changes, with perhaps the three most prominent ones being (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths, Wittrock, 2000):

- changing the names in the six categories from noun to verb forms
- rearranging them as shown in the chart below
- creating a processes and levels of knowledge matrix

This new taxonomy reflects a more active form of thinking and is perhaps more accurate. The new version of Bloom's Taxonomy, with examples and keywords is shown below, while the old version may be found here.



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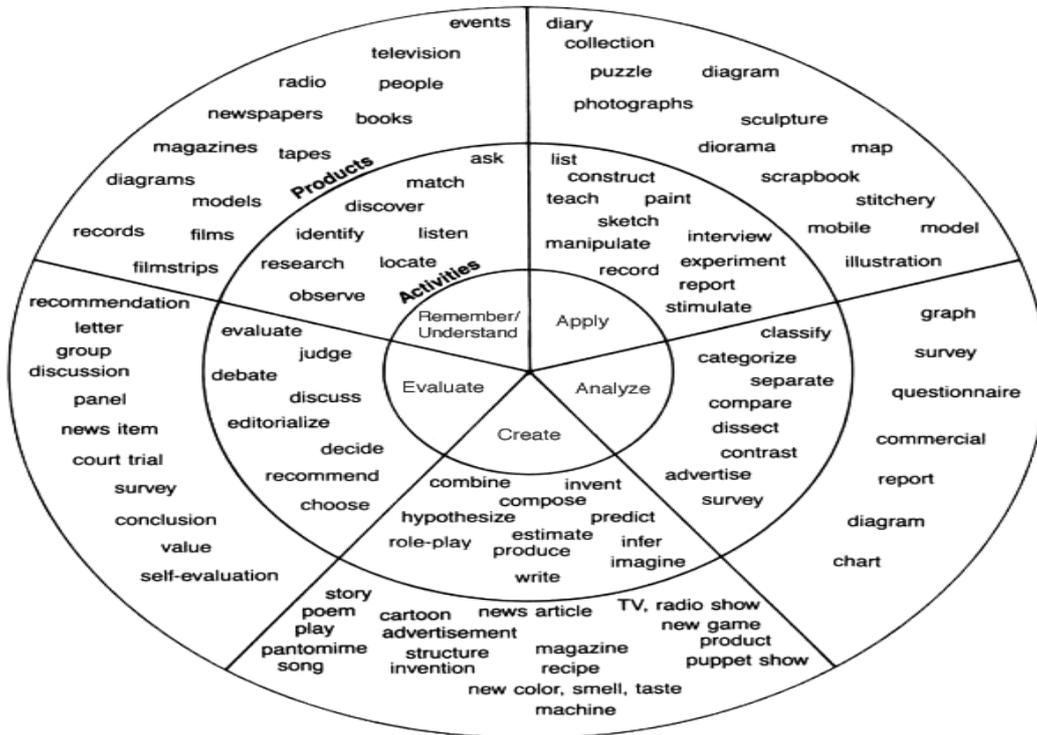
Mapping Out Learning Outcomes and Assessment Levels with Revised Bloom's Taxonomy

This document focuses on cognitive domains and the dimensions of knowledge. Detailed explanations for each domain and the use of this table follow below.

BLOOM'S TAXONOMY DIGITAL PLANNING VERBS					
REMEMBERING	UNDERSTANDING	APPLYING	ANALYZING	EVALUATING	CREATING
Copying Defining Finding Locating Quoting Listening Googling Repeating Retrieving Outlining Highlighting Memorizing Networking Searching Identifying Selecting Tabulating Duplicating Matching Bookmarking Bullet-pointing	Annotating Tweeting Associating Tagging Summarizing Relating Categorizing Paraphrasing Predicting Comparing Contrasting Commenting Journaling Interpreting Grouping Inferring Estimating Extending Gathering Exemplifying Expressing	Acting out Articulate Reenact Loading Choosing Determining Displaying Judging Executing Examining Implementing Sketching Experimenting Hacking Interviewing Painting Preparing Playing Integrating Presenting Charting	Calculating Categorizing Breaking Down Correlating Deconstructing Linking Mashing Mind-Mapping Organizing Appraising Advertising Dividing Deducing Distinguishing Illustrating Questioning Structuring Integrating Attributing Estimating Explaining	Arguing Validating Testing Scoring Assessing Criticizing Commenting Debating Defending Detecting Experimenting Grading Hypothesizing Measuring Moderating Posting Predicting Rating Reflecting Reviewing Editorializing	Blogging Building Animating Adapting Collaborating Composing Directing Devising Podcasting Wiki Building Writing Filming Programming Simulating Role Playing Solving Mixing Facilitating Managing Negotiating Leading



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Mapping of PEOs with Mission of the Department

PEO Statement	M1	M2	M3	M4
PEO1: To empower the students with the knowledge of Basic Engineering Science & Technical Skill	3	1	2	3
PEO2: To develop the skill of methodological approach for decision making and designing	3	2	1	3
PEO3: To prepare students for different fields like industries, Research & Development, teaching etc. through which society will be served	3	1	1	3
PEO4: To create awareness towards social and environmental issues and emphasize on effective communication skill and professionalism.	3	-	3	3

Note: M1, M2, M3, M4 are distinct elements of Mission statement. Enter correlation levels 1, 2 or 3 as defined below:

- '1': Slight(Low)
- '2': Moderate (Medium)
- '3': Substantial (High)
- '-': If there is no correlation.

Mapping of PEOs with POs

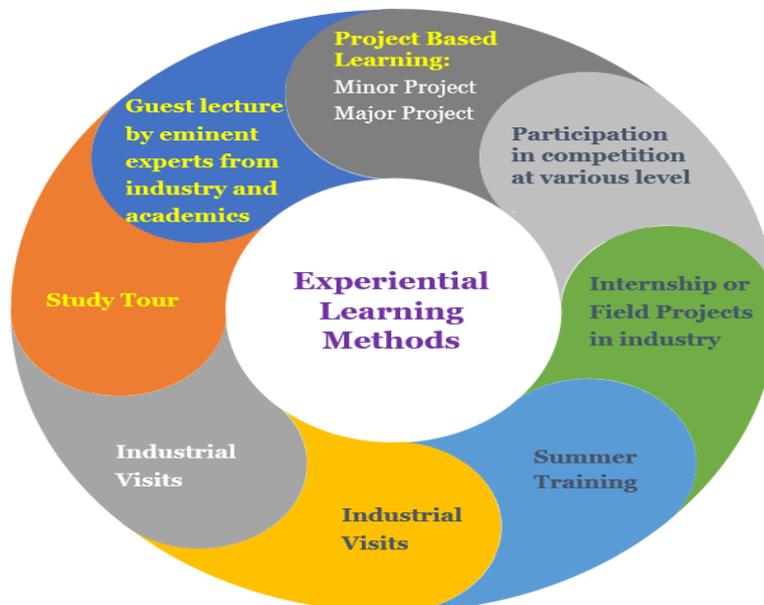


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Program Educational Objectives	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO 1	3	3	1	1	2	3	2	1	2	1	1	2
PEO 2	3	3	3	1	3	3	3	3	2	3	1	3
PEO 3	3	3	1	1	2	3	3	1	2	3	2	2
PEO 4	1	2	1	3	2	1	1	1	3	3	3	1

3-Strongly Mapped, 2-Moderately Mapped, 1-Weakly Mapped, 0-NA

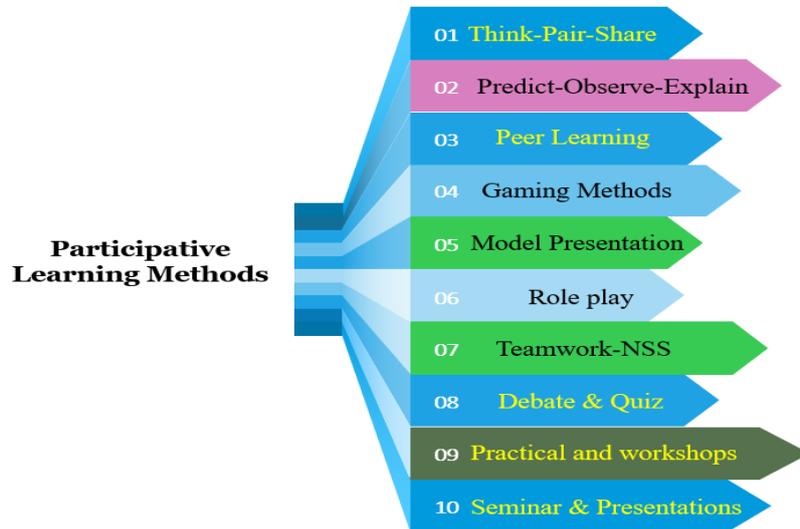
Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



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Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences



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Departmental Curriculum Structure

1st Semester

Curriculum Structure Semester I (First year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Basic Science courses	BS-PH101	Physics-I	3	1	0	4
2	Engineering Science Courses	BS-M102	Mathematics –IB	3	1	0	4
3	Engineering Science Courses	ES-EE101	Basic Electrical Engineering	3	1	0	4
Theory credits							12
Practical/ Sessional							
1	Basic Science courses	BS-PH191	Physics-I Laboratory	0	0	3	1.5
2	Engineering Science Courses	ES-EE191	Basic Electrical Engineering Laboratory	0	0	2	1
3	Engineering Science Courses	ES-ME192	Workshop/Manufacturing Practices	1	0	4	3
Practical credits							5.5
Total credits							17.5



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2nd Semester

Curriculum Structure Semester II (First year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Basic Science courses	BS-CH201	Chemistry-I	3	1	0	4
2	Basic Science courses	BS-M202	Mathematics –II	3	1	0	4
3	Engineering Science Courses	ES-CS201	Programming for Problem Solving	3	0	0	3
4	Humanities and Social Sciences including Management course	HM-HU201	English	2	0	0	2
Theory credits							13
Practical/ Sessional							
1	Basic Science courses	BS-CH291	Chemistry-I Laboratory	0	0	3	1.5
2	Engineering Science Courses	ES-CS291	Programming for Problem Solving	0	0	4	2
3	Engineering Science Courses	ES-ME291	Engineering Graphics & Design	1	0	4	3
4	Humanities and Social Sciences including Management course	HM-HU291	Language Laboratory	0	0	1	1
Practical credits							7.5
Total credits							20.5



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3rd Semester

Curriculum Structure Semester III (Second year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Basic Science courses	CE(BS)301	Biology for Engineers	2	1	0	3
2	Engineering Science Courses	CE(ES)301	Engineering Mechanics	3	1	0	4
3	Engineering Science Courses	CE(ES)302	Energy Science & Engineering	1	1	0	2
4	Basic Science courses	CE(BS)301	Mathematics-III (Transform & Discrete Mathematics)	2	0	0	2
5	Humanities and Social Sciences including Management courses	CE(HS)301	Humanities-I (Effective Technical Communication)	3	0	0	3
6	Humanities and Social Sciences including Management courses	CE(HS)302	Introduction to Civil Engineering	1	1	0	2
Theory credits							16
Practical/ Sessional							
1	Engineering Science Courses	CE(ES)391	Basic Electronics	1	0	2	2
2	Engineering Science Courses	CE(ES)392	Computer-aided Civil Engineering Drawing	1	0	2	2
3	Engineering Science Courses	CE(ES)393	Life Science	1	0	2	2
Practical credits							6
Total credits							22



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4th Semester

Curriculum Structure Semester IV (Second year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Engineering Science Courses	CE(ES)401	Introduction to Fluid Mechanics	2	0	0	2
2	Engineering Science Courses	CE(ES)402	Introduction to Solid Mechanics	2	0	0	2
3	Professional Core courses	CE(PC)401	Soil Mechanics – I	2	1	0	3
4	Professional Core courses	CE(PC)402	Environmental Engineering -I	2	1	0	3
5	Professional Core courses	CE(PC)403	Surveying & Geomatics	2	1	0	3
6	Professional Core courses	CE(PC)404	Concrete Technology	2	1	0	3
7	Humanities and Social Sciences including Management courses	CE(HS)401	Civil Engineering - Societal & Global Impact	2	0	0	2
8	Mandatory Courses (non-credit)	CE(MC)401	Management I (Organizational Behavior)	2	0	0	0
Theory credits							18
Practical/ Sessional							
1	Professional Core courses	CE(ES)491	Fluid Mechanics Laboratory	0	0	2	1
2	Professional Core courses	CE(ES)492	Solid Mechanics Laboratory	0	0	2	1
3	Professional Core courses	CE(ES)493	Engineering Geology Laboratory	0	0	2	1
4	Professional Core courses	CE(PC)493	Surveying & Geomatics	0	0	2	1
5	Professional Core courses	CE(PC)494	Concrete Technology Laboratory	0	0	2	1
Practical credits							5
Total credits							23



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5th Semester

Curriculum Structure Semester V (Third year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Professional Core courses	CE(PC)501	Design of RC Structures	2	1	0	3
2	Professional Core courses	CE(PC)502	Engineering Hydrology	2	1	0	3
3	Professional Core courses	CE(PC)503	Structural Analysis – I	2	1	0	3
4	Professional Core courses	CE(PC)504	Soil Mechanics – II	2	1	0	3
5	Professional Core courses	CE(PC)505	Environmental Engineering – II	2	1	0	3
6	Professional Core courses	CE(PC)506	Transportation Engineering	2	1	0	3
7	Mandatory courses (non-credit)	CE(MC)501	Constitution of India/ Essence of Indian Knowledge Tradition	-	-	-	0
Theory credits							18
Practical/ Sessional							
1	Professional core courses	CE(PC)591	RC Design Sessional	0	0	2	1
2	Professional core courses	CE(PC)594	Soil Mechanics Laboratory	0	0	2	1
3	Professional core courses	CE(PC)595	Environmental Engineering Laboratory	0	0	2	1
4	Professional core courses	CE(PC)596	Transportation Engineering Laboratory	0	0	2	1
5	Professional core courses	CE(PC)597	Computer Application in CE	0	0	2	1
Practical credits							5
Total credits							23



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6th Semester

Curriculum Structure Semester VI (Third year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Professional Core courses	CE(PC)601	Construction Engineering & Management	2	0	0	2
2	Professional Core courses	CE(PC)602	Engineering Economics, Estimation & Costing	2	0	0	2
3	Professional Core courses	CE(PC)603	Water Resources Engineering	2	0	0	2
4	Professional Core courses	CE(PC)604	Design of Steel Structures	2	0	0	2
5	Professional Elective courses	CE(PE)601	Elective-I	2	0	0	2
		CE(PE)601A	Stability of Slopes				
		CE(PE)601B	Foundation Engineering				
		CE(PE)601C	Ground Improvement Technique				
6	Professional Elective courses	CE(PE)602	Elective-II	2	0	0	2
		CE(PE)602A	Building Construction Practice				
		CE(PE)602B	Structural Analysis-II				
		CE(PE)602C	Industrial Structures				
7	Open Elective courses	CE(OE)601	Open Elective-I (Humanities)	2	0	0	2
		CE(OE)601A	Soft Skills and Interpersonal Communication – I				
		CE(OE)601B	Introduction to Philosophical Thoughts				
Theory credits							14
Practical/ Sessional							
1	Professional Core courses	CE(PC)693	Water Resource Engineering Laboratory	0	0	2	1
2	Professional Core courses	CE(PC)694	Steel Structure Design Sessional	0	0	2	1
3	Professional Core courses	CE(PC)695	Quantity Survey Estimation and Valuation Sessional	0	1	2	2
Practical credits							4
Total credits							18



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7th Semester

Curriculum Structure Semester VII (Fourth year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Open Elective courses	CE(OE)701	Open Elective-II	2	0	0	2
		CE(OE)701A	Metro Systems & Engineering				
		CE(OE)701B	ICT for Development				
		CE(OE)701C	Cyber Law & Ethics				
2	Professional Elective courses	CE(PE)701	Elective III	2	1	0	3
		CE(PE)701A	Computational Hydraulics				
		CE(PE)701B	Disaster Preparedness and Planning				
		CE(PE)701C	Hydraulic Structure				
3	Professional Elective courses	CE(PE)702	Elective IV	2	1	0	3
		CE(PE)702A	Pre-stressed Concrete				
		CE(PE)702B	Repairs & Rehabilitation of Structures				
		CE(PE)702C	Finite Element Method				
4	Professional Elective courses	CE(PE)703	Elective V	2	1	0	3
		CE(PE)703A	Air and Noise Pollution and Control				
		CE(PE)703B	Physico-Chemical Processes for Water and Wastewater Treatment				
		CE(PE)703C	Water and Air Quality Modelling				
5	Professional Elective courses	CE(PE)704	Elective-VI	2	1	0	3
		CE(PE)704A	Structural Dynamics				
		CE(PE)704B	Advanced Structural Analysis				
		CE(PE)704C	Coastal Hydraulics and Sediment Transport				
6	Professional Elective courses	CE(PE)705	Elective-VII	2	0	0	2
		CE(PE)705A	Railway and Airport Engineering				
		CE(PE)705B	Pavement Design				
		CE(PE)705C	Transport System Planning				
Theory credits							16
Practical/ Sessional							
1	Internship	CE(IN)791	Industrial Internship (after sixth semester)				1
2	Project	CE(PROJ)792	Project-1 (Project work)	0	0	10	5
Practical credits							6
Total credits							22



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8th Semester

Curriculum Structure Semester VIII (Fourth year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
				L	T	P	
Theory							
1	Humanities and Social Sciences including Management courses	CE(HS)801	Professional Practice, law & Ethics	2	0	0	2
2	Professional Elective Courses	CE(PE)801	Elective VIII	2	0	0	2
		CE(PE)801A	GIS & Remote Sensing				
		CE(PE)801B	Rock Mechanics				
		CE(PE)801C	Environmental laws and Policy				
		CE(PE)801D	Pavement Materials and Design				
3	Open Elective courses	CE(OE)801	Open Elective-III	2	0	0	2
		CE(OE)801A	Human Resource Development and Organizational Behavior				
		CE(OE)801B	Bridge Engineering				
		CE(OE)801C	Deep Foundations				
		CE(OE)801D	Groundwater Contamination				
4	Open Elective courses	CE(OE)802	Open Elective-IV	2	0	2	2
		CE(OE)802A	Soft Skills and Personality Development				
		CE(OE)802B	Earthquake Engineering				
		CE(OE)802C	Urban Transport Planning				
		CE(OE)802D	Environmental Impact Assessment and Life cycle Analysis				
Theory credits							8
Practical/ Sessional							
1	Comprehensive Viva Voce	CE(CV)882	Comprehensive Viva Voce				1
2	Project	CE(PROJ)8 81	Project-2 (Continued from VII)	0	0	10	5
Practical credits							6
Total credits							14



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Syllabus & Course Outcomes

1st Semester

BS-PH101: Physics-I

Course Code – BS-PH101	Physics-I	3L+1T+0P	4 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Learn basic concepts of quantum physics, simple quantum mechanics calculations; Macrostate, Microstate, Density of states, Qualitative treatment of MB, FD and BE statistics.2. Students will be able to Solve problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Harmonic oscillator. Damped harmonic motion forced oscillations and Resonance. Motion of a rigid body.3. Students will be able to Learn the application of wave properties of light Interference, Diffraction and Polarization; Lasers: Principles and working of laser4. Students will be able to Learn Maxwell's equations. Polarization, Dielectrics; Magnetization, magnetic-hysteresis.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Mechanics Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations. Potential energy function $F = -\text{grad } V$, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia..	7L
Module 2	Optics Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity and	5L



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	<p>qualitative discussion of fringes); diffraction grating(resolution formulac only), characteristics of diffraction grating and its applications.</p> <p>Polarisation: Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity.</p> <p>Lasers: Principles and working of laser: population inversion, pumping, various modes, threshold population inversion with examples.</p>	
Module 3	<p>Electromagnetism and Dielectric Magnetic Properties of Materials</p> <p>Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielecrrics, internal fields in a solid, Clausius-Mossotti equation (expression only), applications of dielectrics.</p> <p>Magnetisation, permeability and susceptibility, classificationof magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.</p>	8L
Module 4	<p>Quantum Mechanics</p> <p>Introduction to quantum physics, black body radiation, explanation using the photon concept, Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator, hydrogen atom.</p>	16L
Module 5	<p>Statistical Mechanics</p> <p>Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.</p>	8L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Introduction to Electrodynamics	David J. Griffiths	Pearson Education India Learning Private Limited
	2	Principles of Physics	, David Halliday, Robert Resnick Jearl Walker ,	Wiley.
	3	Electricity, Magnetism, and Light	Wayne M. Saslow	Academic Press
	4	Engineering Mechanics (In SI Units)	S. Timoshenko, D.H. Young,	



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5	Classical mechanics	Narayan Rana, Pramod Joag	McGraw Hill Education
6	Introduction to Classical Mechanics	R Takwale, P Puranik,	McGraw Hill Education
7	Engineering Mechanics	M.K. Harbola	Cengage India
8	An Introduction to Mechanics	David Kleppner, Robert Kolenkow,	McGraw Hill Education

CO-PO Mapping

CO-PO-PSO Mapping

Physics – 1

(Course Code – BS-PH101)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	2	-	-	2	-	2	-	-	3	2	2	-
CO2	3	3	-	2	-	-	2	-	2	-	-	3	-	2	-
CO3	3	3	-	3	-	-	-	-	2	-	-	3	2	2	-
CO4	3	3	-	3	-	-	-	-	2	-	-	3	-	2	-
Avg.	3	3	-	2.5	-	-	2	-	2	-	-	3	2	2	-

BS-M102: Mathematics –IB

Course Code – BS-M102	Mathematics –IB	3L+1T+0P	4 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals. 2. Students will be able to Understand the domain of applications of mean value theorems to engineering problems. 3. Students will be able to Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
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	<p>4. Students will be able to Apply the knowledge for addressing the real life problems which comprise of several variables or attributes and identify extremum points of different surfaces of higher dimensions.</p> <p>5. Students will be able to Learn and apply the concept of rank-nullity, eigen values, eigen vectors, diagonalization and orthogonalization of matrices for understanding physical and engineering problems.</p>
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	<p>Calculus (Integration):</p> <p>Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.</p>	8
Module 2	<p>Calculus (Differentiation):</p> <p>Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.</p>	6
Module 3:	<p>Sequence and Series:</p> <p>Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.</p>	11
Module 4:	<p>Multivariate Calculus:</p> <p>Limit, continuity and partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, Curl and Divergence.</p>	9
Module 5:	<p>Matrices:</p> <p>Inverse and rank of a matrix, Rank-nullity theorem; System of linear equations; Symmetric, Skew-symmetric and Orthogonal matrices; Determinants; Eigenvalues and Eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.</p>	8

Books

Books	Sl.	Book Name	Author	Publishing House
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1	Engineering Mathematics-I	Reena Garg.	Khanna Publishers
2	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons
3	Advanced Engineering Mathematics	Michael Greenberg	Pearson.
4	Mathematical Methods of Science and Engineering	Kanti B. Dutta	Cenage Learning

CO-PO Mapping

CO-PO-PSO Mapping Mathematics – IB (Course Code – BS-M102)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	2	-	3	-	2	2	-	2	2
CO2	3	3	3	2	2	2	-	-	2	-	2	2	-	2	2
CO3	3	3	2	2	2	-	2	-	-	-	2	-	-	2	2
CO4	3	3	2	2	3	2	-	-	2	-	2	2	-	2	2
CO5	3	3	2	2	2	2	2	-	-	-	-	3	-	2	2
Avg.	3	3	2.4	2	2.2	2	2	-	2.33	-	2	2.25	-	2	2

ES-EE101: Basic Electrical Engineering

Course Code – ES-EE101	Basic Electrical Engineering	3T+1L+0P	4 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to describe fundamentals of DC and AC circuits 2. Students will be able to explain the operating principle of transformer 3. Students will be able to illustrate construction, working of Electrical Machines
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4. Students will be able to classify different power converters and installation process

Syllabus

Sl No.	Course Content	Total Hours
Module 1	<p>DC Circuits</p> <p>Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits</p>	8
Module 2	<p>AC Circuits</p> <p>Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections</p>	8
Module 3	<p>Transformers</p> <p>Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections</p>	6
Module 4	<p>Electrical Machines</p> <p>Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.</p>	8
Module 5	<p>Power Converters</p> <p>DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.</p>	6
Module 6	<p>Electrical Installations</p> <p>Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of</p>	6



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	Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.	
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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Basic Electrical Engineering	Ritu Sahdev	Khanna Book Publishing Co. (P) Ltd
	2	Basic Electrical Engineering	D. P. Kothari and I. J. Nagrath	Tata McGraw Hill
	3	Basic Electrical Engineering	D. C. Kulshreshtha	McGraw Hill
	4	Fundamentals of Electrical Engineering	L. S. Bobrow	Oxford University Press
	5	Electrical and Electronics Technology	E. Hughes	Pearson
	6	Electrical Engineering Fundamentals	V. D. Toro	Prentice Hall India

CO-PO Mapping

CO-PO-PSO Mapping Basic Electrical Engineering (Course Code – ES-EE101)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	3	-	2	-	-	3	2	-	-
CO2	3	3	3	2	2	2	3	-	2	-	-	3	2	-	-
CO3	3	2	3	2	2	2	3	-	2	-	-	3	2	-	-
CO4	3	2	2	2	2	2	3	-	2	-	-	3	2	-	-
Avg.	3.00	2.50	2.50	3.00	2.00	2.00	3.00	-	2.00	-	-	3.00	2	-	-

BS-PH191: Physics-I Laboratory

Course Code – BS-PH191	Physics-I Laboratory	0T+0L+3P	1.5 Credits
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Course Outcome (CO)



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Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Observe and read data in slide calliper's, screw gauge. Calculate different modulus of elasticity to apply basic knowledge Physics of Elasticity and apply viscosity principle of streamline motion of water to calculate its viscosity coefficient required in fluid mechanics. 2. Students will be able to Operate optical instruments to illustrate physical properties of light and to observe spectral lines of light to verify medium specific characteristics. Calculate Rydberg constant by studying Hydrogen spectrum to visualize visible spectra and to assess this empirical fitting parameter as a fundamental physical constant 3. Students will be able to Determine Band Gap and Hall coefficient of a given intrinsic semiconductor and distinguish between different intrinsic semiconductors. Determine the dielectric constant of different capacitors to correlate their usage like insulator and limitation of their usage as a dielectric material. 4. Students will be able to Determine Planck's constant and Stefan's constant applying modern Physics.
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Syllabus

Sl No.	Course Content	Total Hours
Choose 10 experiments including at least one from Optics, Electricity and Magnetism and Quantum Mechanics and at least a total of six from these three groups.		
Experiment – 1	Experiments in Optics <ul style="list-style-type: none"> Determination of dispersive power of the material of a prism Determination of wavelength of a monochromatic light by Newton's ring Determination of wavelength of a monochromatic light by Fresnel's bi-prism Determination of wavelength of the given laser source by diffraction method 	
Experiment – 2	Electricity & Magnetism experiments <ul style="list-style-type: none"> Determination of thermo electric power of a given thermocouple. Determination of specific charge (e/m) of electron by J.J. Thompson's method. Determination of dielectric constant of a given dielectric material. Determination of Hall coefficient of a semiconductor by four probe method. To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell. Determination of resistance of ballistic galvanometer by half deflection method and study of variation of logarithmic decrement with series resistance. 	



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	<ul style="list-style-type: none"> • Determination of unknown resistance using Carey Foster's bridge • Study of Transient Response in LR, RC and LCR circuits using expeyes • Generating sound from electrical energy using expeyes 	
Experiment – 3	<p>Experiments in Quantum Physics</p> <ul style="list-style-type: none"> • Determination of Stefan-Boltzmann constant. • Determination of Planck constant using photocell. • Determination of Lande-g factor using Electron spin resonance spectrometer. • Determination of Rydberg constant by studying Hydrogen spectrum. • Determination of Band gap of semiconductor. • To study current voltage characteristics, load response, areal characteristic and spectral response of a photovoltaic solar cell. 	
Experiment – 4	<p>Miscellaneous experiments</p> <ul style="list-style-type: none"> • Determination of Young's modulus of elasticity of the material of a bar by the method of flexure • Determination of bending moment and sheer force of a rectangular beam of uniform cross-section • Determination of modulus of rigidity of the material of a rod by static method • Determination of rigidity modulus of the material of a wire by dynamic method • To determine the moment of inertia of a body about an axis passing through its centre of gravity and to determine the modulus of rigidity of the material of the suspended wire • Determination of coefficient of viscosity by Poiseulle's capillary flow method 	

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Introduction to Electrodynamics	David J. Griffiths	Pearson Education India Learning Private Limited
	2	Principles of Physics	, David Halliday, Robert Resnick Jearl Walker ,	Wiley.
	3	Electricity, Magnetism, and Light	Wayne M. Saslow	Academic Press
	4	Engineering Mechanics (In SI Units)	S. Timoshenko, D.H. Young,	

CO-PO Mapping



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CO-PO-PSO Mapping															
Physics – 1 Laboratory															
(Course Code – BS-PH191)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	-	-	2	-	3	-	-	3	-	-	2
CO2	3	3	3	3	-	-	2	-	3	-	-	3	-	-	2
CO3	3	3	3	3	-	-	3	-	3	-	-	3	-	-	3
CO4	3	3	-	3	-	-	-	-	3	-	-	3	-	-	-
Avg.	3	3	2.67	3	-	-	2.33	-	3	-	-	3	-	-	2.33

ES-EE191: Basic Electrical Engineering Laboratory

Course Code – ES-EE191	Basic Electrical Engineering Laboratory	0T+0L+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Identify different instruments and cut section of different machine. 2. Students will be able to Describe the steady -state and transient behavior of RLC circuits 3. Students will be able to Calculate the power of 3-ph system by two wattmeter 4. Students will be able to Analyze different characteristics of transformer & DC machines
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Syllabus

Sl No.	Course Content	Total Hours
Experiments	<ul style="list-style-type: none"> • First activity: Introduction to basic safety precautions and mentioning of the do's and Don'ts. Noting down list of experiments to be performed, and instruction for writing the laboratory reports by the students. Group formation. Students are to be informed about the modalities of evaluation. • Introduction and uses of following instruments: <ol style="list-style-type: none"> 1. Voltmeter 2. Ammeter 3. Multimeter 	3L+1T



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	<p style="text-align: center;">4. Oscilloscope</p> <ul style="list-style-type: none"> • Demonstration of real life resistors, capacitors with color code, inductors and autotransformer. • Demonstration of cut-out sections of machines: DC machine, Induction machine, Synchronous machine and single phase induction machine. • Calibration of ammeter and Wattmeter. • Determination of steady state and transient response of R-L, R-C and R-L-C circuit to a step change in voltage. • Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor. • Determination of resonance frequency and quality factor of series and parallel R-L-C circuit. • Open circuit and short circuit test of a single-phase transformer • Load test of the transformer and determination of efficiency and regulation • Demonstration of three phase transformer connections. Voltage and current relationship, phase shifts between the primary and secondary side. • Measurement of power in a three phase unbalanced circuit by two wattmeter method. • Determination of Torque –Speed characteristics of separately excited DC motor. • Determination of Torque speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor. • Determination of operating characteristics of Synchronous generator. • Demonstration of operation of (a) DC-DC converter (b) DC-AC converter (c) DC-AC converter for speed control of an Induction motor • Demonstration of components of LT switchgear. 	
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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Basic Electrical Engineering	Ritu Sahdev	Khanna Book Publishing Co. (P) Ltd
	2	Basic Electrical Engineering	D. P. Kothari and I. J. Nagrath	Tata McGraw Hill
	3	Basic Electrical Engineering	D. C. Kulshreshtha	McGraw Hill
	4	Fundamentals of Electrical Engineering	L. S. Bobrow	Oxford University Press
	5	Electrical and Electronics Technology	E. Hughes	Pearson



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6	Electrical Engineering Fundamentals	V. D. Toro	Prentice Hall India
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CO-PO Mapping

CO-PO-PSO Mapping Basic Electrical Engineering Laboratory (Course Code – ES-EE191)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	3	-	2	-	-	3	2	-	-
CO2	3	2	2	2	2	-	3	-	2	-	-	3	-	-	-
CO3	3	2	2	2	2	-	3	-	2	-	-	3	-	-	-
CO4	3	2	2	2	2	-	3	-	2	-	-	3	2	-	-
Avg.	3	2	2	2	2	-	3	-	2	-	-	3	2	-	-

ES-ME192: Workshop/Manufacturing Practices

Course Code – ES-ME192	Workshop/Manufacturing Practices	1L+0T+4P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> The Students will be able to Identify and operate various hand tools related to variety of manufacturing operations. The Students will be able to Fabricate simple components with their own hands. The Students will be able to Apply practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes. The Students will be able to Produce small devices of their interest in project or research purpose .
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Machine shop:	8



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	<p>Typical jobs that may be made in this practice module:</p> <p>To make a pin from a mild steel rod in a lathe.</p> <p>To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.</p>	
Module 2	<p>Fitting shop</p> <p>Typical jobs that may be made in this practice module:</p> <p>To make a Gauge from MS plate</p>	8
Module 3	<p>Carpentry</p> <p>Typical jobs that may be made in this practice module:</p> <p>To make wooden joints and/or a pattern or like.</p>	8
Module 4	<p>Welding shop</p> <p>Typical jobs that may be made in this practice module:</p> <p>ARC WELDING: To join two thick (approx. 6mm) MS plates by manual metal arc welding.</p> <p>GAS WELDING: To join two thin mild steel plates or sheets by gas welding</p>	8 Arc welding 4 hours + Gas welding 4 hours
Module 5	<p>Casting</p> <p>Typical jobs that may be made in this practice module:</p> <p>One/ two green sand moulds to prepare, and a casting be demonstrated</p>	8
Module 6	<p>Smithy (4 hours)</p> <p>Typical jobs that may be made in this practice module:</p> <p>A simple job of making a square rod from a round bar or like</p>	4
Module 7	<p>Plastic moulding & Glass cutting</p> <p>Typical jobs that may be made in this practice module:</p> <p>For plastic moulding, making at least one simple plastic component should be made.</p> <p>For glass cutting, three rectangular glass pieces may be cut to make a kaleidoscope using a black color diamond cutter, or similar other components may be made.</p>	4
	<p>Electrical & Electronics</p> <p>Familiarization with LT switchgear elements, making its sketches and noting down its specification. KitKat fuse, Glass cartridge fuse, Plastic fuse holders</p>	8



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	<p>(optional), Iron clad isolators, MCB style isolators, Single phase MCB, Single-phase wire, wiring cable.</p> <p>Demonstration of domestic wiring involving two MCB, two piano key switches, one incandescent lamp, one LED lamp and plug point.</p> <p>Simple wiring exercise to be executed to understand the basic electrical circuit.</p> <p>Simple soldering exercises to be executed to understand the basic process of soldering.</p> <p>Fabrication of a single-phase full wave rectifier with a step down transformer using four diodes and electrolytic capacitor and to find its volt-ampere characteristics to understand basic electronic circuit fabrication.</p>	
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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Elements of Workshop Technology	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar	Media promoters and publishers private
	2	Manufacturing Engineering and Technology	Kalpakjian S. and Steven S. Schmid	Pearson Education India Edition
	3	Manufacturing Technology – I	Gowri P. Hariharan and A. Suresh Babu	Pearson Education

CO-PO Mapping

CO-PO-PSO Mapping															
Workshop/Manufacturing Practices															
(Course Code – ES-ME192)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	2	-	-	-	-	2	2	3	-	2
CO2	2	3	3	2	2	2	-	-	-	-	2	2	-	3	-
CO3	3	2	2	2	2	2	-	-	-	-	2	3	-	2	-
CO4	2	3	3	2	2	2	-	-	-	-	2	2	2	-	-
Avg.	2.5	2.5	2.5	2	2	2	-	-	-	-	2	2.25	2.5	2.5	2



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2nd Semester

Course Code – BS-CH201	Chemistry-I	3L+1T+0P	4 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and list major chemical reactions that are used in the synthesis of drug molecules.2. Students will be able to Rationalize bulk properties and processes using thermodynamic considerations, corrosion and water chemistry, electrochemistry, acid base theory, Knowledge of stereochemistry for understanding mechanism of the major chemical reaction.3. Students will be able to Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques like IR, UV, NMR that is usable in structure elucidation and characterization of various molecules.4. Students will be able to Understand the periodic properties such as ionization potential, electron affinity, electronegativity, polarizability, thermal stability and determination of shape of molecule..
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Atomic and molecular structure Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals of diatomic molecules (e.g.H ₂). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.	10L
Module 2	Spectroscopic techniques and applications Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.	8L
Module 3	Use of free energy in chemical equilibria First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free	8L



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	energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams..	
Module 4	Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries	4L
Module 5	Stereochemistry Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds	4L
Module 6	Organic reactions and synthesis of a drug molecule Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule	4L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Engineering Chemistry	Satyaprakash	Khanna Book Publishing
	2	University chemistry	B. H. Mahan	
	3	Chemistry: Principles and Applications	M. J. Sienko and R. A. Plane	
	4	Fundamentals of Molecular Spectroscopy	C. N. Banwell	
	5	Engineering Chemistry (NPTEL Web-book)	B. L. Tembe, Kamaluddin and M. S. Krishnan	and Young
	6	Spectroscopy of Organic Compounds	P.S.Kalsi	New Age International Pvt Ltd Publishers

CO-PO Mapping

CO-PO-PSO Mapping
Chemistry-I



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(Course Code – BS-CH201)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	2	-	2	-	-	-	1	2	-
CO2	3	3	3	3	3	3	3	-	2	-	-	2	-	2	-
CO3	2	3	3	3	3	3	2	-	3	3	-	-	1	2	-
CO4	3	3	3	3	3	2	-	-	-	2	-	2	-	2	-
Avg.	2.75	3	2.75	3	3	2.5	2.33	-	2.33	2.5	-	2	1	2	-

BS-M202: Mathematics –IIB

Course Code – BS-M202	Mathematics –IIB	3T+1L+0P	4 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 5. Students will be able to Learn the methods for evaluating multiple integrals and their applications to different physical problems. 6. Students will be able to Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences. 7. Students will be able to Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems. 8. Students will be able to Apply different types of transformations between two 2-dimensional planes for analysis of physical or engineering problems.
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Syllabus

SI No.	Course Content	Total Hours
1	<p>Multivariate Calculus (Integration):</p> <p>Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, change of variables (Cartesian to Polar), Applications: Areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals,</p>	11



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	vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	
2	First order ordinary differential equations: Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	5
3	Ordinary differential equations of higher orders: Second order linear differential equations with constant coefficients, Use of D- operators, Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.	9
4	Complex Variable – Differentiation Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties.	6
5	Complex Variable – Integration Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.	9

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Engineering Mathematics-I	Reena Garg.	Khanna Publishers
	2	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons
	3	Advanced Engineering Mathematics	Michael Greenberg	Pearson.
	4	Mathematical Methods of Science and Engineering	Kanti B. Dutta	Cenage Learning



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	5	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers
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CO-PO Mapping

CO-PO-PSO Mapping Mathematics - IIB (Course Code – BS-M202)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	-	-	-	2	2	-	2	-
CO2	3	3	2	2	2	2	-	-	2	-	2	2	-	2	2
CO3	3	3	1	2	2	-	2	-	2	-	-	2	-	2	2
CO4	3	3	2	2	3	2	-	-	-	-	2	2	-	2	2
Avg.	3	3	2	2.25	2.25	2	2	-	2	-	2	2	-	2	2

ES-CS201: Programming for Problem Solving

Course Code – ES-CS201	Programming for Problem Solving	3L+0T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to describe the meaning of system of numbers, logic gates and the basic anatomy of a Computer. 2. Students will be able to understand the inherent meaning of the basic elements of C Programming Language like; constants, variables, operators, operator precedence etc., and identify the use of data types and C statements and classify the statements. 3. Students will be able to organize the statements in appropriate order to prepare a complete program that solves a specific problem and analyze a program to point out the bugs that might be present in it and change it to achieve the goal. 4. Students will be able to construct the final program and create the executable module for execution purpose.
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Syllabus

SI No.	Course Content	Total Hours
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	Introduction to Programming	
Module 1	<p>Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.</p> <p>Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.</p> <p>From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code</p>	4L
Module 2	Arithmetic expressions and precedence	2L
Module 3	Conditional Branching and Loops	
	<p>Writing and evaluation of conditionals and consequent branching Iteration and loops</p>	6L
Module 4	<p>Arrays</p> <p>Arrays (1-D, 2-D), Character arrays and Strings</p>	3L
Module 5	Basic Algorithms Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)	6L
Module 6	Function	
	<p>Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference</p>	5L
Module 7	Recursion	
	<p>Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.</p>	4-5L
Module 8	Structure	
	<p>Structures, Defining structures and Array of Structures</p>	4L
Module 9	Pointers	
	<p>Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)</p>	2L



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Module 10	File handling (only if time is available, otherwise should be done as part of the lab)	-
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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Computer Concepts and Programming in C	R. S. Salaria	Khanna Publishers
	2	Schaum's Outline of Programming with C	Byron Gottfried	McGraw-Hill
	3	Programming in ANSI C	E. Balaguruswamy	Tata McGraw-Hill
	4	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	Prentice Hall of India

CO-PO Mapping

CO-PO-PSO Mapping Programming for Problem Solving (Course Code – ES-CS201)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	3	2	-	-	-	-	3	-	1	2	3	2	1
CO2	1	3	1	-	-	-	-	2	-	3	1	2	1	2	-
CO3	3	1	1	2	-	-	-	2	2	2	-	3	2	2	1
CO4	3	2	3	-	-	-	-	2	2	2	1	-	2	2	1
Avg.	2.33	2	2	2	-	-	-	2	2.33	2.33	1	2.33	2	2	1

HM-HU201: English



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Course Code – HM-HU201	English	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Revise the basic grammar of English language. 2. Students will be able to Learn appropriate use of English language to enhance knowledge on building vocabulary and framing sentences. 3. Students will be able to Learn and incorporate sensible style in Technical writing. 4. Students will be able to Acquire proficiency in English language for comprehensive excellence in reading, listening, writing and speaking.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	<p>Vocabulary Building</p> <p>The concept of Word Formation: Compounding, Backformation, Clipping, Blending.</p> <p>Root words from foreign languages and their use in English</p> <p>Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.</p> <p>Synonyms, antonyms, and standard abbreviations: Acronyms</p>	
Module 2	<p>Basic Writing Skills</p> <p>Sentence Structures & Types: Simple, Compound, Complex</p> <p>Use of phrases and clauses in sentences: Transformation of sentences, active, passive, narration</p> <p>Importance of proper punctuation</p> <p>Creating coherence: Arranging paragraphs & Sentences in logical order</p> <p>Creating Cohesion: Organizing principles of paragraphs in documents</p> <p>Techniques for writing precisely.</p>	
Module 3	<p>Identifying Common Errors in Writing</p> <p>Subject-verb agreement</p> <p>Noun-pronoun agreement</p> <p>3 Misplaced modifiers</p>	



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	Articles Prepositions Redundancies Clichés	
Module 4	Nature and Style of sensible Writing Describing Defining Classifying Providing examples or evidence 5 Writing introduction and conclusion	
Module 5	Writing Practices Comprehension Précis Writing Essay Writing Business Letter, Cover Letter & CV; E-mail	

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Effective Communication Skills	Kulbushan Kumar, R S Salaria	Khanna Publishing House
	2	Practical English Usage	Michael Swan	OUP.
	3	Remedial English Grammar	F.T. Wood	Macmillan
	4	On Writing Well	William Zinsser	Harper Resource Book
	5	Study Writing	Liz Hamp-Lyons and Ben Heasley	Cambridge University
	6	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press

CO-PO Mapping

CO-PO-PSO Mapping
English
(Course Code – HM-HU201)



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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-	2
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-	2
CO3	-	-	-	-	-	-	-	-	2	3	2	3	-	-	2
CO4	-	2	-	-	-	-	2	2	2	3	2	3	-	-	2
Avg.	-	2	-	-	-	-	2	2	2	3	2	3	-	-	2

BS-CH291: Chemistry-I Laboratory

Course Code – BS-CH291	Chemistry-I Laboratory	0L+0T+3P	1.5 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Use modern instrumentation and classical techniques like viscometer, stalagmometer, pH-meter, potentiometer and conductometer etc. to design experiments and to properly record the results of their experiments to achieve high accuracy. 2. Students will be able to Separate the mixture of amino acids by TLC and analysis of chemical salts by qualitatively. 3. Students will be able to Estimate the quantitative analysis of Dissolved oxygen, chloride ion and removal of hardness of water etc. which are required to determine the usability of water used in industries. 4. Students will be able to Understand the miscibility of solutes in various solvents required in paint, emulsion and material industries and determine the acid value of an oil, kinetics of oxidation of iodide by hydrogen peroxide.
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Syllabus

Sl No.	Course Content	Total Hours
Choose 10 experiments from the following		
Experiments	<ol style="list-style-type: none"> 1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution. 2. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution. 	



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	<ol style="list-style-type: none"> 3. Determination of dissolved oxygen present in a given water sample. 4. To determine chloride ion in a given water sample by Argentometric method (using chromate indicator solution) 5. Determination of surface tension and viscosity 6. Thin layer chromatography 7. Ion exchange column for removal of hardness of water 8. Determination of the rate constant of a reaction 9. Determination of cell constant and conductance of solutions 10. Potentiometry - determination of redox potentials and emfs 11. Saponification/acid value of an oil 12. Chemical analysis of a salt 13. Determination of the partition coefficient of a substance between two immiscible liquids 14. Adsorption of acetic acid by charcoal 15. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg. 	
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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Engineering Chemistry	Satyaprakash	Khanna Book Publishing
	2	University chemistry	B. H. Mahan	
	3	Chemistry: Principles and Applications	M. J. Sienko and R. A. Plane	
	4	Fundamentals of Molecular Spectroscopy	C. N. Banwell	
	5	Engineering Chemistry (NPTEL Web-book)	B. L. Tembe, Kamaluddin and M. S. Krishnan	and Young
	6	Spectroscopy of Organic Compounds	P.S.Kalsi	New Age International Pvt Ltd Publishers

CO-PO Mapping

CO-PO-PSO Mapping Chemistry-I Laboratory (Course Code – BS-CH291)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	3	-	-	3	3	3	-	1	-	-
CO2	3	3	3	3	-	2	-	-	3	2	3	-	-	2	-
CO3	3	3	3	2	-	3	-	-	3	3	2	-	1	2	-



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CO4	3	3	3	-	-	-	-	-	3	-	-	-	1	2	-
Avg.	3	3	3	2.6	-	2.6	-	-	3	2.6	2.6	-	1	2	-

ES-CS291: Programming for Problem Solving

Course Code – ES-CS291	Programming for Problem Solving	0L+0T+4P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to define the specifications like input and output relating to a particular problem and describe the algorithm that solves the problem. 2. Students will be able to construct each of the modules of a program by restating the steps of the algorithm using functions in the framework of C language. 3. Students will be able to create the program by using the functions and execute the program. 4. Students will be able to point out the bugs if any, and modify the program to solve the problem.
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Syllabus

SI No.	Course Content	Total Hours
Experiment – 1	Tutorial 1: Problem solving using computers: Lab1: Familiarization with programming environment	2
Experiment – 2	Tutorial 2: Variable types and type conversions: Lab 2: Simple computational problems using arithmetic expressions	2
Experiment – 3	Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures	2
Experiment – 4	Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series .	2
Experiment – 5	Tutorial 5: 1D Arrays: searching, sorting: Lab 5: 1D Array manipulation .	2



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Experiment – 6	Tutorial 6: 2D arrays and Strings Lab 6: Matrix problems, String operations	2
Experiment – 7	Tutorial 7: Functions, call by value: Lab 7: Simple functions	2
Experiment – 8 & 9	Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration): Lab 8 and 9: Programming for solving Numerical methods problems	2
Experiment – 10	Tutorial 10: Recursion, structure of recursive calls Lab 10: Recursive functions	2
Experiment – 11	Tutorial 11: Pointers, structures and dynamic memory allocation Lab 11: Pointers and structures	2
Experiment – 12	Tutorial 12: File handling: Lab 12: File operations	2

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Computer Concepts and Programming in C	R. S. Salaria	Khanna Publishers
	2	Schaum's Outline of Programming with C	Byron Gottfried	McGraw-Hill
	3	Programming in ANSI C	E. Balaguruswamy	Tata McGraw-Hill
	4	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	Prentice Hall of India

CO-PO Mapping

CO-PO-PSO Mapping															
Programming for Problem Solving															
(Course Code – ES-CS291)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2		-	-	-	2	2	-	2	-	2	2	1
CO2	2	-	2	2	-	-	-	-	2	2	-	2	2	2	1
CO3	2	2.5	2	2	-	-	-	-	3	2	2	-	2	2	1



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CO4	-	3	2	3	-	-	-	2		2	-	2	3	2	1
Avg.	2	2.5	2	2.33	-	-	-	2	2.33	2	2	2	2.25	2	1

ES-ME291: Engineering Graphics & Design

Course Code – ES-ME291	Engineering Graphics & Design	1L+0T+4P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Learn basics of drafting and use of drafting tools which develops the fundamental skills of industrial drawings. 2. Students will be able to Know about engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements. 3. Students will be able to Understand projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts. 4. Students will be able to Become familiar with computer aided drafting useful to share the design model to different section of industries as well as for research & development.
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Syllabus

SI No.	Course Content	Total Hours
Module 1:	INTRODUCTION TO ENGINEERING DRAWING Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.	1L+4P
Module 2:	LETTERING, DIMENSIONING, SCALES Plain scale, Diagonal scale and Vernier Scales.	1L+4P
Module 3:	GEOMETRICAL CONSTRUCTION AND CURVES Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.	1L+4P



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Module 4:	<p>PROJECTION OF POINTS, LINES, SURFACES</p> <p>Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes</p> <p>- Auxiliary Planes.</p>	1L+4P
Module 5:	<p>PROJECTION OF REGULAR SOLIDS</p> <p>Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).</p>	1L+4P
Module 6:	<p>COMBINATION OF REGULAR SOLIDS, FLOOR PLANS</p> <p>Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.</p>	1L+4P
Module 7:	<p>ISOMETRIC PROJECTIONS</p> <p>Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic</p> <p>Views and Vice-versa, Conventions;</p>	1L+4P
Module 8	<p>SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS</p> <p>Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;</p> <p>Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)</p>	1L+4P
Module 9	<p>OVERVIEW OF COMPUTER GRAPHICS, CUSTOMISATION& CAD DRAWING</p> <p>Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;</p>	1L+4P
Module 10	<p>ANNOTATIONS, LAYERING & OTHER FUNCTIONS</p>	2L+8P



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	<p>applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer- aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;</p>	
Module 11	<p>DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT</p> <p>Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerance; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying color coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).</p>	2L+8P

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Engineering Graphics & Design	Pradeep Jain, Ankita Maheswari, A.P. Gautam	Khanna Publishing House
	2	Engineering Drawing	Bhatt N.D., Panchal V.M. & Ingle P.R	Charotar Publishing House
	3	Engineering Graphics	Agrawal B. & Agrawal C. M	Pearson Education
	4	Text book on Engineering Drawing	Narayana, K.L. & P Kannaiah	Scitech Publishers

CO-PO Mapping

CO-PO-PSO Mapping															
Engineering Graphics & Design															
(Course Code – ES-ME291)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	2	2	-	-	-	-	2	2	-	3	-
CO2	2	2	3	2	2	-	-	-	-	-	2	2	3	-	2



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CO3	2	3	3	2	3	2	-	-	-	-	2	3	-	2	-
CO4	3	2	2	2	2	2	-	-	-	-	2	2	2	-	2
Avg.	2.5	2.5	2.5	2.00	2.25	2	-	-	-	-	2	2.25	2.5	2.5	2

HM-HU291: Language Laboratory

Course Code – HM-HU291	Language Laboratory	0L+0T+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Understand and incorporate professional application of English Language with emphasis on listening and speaking skills through language lab aids. 2. Students will be able to Learn and Practice sessions on pronunciation, intonation, voice modulation, stress, pitch and accent and developing communicative skills with special focus on Group Discussion. 3. Students will be able to Develop effective reading and writing style through Language Lab aids. 4. Students will be able to Demonstrate proficiency in reading, listening comprehension, technical writing and in speaking..
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Syllabus

SI No.	Course Content	Total Hours
Experiment 1:	Honing 'Listening Skill' and its sub skills through Language Lab Audio device;	3P
Experiment 2:	Honing 'Speaking Skill' and its sub skills	2P
Experiment 3:	Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/	2P
Experiment 4:	Voice modulation/ Stress/ Intonation/ Pitch & Accent) of connected speech	2P
Experiment 5:	Honing 'Conversation Skill' using Language Lab Audio –Visual input;	2P



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	Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone & Role Play Mode)	
Experiment 6:	G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD	4P
Experiment 7:	Honing 'Reading Skills' and its sub skills using Visual / Graphics/ Diagrams /Chart Display/Technical/ Non-Technical Passages	2P
Experiment 8	Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input; Practice Sessions	2P

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Effective Communication Skills	Kulbushan Kumar, R S Salaria	Khanna Publishing House
	2	Practical English Usage	Michael Swan	OUP.
	3	Remedial English Grammar	F.T. Wood	Macmillan
	4	On Writing Well	William Zinsser	Harper Resource Book
	5	Study Writing	Liz Hamp-Lyons and Ben Heasley	Cambridge University
	6	Communication Skills	Sanjay Kumar and PushpLata	Oxford University Press

CO-PO Mapping

CO-PO-PSO Mapping Language Laboratory (Course Code - HM-HU291)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	2	2	3	2	3	-	-	2
CO2	-	-	-	-	-	-	-	-	3	3	-	3	-	-	2
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO4	-	-	-	-	-	-	2	-	3	3	3	3	-	-	2
Avg.	-	-	-	-	-	2	2	2	2.5	3	2.5	3	-	-	2



Department of Civil Engineering

3rd Semester

CE(BS)301: Biology for Engineers

Course Code – CE(BS)301	Biology for Engineers	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Describe how biological observations of 18th Century that lead to major discoveries. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological2. Students will be able to Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring3. Students will be able to Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. Classify enzymes and distinguish between different mechanisms of enzyme action.4. Students will be able to Identify DNA as a genetic material in the molecular basis of information transfer. Analyse biological processes at the reductionistic level. Apply thermodynamic principles to biological systems.5. Students will be able to Identify and classify microorganisms.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	<p>Introduction</p> <p>Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.</p> <p>Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry</p>	2L
Module 2	<p>Classification</p>	3L



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	<p>Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion</p> <p>– aminotelic, uricotelic, ureotelic (e) Habitataaquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus</p> <p>Purpose: To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.</p>	
Module 3	<p>Genetics</p> <p>Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation</p> <p>using human genetics.</p> <p>Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"</p>	4L
Module 4	<p>Biomolecules</p> <p>Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.</p> <p>Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine</p>	4L
Module 5	<p>Enzymes</p> <p>Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and</p>	4L



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	<p>kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.</p> <p>Purpose: To convey that without catalysis life would not have existed on earth</p>	
Module 6	<p>Information Transfer</p> <p>Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.\</p> <p>Purpose: The molecular basis of coding and decoding genetic information is universal</p>	4L
Module 7	<p>Macromolecular analysis</p> <p>Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.</p> <p>Purpose: How to analyses biological processes at the reductionistic level</p>	5L
Module 8	<p>Metabolism</p> <p>Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge</p> <p>Purpose: The fundamental principles of energy transactions are the same in physical and biological world.</p>	4L
Module 9	<p>Microbiology</p> <p>Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.</p>	3L

Books



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Books	Sl.	Book Name	Author	Publishing House
	1	Biology: A global approach	Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.;	Pearson Education Ltd
	2	Outlines of Biochemistry	Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H	John Wiley and Sons
	3	Principles of Biochemistry (V Edition)	Nelson, D. L.; and Cox, M. M.W.H	Freeman and Company
	4	Molecular Genetics (Second edition)	Stent, G. S.; and Calender, R. W.H	Freeman and company
	5	Microbiology	Prescott, L.M J.P. Harley and C.A. Klein	

CO-PO Mapping

CO-PO Mapping

Biology for Engineers

(Course Code – CE(BS)301)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	-	2	-	-	1	-	-	2	2	3	2
CO2	2	2	2	2	-	3	-	-	1	-	-	3	2	1	2
CO3	1	3	1	3	-	2	-	-	2	-	-	2	2	2	2
CO4	2	2	1	3	-	3	-	-	1	-	-	3	1	2	1
CO5	1	2	2	2	-	2	-	-	2	-	-	2	-	2	3
Avg.	1.60	2.2	1.4	2.4	-	2.25	-	-	1.4	-	-	1.4	1.75	2	2

CE(ES)301: Engineering Mechanics



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Course Code – CE(ES)301	Engineering Mechanics	3L+1T+0P	4 credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to draw free body diagrams and determine the resultant of forces and/or moments. 2. The students will be able to determine the centroid and second moment of area of sections. 3. The students will be able to apply laws of mechanics to determine efficiency of simple machines with consideration of friction. 4. The students will be able to analyze statically determinate planar frames. 5. The students will be able to analyze the motion and calculate trajectory characteristics.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Introduction to Engineering Mechanics Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy	6L
Module 2	Friction Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;	3L
Module 3	Basic Structural Analysis Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;	4L
Module 4	Centroid and Centre of Gravity Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.	5L
Module 5	Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with	4L



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	friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.	
Module 6	Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2 nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).	4L
Module 7	Introduction to Kinetics of Rigid Bodies Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;	5L
Module 8	Mechanical Vibrations Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums;	5L
Tutorials	From the above modules covering, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plan; Free body diagrams various systems including block-pulley; To verify the principle of moment in the disc apparatus; Helical block; To draw a load efficiency curve for a screw jack	6L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Engineering Mechanics: Principles of Statics and Dynamics	R.C. Hibbler	Pearson Press
	2	Engineering Mechanics	I.H. Shames	Prentice Hall
	3	A Text Book of Engineering Mechanics	R.K. Bansal	Laxmi Publications
	4	Engineering Mechanics	R.S. Khurmi	S.Chand and Co.



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CO-PO Mapping

CO-PO Mapping Engineering Mechanics (Course Code – CE(ES)301)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	1	1	-	-	1	-	3	2	1	2
CO2	3	3	2	3	-	2	3	1	1	-	1	3	3	3	2
CO3	2	1	-	-	2	-	1	-	1	1	-	3	1	1	3
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
CO5	2	1	2	1	3	2	3	3	3	3	3	3	3	2	3
	2.4	1.6	2.33	2	2.67	1.5	2.2	2	1.75	1.75	2	3	2.4	1.8	2.6

CE(ES)302: Energy Science & Engineering

Course Code – CE(ES)302	Energy Science & Engineering	1L+1T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to analyse Comprehension of the sources, utilization technologies, storage and distribution modes of energy that presently power cities, buildings, transportation. 2. Students will be able to How alternative energy sources and technologies may disrupt conventional energy utilization behaviors. 3. Students will be able to Use knowledge of scientific and technological challenges posed by distributed electricity/power generation with computer simulation to understand energy distribution networks.
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	4. Students will be able to Describe how essential and consumer technologies rely on critical raw materials and have knowledge of the global impact of their extraction, refining, substitution and recovery.
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Syllabus

Sl No.	Course Content	Total Hours
Module1	<p>Introduction to Energy Science Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment.</p> <p>Tutorials: Compile a World map showing Energy Reserves by source, Total Energy consumption, Per capita energy consumption and Carbon Footprint</p>	3L
Module2	<p>Energy Sources Overview of energy systems, sources ,transformations, efficiency, and storage. Fossil fuels(coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies &alternativesforfossilfuels-biomass,wind,solar,nuclear,wave,tidalandhydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storageorregeneration(Ex.Pumpedstoragehydropowerprojects,superconductor-basedenergy storages, high efficiency batteries)</p> <p>Tutorials: Compile a Word Map showing Alternative Energy source usage; Compile a Process diagram for a Pumped Storage project; Collect details of a typical North Sea oil platform. Compile a map of India showing exiting potential and utilized potential for hydro power. List the pros and consfor Thermal hydro,nuclear and solar power projects.</p>	4L
Module3	<p>Energy & Environment Energy efficiency and conservation; introduction to clean energy technologiesanditsimportanceinsustainabledevelopment;Carbonfootprint,energyconsumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy</p> <p>Tutorials: Study the functioning of an Electro Static Precipitator in a thermal power plant; study the uses of coarse and fine FlyAsh from thermal powerplants. Compile the safety provisions In design and construction of arc reactor containment building</p>	5L
Module4	<p>Civil Engineering Projects connected with the Energy Sources Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project ,wave energy caissons, coastal installations for tidal power, wind mill towers; hydropower stations above-ground and underground along with associateddams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraint sand testing procedures for reactor</p>	10L



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	containment buildings; Spent Nuclear fuel storage and disposal systems Tutorials: Compile a process diagram for atypical underground hydro power project; Collect Details of a model solar chimney project; collect details of a wave energy project at Vizhinjam; Collect details of the Kalpasar (Tidal energy) project	
Module 5	Engineering for Energy conservation Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption. Tutorials: Draw a typical geometrical orientation of a house in your area to avoid sun's radiation in the bedroom in the evening; Identify typical examples of Indian building shading Various LEED ratings; List various building materials with their embodied energy content. Do an Energy Audit of your Departmental Building in the college	8L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Energy Technology	O.P, Gupta	Khanna Book Publishing, (2019)
	2	Renewable Energy (2nd edition)	Boyle, Godfrey (2004)	Oxford University Press
	3	Energy Engineering & Management	Chakrabarti	PHI

CO-PO Mapping

CO-PO Mapping

Energy Science & Engineering

(Course Code –CE(ES)302)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	2	3	3	1	1	1	2	3	2	1	2
CO2	3	1	1	2	3	3	3	1	2	1	2	3	3	3	1
CO3	2	1	1	1	3	3	3	1	1	1	1	3	1	1	1



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CO4	3	1	2	1	3	3	3	2	1	2	2	3	3	2	3
Avg.	2.75	1	1.25	1.25	3	3	3	1.25	1.25	1.25	1.75	3	2.25	1.75	1.75

CE(BS)301: Mathematics-III (Transform & Discrete Mathematics)

Course Code – CE(BS)301	Mathematics-III (Transform & Discrete Mathematics)	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Apply different types of transformations between two 2-dimensional planes for analysis of physical or engineering problems. 2. Students will be able to Understand sets, relations, functions and discrete structures 3. Students will be able to Create the ability to determine if a logical argument is valid or invalid in reality with the help of Propositional Calculus. 4. Students will be able to Understand the theoretical workings of mathematical approaches like counting technique and solution of recurrence relation. 5. Students will be able to Apply the knowledge of graphs and algorithms in solving real life problems appropriate to the discipline.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Transform Calculus -1 Polynomials – Orthogonal Polynomials – Lagrange’s, Chebysev Polynomials; Trigonometric Polynomials; Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method.	6 L
Module 2	Transform Calculus-2 Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications.	6 L
Module 3	Sets, relations and functions	4 L



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	Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.	
Module 4	Propositional Logic Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.	4 L
Module 5	Partially ordered sets Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices. Boolean and pseudo Boolean lattices.	4 L
Module 6	Algebraic Structures Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations- ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only).	4 L
Module 7	Introduction to Counting Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.	3 L
Module 8	Introduction to Graphs Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.	3 L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Elements of Discrete Mathematics, 2nd Ed	C. L. Liu	Tata McGraw-Hill
	2	Discrete Mathematics: Proof Techniques and Mathematical Structures	R. C. Penner	World Scientific
	3	Concrete Mathematics, 2nd Ed	K. H. Rosen	Addison- Wesley,



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4	Discrete Structures, Logic, and Computability, 3rd Ed	J. L. Hein	Jones and Bartlett
5	Schaum's Outline of Theory and Problems of Discrete Mathematics,	S. Lipschutz and M. L. Lipson	Tata McGraw-Hill
6	Discrete Mathematics with Applications to Computer Science	J. P. Tremblay and R. P. Manohar	Tata McGraw-Hill
7	Advanced Engineering Mathematics, 9th Edition	Erwin Kreyszig	John Wiley & Sons
8	A text book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications

CO-PO Mapping

CO-PO Mapping

Mathematics-III (Transform & Discrete Mathematics)

(Course Code – CE(BS)301)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	1	-	2	-	2	2	2	2	3
CO2	3	3	2	1	2	2	2	-	1	-	-	1	2	3	2
CO3	3	3	2	2	2	2	2	-	2	-	2	2	1	2	3
CO4	3	3	2	2	3	2	2	-	-	-	1	2	3	2	2
CO5	3	3	3	2	1	1	-	-	-	-	2	1	2	2	1
Avg.	3	3	2.4	1.8	2	1.8	1.75		1.67		1.75	1.6	2	2.2	2.2

CE(HS)301: Humanities-I (Effective Technical Communication)

Course Code – CE(HS)301	Humanities-I (Effective Technical Communication)	3T+0L+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to learn information developing and designing through various technical documents. 2. Students will be able to learn appropriate use of English language to enhance knowledge on building vocabulary and framing sentences. 3. Students will be able to learn and incorporating sensible style in Technical writing. 4. Students will be able to acquire proficiency in English language for comprehensive excellence in reading, listening, writing and speaking.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.	4L
Module 2	Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Human factors, Managing technical communication projects, time estimation, Single sourcing, Localization.	8L
Module 3	Self-Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity	8L
Module 4	Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.	8L
Module 5	Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work-culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.	8L



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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Guide to writing as an Engineer	David F. Beer and David McMurrey	John Willey
	2	Pocket Style Manual	Diane Hacker	Bedford Publication
	3	Effective Communication Skills	Kulbhushan Kumar	Khanna Publishing House
	4	You Can Win	Shiv Khera	Macmillan Books
	5	Technical Communications	Raman Sharma	Oxford Publication
	6	Applied Writing for Technicians	Dale Jungk	McGraw Hill

CO-PO Mapping

CO-PO Mapping

Humanities-I (Effective Technical Communication)

(Course Code - CE(HS)301)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	2	2	1	1	-	1	2	-	2	3	2	2	1
CO2	-	-	2	3	1	1	-	2	2	-	1	3	1	3	1
CO3	-	-	2	3	1	-	-	2	2	-	2	3	2	1	2
CO4	-	-	3	3	1	-	-	2	2	-	-	3	1	2	2
Avg.	-	-	2.25	2.75	1	1		1.75	2	-	1.67	3	1.5	2	1.5

CE(HS)302: Introduction to Civil Engineering

Course Code – CE(HS)302	Introduction to Civil Engineering	1L + 1T+0P	2 Credits
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Department of Civil Engineering

Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand the knowledge of construction equipment's practices and techniques to be used in the field. 2. Students will be able to apply theoretical and practical aspects of project management techniques to achieve project goals. 3. Students will be able to develop basic skills and knowledge regarding various software related to design and drawing of civil engineering works
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	<p>Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career</p> <p>Tutorials Develop a matrix of various disciplines and possible roles for engineers in each</p>	1L
Module 2	<p>History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers</p> <p>Tutorials Identify 10 ancient monuments and ten modern marvels and list the uniqueness of each</p>	1L
Module 3	<p>Overview of National Planning for Construction and Infrastructure Development; Position of construction industry vis-à-vis other industries, five-year plan outlays for construction; current budgets for infrastructure works</p> <p>Tutorials Develop a Strategic Plan for Civil Engineering works for next ten years based on past investments and identify one typical on-going mega project in each area</p>	1L
Module 4	<p>Fundamentals of Architecture & Town Planning: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities</p> <p>Tutorials Identify ten best civil engineering projects with high aesthetic appeal with one possible factor for each ; List down the possible systems required for a typical Smart City</p>	1L
Module 5	<p>Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Pre-stressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes</p> <p>Tutorials Identify three top new materials and their potential in construction; Visit a Concrete Lab and make a report</p>	2L
Module 6	<p>Basics of Construction Management & Contracts Management: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management</p> <p>Tutorials Identify 5 typical construction methods and list their advantages/positive features</p>	2L



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Module7	<p>Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction</p> <p>Tutorials Sustainability principles, Sustainable built environment, water treatment systems, and good practices of wastewater management. Examples of Solid and hazardous waste management, Air Pollution and control</p>	2L
Module8	<p>Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunneling</p> <p>Tutorials ListtopfivetunnelprojectsinIndiaandtheirfeatures;collectandstudygeotechnicalinvestigationreportof anyoneMetroRail(underground)project;Visitaconstructionsiteandmakeasite visit report</p>	2L
Module9	<p>Hydraulics, Hydrology & Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi-purpose reservoir projects</p> <p>Tutorials Identifythreeriverinterlinkingprojectsandtheirfeatures;visitaHydraulicsLabandmakeareport</p>	1L
Module10	<p>Ocean Engineering: Basics of Wave and Current Systems; Sediment transport systems; Ports& Harbors and other marine structures</p> <p>Tutorials Identify5typicalportsinIndiaandlistthestructuresavailableinthem;Visitarelated/similarfacility, if possible in nearby place and make a report</p>	1L
Module11	<p>Power Plant Structures: Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures; hydropower projects</p> <p>Tutorials Collect the typical layout for a large thermal power plant and a large hydro power plant and identify all the structures and systems falling in them.</p>	1L
Module12	<p>Structural Engineering: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies;</p> <p>Tutorials Identify5unique features for typical buildings, bridges ,tall-structures and large span structures; Visit Structures Testing Lab/facility and make a report</p>	3L
Module13	<p>Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;</p> <p>Tutorials Collect visual representations prepared by a Total Station and LIDAR and compare; Study typical Google street map and Google Earth Map and study how each can facilitate the other</p>	1L
Module14	<p>Traffic & Transportation Engineering: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials, design, construction and management; Case studies and examples.</p> <p>Tutorials Investments in transport infrastructure; Developments and challenges; Intelligent Transport Systems; Smart Cities, Urban Transport;Road Safety; Sustainable and resilient highway esign principles; Plan a sustainable transport system for acity; Identify key features/ components in the planning and design of a green field highway/airport/port/railway and the cost–economics.</p>	1L
Module15	<p>Repairs & Rehabilitation of Structures: Basics of corrosion phenomena and other structural distress mechanisms; some simple system sof rehabilitation of structures; Non-Destructive testing systems; Use of carbon fiber wrapping and carbon composites in repairs.</p> <p>Tutorials Collectthehistoryofamajorrehabilitationprojectandlisttheinterestingfeatures</p>	1L
Module16	<p>Computational Methods, IT, IoT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE21, MODFLOW, REVIT, TEKLA, AUTOCAD, GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM,)</p>	2L



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	Tutorials Visit AutoCAD lab and prepare a report; Identify ten interesting software systems used in Civil Engineering and their key features	
Module 17	Industrial lectures: Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning; Tutorials For each case study list the interesting features	2L
Module 18	Basics of Professionalism: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction	3L
Tutorials	List 5 cases of violation of professional ethics and list preventive measures; Identify 5 interesting projects and their positive features; Write 400 word reports on One ancient monument and a modern marvel of civil engineering	5L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Law of Arbitration and Conciliation	Chandiramani, Neelima	.Avinash Publications Mumbai.
	2	Law of Contract	Avtar Singh	Eastern Book Co.
	3	Fundamental concepts in Law of Contract	Meena Rao	3rd Edn. Professional Offset
IS Codes		The National Building Code		BIS, (2017)

CO-PO Mapping

CO-PO Mapping

Introduction to Civil Engineering

(Course Code – CE(HS)302)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	1	1	1	2	1	1	3	3	1	2
CO2	1	1	1	3	2	2	3	1	1	1	1	3	3	3	1
CO3	1	1	2	2	2	2	1	2	1	1	2	3	1	2	1
Avg.	1.33	1	1.66	2.33	2	1.66	1.66	1.33	1.33	1	1.33	3	2.33	2	1.33

CE(ES)391: Basic Electronics



Department of Civil Engineering

Course Code – CE(ES)391	Basic Electronics	1T+0L+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to identify semiconductor materials basic concept, Diodes and their applications. 2. Students will be able to explain the operation of BJTs, FETs, MOS, CMOS structure and their applications in the field of Amplification including OP-Amp. 3. Student will be able to acquire the proficiency to express binary numbers, different logic operations, design Gates and simple digital circuits using the Gates including different digital logic devices.
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Syllabus

SI No.	Course Content	Total Hours
Theory		
Module 1	Diodes and Applications covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications;	4L
Module 2	Transistor Characteristics covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET)– Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits;	4L
Module 3	Transistor Amplifiers and Oscillators covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift,	4L



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	Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators;	
Module 4	Operational Amplifiers and Applications covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground;	4L
Practical		
Module 1	Laboratory Sessions covering, Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices – Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;	2
Module 2	Study and Operation of Digital Multi Meter, Function / Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Amplitude, Phase and Frequency of Sinusoidal Signals using Lissajous Patterns on CRO; (CRO);	2
Module 3	Experimental Verification of PN Junction Diode Characteristics in A) Forward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS) Configuration;	2
Module 4	Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gain and Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators;	2
Module 5	Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications – Differentiator and Integrator, Square Wave and Triangular Wave Generation, Applications of 555 Timer – Astable and Monostable Multivibrators;	2



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Module 6	Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops – SR, JK and DFlip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4- bit/8-bit ShiftRegister ICs; Functionality of Up-Down / Decade Counter ICs;	2
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Books

Books	Sl.	Book Name	Author	Publishing House
	1	Laboratory Manual for Electronic Devices and Circuits	David. A. Bell	Prentice Hall
	2	Basic Electronics- Devices, Circuits and IT Fundamentals	Santiram Kal	Prentice Hall, India
	3	Digital Fundamentals	Thomas L. Floyd and R. P. Jain	Pearson Education
	4	Basic Electronics – A Text-Lab	Paul B. Zbar, A.P. Malvino and M.A. Miller	TMH

CO-PO Mapping

CO-PO-PSO Mapping															
Basic Electronics															
(Course Code – CE(ES)391)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3	-	-	2	3	2	-	3	2	3	1
CO2	2	-	2	2	2	-	-	2	2	1	3	2	3	2	3
CO3	3	3	3	3	3	-	-	3	3	2	2	2	2	2	2
Avg.	2.67	2.50	2.33	2.67	2.67	-	-	2.33	2.67	1.67	2.50	2.33	2.33	2.33	2.00

CE(ES)392: Computer-aided Civil Engineering Drawing

Course Code – CE(ES)392	Computer-aided Civil Engineering Drawing	1L+0T+2P	2 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ul style="list-style-type: none"> • Students will be able to develop ideas of AutoCAD commands for drawing 2D & 3D building drawings required for different civil Engineering applications. • Students will be able to plan and draw Civil Engineering Buildings as per aspect and orientation. • Students will be able to presenting drawings as per user requirements and preparation of technical report. • Students will learn the basics of Building Information modelling system and perspective view of buildings.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	INTRODUCTION Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co-ordinate systems, reference planes. Commands: Initial settings, drawing aids, drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.	2 L
Module 2	SYMBOLS AND SIGN CONVENTIONS Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards	2 L
Module 3	MASONRY BONDS English Bond and Flemish Bond – Corner wall and Cross walls -One brick wall and one and half brick wall	1 L
Module 4	BUILDING DRAWING Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity	5 L
Module 5	PICTORIAL VIEW Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information Modelling (BIM)	2 L



Department of Civil Engineering

Drawing 1	Buildings with load bearing walls including details of doors and windows.	6P
Drawing 2	Taking standard drawings of a typical two storeyed building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500-700 words	4P
Drawing 3	RCC framed structures	6P
Drawing 4	Reinforcement drawings for typical slabs, beams, columns and spread footings	6P
Drawing 5	Industrial buildings - North light roof structures – Trusses	4P
Drawing 6	Perspective view of one and two storey buildings	4P

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Civil Engineering Drawing	Subhash C Sharma & Gurucharan Singh	Standard Publishers
	2	Engineering Graphics & Design	Pradeep Jain & A.P. Gautam.	Khanna Publishing House
	3	AUTOCAD for Engineers and Designers	Sham Tickoo Swapna D	Pearson Education India Ltd.
	4	Engineering Drawing and Graphics + AUTOCAD	Venugopal	New Age International Pvt. Ltd.

CO-PO Mapping

CO-PO-PSO Mapping Computer-aided Civil Engineering Drawing (Course Code – CE(ES)392)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	2	3	2	-	3	3	1	3
CO2	3	2	3	2	3	-	-	2	2	2	2	3	1	2	3
CO3	3	3	3	3	3	-	-	3	3	-	2	3	2	3	3
CO4	3	2	2	2	3	-	-	-	3	3	2	3	2	3	2
Avg.	3	2.25	2.5	2.25	3	-	-	2.33	2.75	2.33	2	3	2	2.25	2.75



Department of Civil Engineering

CE(ES)393: Life Science

Course Code – CE(ES)393	Life Science	0T+0L+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Describe how plant physiology helps to absorb water. Convey that how ecosystem works, the components, food chain, ecological pyramids2. Students will be able to Describe basic concepts of population dynamics and how to do environmental management.3. Students will be able to Highlight the concepts of DNA, RNA and operon. Describe animal tissue culture and basic concepts of recombinant DNA technology.4. Students will be able to Convey mean, median, mode concept and basic strategies of data analysis.5. Students will be able to apply Practical approach towards biotechnology and also convey the strategies how to handle environmental impact of mega projects.
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Syllabus

SI No.	Course Content	Total Hours
Module 1A	Plant Physiology Transpiration; Mineral nutrition	3 L
Module 1B	Ecology Ecosystems- Components, types, flow of matter and energy in anecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum;Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids;	3 L
Module 2A	Population Dynamics Population ecology- Population characteristics,ecotypes; Population genetics- Concept of gene pool and genetic diversity in populations, polymorphism and heterogeneity;	3 L
Module 2B	Environmental Management Principles: Perspectives, concerns andmanagement strategies; Policies and legal aspects- Environment Protection Acts and modification,International Treaties; Environmental Impact Assessment- Case studies (International Airport,thermal power plant);	3 L
Module 3A	Molecular Genetics	3 L



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	Structures of DNA and RNA; Concept of Gene, Generegulation, e.g., Operon concept	
Module 3B	Biotechnology Basic concepts: Totipotency and Cell manipulation; Plant &Animal tissue culture- Methods and uses in agriculture, medicine and health; Recombinant DNATechnology- Techniques and applications	3 L
Module 4	Biostatistics Introduction to Biostatistics:-Terms used, types of data;Measures of Central Tendencies- Mean, Median, Mode, Normal and Skewed distributions; Analysisof Data- Hypothesis testing and ANNOVA (single factor)	4 L
Module 5	Laboratory & Fieldwork Sessions Comparison of stomatal index in differentplants; Study of mineral crystals in plants; Determination of diversity indices in plant communities;To construct ecological pyramids of population sizes in an ecosystem; Determination of ImportanceValue Index of a species in a plant community; Seminar (with PPTs) on EIA of a Mega-Project (e.g.,Airport, Thermal/Nuclear Power Plant/ Oil spill scenario); Preparation and extraction of genomic DNA and determination of yield by UV absorbance; Isolation of Plasmid DNA and its separation byGel Electrophoresis; Data analysis using Bio-statistical tools;	15 P

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Biology: A global approach	Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B	Pearson Education Ltd
	2	Outlines of Biochemistry	Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H	John Wiley and Sons
	3	Principles of Biochemistry (V Edition)	Nelson, D. L.; and Cox, M. M.W.H	Freeman and Company
	4	Molecular Genetics (Second edition)	Stent, G. S.; and Calender, R. W.H	Freeman and company
	5	Microbiology	Prescott, L.M J.P. Harley and C.A. Klein	



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CO-PO Mapping

CO-PO Mapping

Life Science

(Course Code - CE(ES)393)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	2	2	1	-	1	-	1	2	2	2	3
CO2	2	2	2	2	1	3	1-	-	1	-	-2	3	2	1	2
CO3	1	3	1	3	2	2	1	-	2	-	2	2	2	2	1
CO4	2	2	1	3	2	3	1	-	1	-	1	3	2	3	2
CO5	1	2	2	2	3	2	1	-	2	-	2	2	2	2	1
Avg.	1.60	2.2	1.4	2.4	2	2.25	1	-	1.4	-	1.6	1.4	2	2	1.83



Department of Civil Engineering

4th Semester

CE(ES)401: Introduction to Fluid Mechanics

Course Code – CE(ES)401	Introduction to Fluid Mechanics	2L + 0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to define basic terms, values and laws in the areas of fluids properties, statics, kinematics and dynamics of fluids, and hydraulic design of pipe systems; 2. Students will be able to describe methods of implementing fluid mechanics laws and phenomena while analyzing the operational parameters of hydraulic problems; 3. Students will be able to practically apply tables and diagrams, and equations that define the associated laws; 4. Students will be able to calculate and optimize operational parameters of hydraulic problems; 5. Students will be able to explain the correlation between different operational parameters; 6. Students will be able to select engineering approach to problem solving based on the acquired physics and mathematical knowledge
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Syllabus

SI No.	Course Content	Total Hours
Module 1	INTRODUCTION Properties of fluids: Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension.	3 L
Module 2	FLUID STATICS Pressure at a point, basic equation for pressure field, pressure variation in a fluid at rest- incompressible fluid, compressible fluid, absolute pressure, gauge pressure; pressure measurements by manometers – general, inclined, inverted, micro-manometer; pressure and forces on submerged planes and curved surfaces, centre of pressure, buoyancy	4 L



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	and floatation, Stability of submerged and floating bodies, metacentric height.	
Module 3	FLUID KINEMATICS The velocity field, Eulerian and Lagrangian flow descriptions, concepts of: - one-, two- and three-dimensional flows, steady and unsteady flows, streamlines, streaklines, pathlines; The acceleration field; Control volume and system representation, Continuity Equation, Momentum Equation, Moment-ofmomentum equation, applications to pipe bends	6L
Module 4	FLUID DYNAMICS Application of Newton's Law along a streamline, Bernoulli Equation, Kinetic energy head, potential energy head and pressure energy head, total energy head, Pitot tube, Examples of use of Bernoulli Equation, measurement of flows - venturimeter, energy line and hydraulic grade line	7 L
Module 5	DIMENSIONAL ANALYSIS Buckingham Pi Theorem, determination of Pi terms, correlation of experimental data, examples.	3 L
Module 6	FLOW THROUGH PIPES Laminar flow, Reynolds number, critical velocity, turbulent flow, shear stress at pipe wall, velocity distribution, loss of head for laminar flow, Darcy-Weisbach Formula, friction factor, contraction and expansion head losses. Concept of boundary layer and its growth.	7L
Module 7	PIPELINE SYSTEMS Pipes in series, pipes in parallel, equivalent pipes, branching pipes, pipe networks	7L
Module 8	HYDRAULIC MACHINES : Basics of hydraulic machines, specific speed of pumps and turbines.	3L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	A Textbook of Fluid Mechanics	R. K. Bansal	Laxmi Publications (P) Ltd., New Delhi



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	2	Fluid Mechanics	Sadhu Singh.	Khanna Publishing House
	3	Introduction to Fluid Mechanics and Fluid Machines	S. K. Som, G. Biswas and S. Chakraborty	Tata McGraw Hill Education Private Limited, New Delhi, 2012.
	4	Fluid Mechanics and Hydraulic Machines	K. Subramanya	McGraw Hill Education (India)

CO-PO Mapping

CO-PO Mapping

Introduction to Fluid Mechanics

(Course Code – CE(ES)401)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	1	3	1	1	3	3	3	3
CO2	3	3	3	1	3	-	-	-	2	1	1	3	1	3	3
CO3	3	3	3	3	3	1	-	-	3	1	1	3	2	3	3
CO4	3	3	2	2	3	-	1	1	3	3	1	3	2	3	2
CO5	3	3	3	2	1	1	1	1	3	2	1	3	2	3	3
CO6	3	3	2	2	1	1	1	1	2	1	1	3	2	3	1
	3	3	2.5	2	2.33	1	1	1	2.67	1.5	1	3	2	3	2.50

CE(ES)402: Introduction to Solid Mechanics

Course Code – CE(ES)402	Introduction to Solid Mechanics	2L+0T+0P	2 credits
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Course Outcome (CO)



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Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to identify the equilibrium conditions and elastic properties of axially loaded bars through stress-strain and force-displacement curves. 2. The students will be able to identify the principal plane and principal stresses through the Mohr circle. 3. The students will be able to calculate the bending moment, shear force, and deflection of beams for uniformly distributed, concentrated, linearly varying, and external concentrated moment. 4. The students will be able to calculate the member forces in a plane truss using Method of Joint and Method of Section. 5. The students will be able to know the concepts of strain energy due to axial load, bending and shear.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Review of Basic Concepts of Stress and Strain: Normal stress, Shear stress, bearing stress, Normal strain, shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety, Beam Statics: Support reactions, concepts of redundancy, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams	6L
Module 2	Symmetric Beam Bending: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, Bending and shear stress for regular sections, shear centre	3L
Module 3:	Deflection of statically determinate beams: Fundamental concepts: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions: Direct integration solution	4L
Module 4:	Analysis of determinate plane trusses: Concepts of redundancy, Analysis by method of joints, method of sections	4L
Module 5:	Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle	3L
Module 6	Introduction to thin cylindrical & spherical shells: Hoop stress and meridional - stress and volumetric changes	3L
Module 7	Torsion: Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical; springs	4L
Module 8	Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae.	3L

Books



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Books	Sl.	Book Name	Author	Publishing House
	1	Elements of Strength of Material	S. P. Timoshenko and D. H. Young	EWP Pvt. Ltd
	2	Mechanics of Material	R.C. Hibbeler	Pearson
	3	Strength of Materials	R. Subramanian	OXFORD University Press
	4	Strength of Materials	S S Bhavikatti	Vikas Publishing House Ltd

CO-PO Mapping

CO-PO Mapping

Introduction to Solid Mechanics

(Course Code – CE(ES)402)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	2	3	3	2	3	1	2	1	-	2	1	2	3	2	3
CO3	3	2	2	2	3	1	-	1	2	2	3	1	2	2	3
CO4	3	-	2	-	3	2	2	2	-	-	-	2	3	3	3
CO5	3	3	-	2	2	2	3	-	1	1	-	2	3	2	3
	2.6	2.5	2.5	2.25	2.75	1.5	2.25	1.33	1.5	1.67	1.67	2	2.4	2.2	2.6

CE(PC)401: Soil Mechanics-I



Department of Civil Engineering

Course Code – CE(PC)401	Soil Mechanics-I	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to classify soil as per grain size distribution curve and understand the index properties of soil. 2. The students will be able to apply the concept of total stress, effective stress and pore water pressure for solving geotechnical problems. 3. The students will be able to assess the permeability of different types of soil and solve flow problems. 4. The students will be able to estimate the seepage loss, factor of safety against piping failure using flow net related to any hydraulic structure. 5. The students will be able to determine vertical stress on a horizontal plane within a soil mass subjected to different types of loading on the ground surface and also the maximum stressed zone or isobar below a loaded area.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	<p>Properties of Soil: I-situ Density, Moisture Content, Specific Gravity, Relative density, Functional Relationships.</p> <p>Index Properties of Soil</p> <p>Introduction, Particle Size Distribution, Mechanical Analysis - Sieve Analysis, Sedimentation Analysis – Hydrometer and Pipette Methods. Consistency of Soil</p> <p>– Atterberg Limits, Different Indices, Discussion on Limits and Indices.</p> <p>Classification of Soil</p> <p>Classification by Structure, Particle Size Classification, Textural System, PRA System (AASHTO Classification), Unified Classification System, As per IS Code Recommendation, Field Identification of Soil, Classification by Casagrande's Plasticity Chart.</p>	
Module 2	<p>Soil Hydraulics</p> <p>Modes of Occurrence of Water in Soil – Free Water, Held Water, Structural Water, Capillary Water, Gravitational Water, Adsorbed Water, Pore Water, Pore Water Pressure, Effective Pressure, Total Pressure, Effective Pressure under Different Conditions and in Different Cases of Flow through Soils, Critical Hydraulic Gradient, Quick Sand Condition.</p>	3L + 1T
	Permeability	



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Module 3:	Introduction, Darcy's Law, Coefficient of Permeability, Discharge Velocity, Seepage Velocity, Factors Affecting Permeability. Determination of Coefficient of Permeability – Constant Head and Falling Head Methods, Permeability of Stratified Soil Deposits, Field Determination of Permeability – Unconfined and Confined Aquifers.	3L + 1T
Module 4:	Seepage Analysis Introduction, Seepage, Seepage Pressure, Two Dimensional Flow, Laplace's Equations, Continuity equation, Flow Nets, Flow through Earthen Dam, Estimation of Seepage, Construction, Properties and Use of Flow Nets, Piping and Heaving, Uplift due to Seepage, Design of Fillers.	3L + 1T
Module 5:	STRESS DISTRIBUTION IN SOILS Introduction, Geostatic Stress, Boussinesq's Equation, Determination of Stress due to Point Load, Vertical Stress Distribution on a Horizontal Plane, Isobar and Pressure Bulb, Vertical Stress Distribution on a Vertical Plane, Vertical Stress under Uniformly Loaded Circular Area, Vertical Stress Beneath a Corner of a Rectangular Area, Equivalent Point Load Method, 2:1 Method, Newmark's Influence Chart, Vertical Stress Beneath Line and Strip Loads. Westergaard Analysis, Comparison of Boussinesq and Westergaard Theories, Contact Pressure.	4L + 2T
Module 6	SHEARING STRENGTH OF SOILS Shear Strength of Soil Introduction, Basic Concept of Shear Resistance and Shear Strength of Soil, Mohr Circle of Stress, Sign Conventions, Mohr - Coulomb Theory, Relationship between Principal Stresses and Cohesion. Determination of Shear Parameters of Soil Stress Controlled and Strain Controlled Tests, Laboratory Determination of Soil Shear Parameters- Direct Shear Test, Triaxial Test, Classification of Shear Tests Based on Drainage Conditions, Unconfined Compression Test, Vane Shear Test as per Relevant IS Codes. Stress- Strain Relationship of Clays and Sands, Concept of Critical Void Ratio. Skempton's Pore Pressure Parameters. Sensitivity and Thixotropy of clay. Concept of Stress path.	5L + 3T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Textbook of Soil Mechanics and Foundation Engineering (Geotechnical Engineering Series)	V.N.S. Murthy	CBS Publishers



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	2	Soil Mechanics and Foundations	Punmia, B.C. and Jain A. K	Laxmi Publications (P) Ltd
	3	Basic and Applied Soil Mechanics	Gopal Ranjan & A.S.R. Rao	New Age International Pvt. Ltd, Publishers
	4	Principles of Geotechnical Engineering	B.M. Das	Thomson Brooks / Cole

CO-PO Mapping

CO-PO Mapping

Soil Mechanics-I

(Course Code – CE(PC)401)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	1	1	-	-	1	-	3	2	1	2
CO2	3	3	2	3	1	2	3	1	1	-	1	3	3	3	1
CO3	1	2	-	-	2	-	1	-	1	1	-	3	1	1	1
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
CO5	2	1	2	1	3	1	3	3	3	3	3	3	3	2	3
Avg.	2.2	1.8	2.33	2	2.25	1.25	2.2	2	1.75	1.75	2	3	2.4	1.8	2

CE(PC)402: Environmental Engineering-I

Course Code – CE(PC)402	Environmental Engineering-I	2L+1T+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to define the basic concepts and terminologies of water supply engineering and solid waste management 2. The students will be able to describe different surface and groundwater sources; and composition and characteristics of municipal solid waste 3. The students will be able to apply the methods of quantifying water requirement and MSW generation 4. The students will be able to solve different mathematical problems regarding different components of water supply systems, distribution networks and MSW management systems. 5. The students will be able to compare between different water samples based on their physical, chemical and biological characteristics
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Water Requirement Estimation Water Demand: Different types of water demand; Per capita demand; Variations in demand; Factors affecting water demand Future Demand Forecasting: Design period; Population forecasting methods	2L + 2T
Module 2	Sources of Water Surface Water Sources; Ground Water Sources	4L + 2T
Module 3:	Water Quality Water Quality Characteristics: Physical, Chemical, and Biological parameters Drinking Water Standards: BIS; WHO; USEPA Water Quality Indices: Basic concept and examples	4L + 2T
Module 4:	Water Treatment Typical flow chart for surface and groundwater treatments Unit Operation and Processes: Aeration, Plain Sedimentation, Sedimentation with Coagulation and Flocculation, Water Softening, Filtration, Disinfection	9L + 3T
Module 5:	Water Conveyance and Distribution Hydraulic design of pressure pipes; Analysis of distribution network; Storage and distribution reservoirs; Capacity of reservoirs.	4L + 2T
Module 6	Characteristics of Municipal Solid Waste (MSW) Composition and characteristics of MSW	1L + 1T
Module 7	Handling of MSW Generation, collection and transportation of MSW	1L + 1T
Module 8	Engineered Systems for MSW Management Methods of reuse/ recycle, energy recovery, treatment and disposal of MSW	3L + 1T



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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Environmental Engineering	S.C. Sharma	Khanna Publishing House
	2	Environmental Engineering. Volume-1 and Volume-2	Garg, S.K.	Khanna Publishers
	3	Environmental Engineering	Peavy, H.S, Rowe, D.R, Tchobanoglous, G	Tata McGraw Hill Indian Edition
	4	Introduction to Environmental Engineering and Science	Masters, G.M., Ela, W.P.	Prentice Hall / Pearson

CO-PO Mapping

CO-PO Mapping

Environmental Engineering

(Course Code – CE(PC)402)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	3	2	3	2	3	1	2	-	-	1	1	2	3	2	3
CO3	3	1	2	2	3	-	-	1	1	1	-	1	2	2	3
CO4	3	-	2	-	3	2	2	-	1	-	-	2	3	3	3
CO5	1	2	-	2	2	2	3	-	1	1	-	2	3	2	3
Avg.	2.4	1.75	2.5	2.25	2.75	1.67	2.25	1	1	1	1	2	2.4	2.2	2.6



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CE(PC)404: Concrete Technology

Course Code – CE(PC)403	Surveying and Geomatics	2L + 1T	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to define and state the scope of surveying and geomatics in civil engineering.2. Students will be able to Apply the different methods of surveying and geomatics to measure the features of interest3. Students will be able to Analyze the traditional and advanced methods of surveying4. Students will be able to Evaluate the different techniques of surveying and geomatics in solving real world problems5. Students will be able to Design and construct solutions for real world problems related to surveying and geomatics
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Principles of Surveying: Introduction, Principles and classification of surveying; Concept of scales; Survey stations and lines – ranging and bearing; Chain surveying – Concept, Instruments, numerical problems on errors due to incorrect chain; Plane table surveying – Advantages, disadvantages, parts, methods; Elements of simple and compound curves	4L + 2T
Module 2	Levelling: Levelling – Principles, Precautions and Difficulties; Differential levelling, -- Concepts and numerical problems; Contouring	3L + 1T
Module 3:	Triangulation and Trilateration: Theodolite survey – Instruments, measurements of horizontal and vertical angles; Triangulation – Network, signals, numerical examples; Baseline measurement – site selection, measuring equipment, numerical problems on baseline corrections; Trigonometric levelling – Axis signal correction	4L + 2T
Module 4:	Advanced Surveying: Principle of Electronic Distance Measurement (EDM); Types of EDM instruments; Distomats; Total Station – Parts, advantages, applications, field procedure and errors; Global Positioning System (GPS) – Concept, applications, segments, location determination, errors; Principle of Differential GPS; Terrestrial laser scanner.	3L + 2T



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Module 5:	Photogrammetric Surveying: Concept; Classification of photogrammetric surveying – terrestrial, aerial and satellite; scale of a vertical photograph; relief displacement and object height determination; Stereoscopic vision – depth perception, parallax angle, stereoscopes; Object height determination using parallax; Parallax bar; Flight planning – Concept and numerical problems; Photo mosaic; Orthophotography; Stereoscopic plotting instruments.	4L + 2T
Module 6	Remote Sensing: Energy sources and radiation principles; Concept of Electromagnetic Spectrum; Energy interactions in the atmosphere and earth surface features; Data acquisition and interpretation; Platforms and sensors – Geostationary and sunsynchronous orbits, pushbroom and whiskbroom scanning system, characteristics of IRS, Landsat and Sentinel sensors; Visual image interpretation	3L + 2T
Module 7	Digital Image Processing: Concept; Image rectification and restoration; Image enhancement; Image classification; Accuracy assessment and post classification smoothing.	4L + 2T
Module 8	Applications of Geomatics in Civil Engineering: 3D mapping; Earthquake and landslides; Runoff modelling; Groundwater targeting; Flood risk assessment; Urban planning; Highway and transportation	3L + 1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Surveying & Levelling	N. N. Basak	McGraw Hill Education (India) Private Limited
	2	Surveying – Vol. I, II & III	B. C. Punmia Ashok Kumar Jain Arun Kumar Jain	Laxmi Publications (P) Ltd
	3	Surveying – Vol. I & II	S. K. Duggal	McGraw Hill Education
	4	Surveying & Levelling – Part I & II	T. P. Kanetkar S. V. Kulkarni	Pune Vidyarthi Griha Prakashan

CO-PO Mapping

CO-PO-PSO Mapping															
Soil Mechanics															
(Course Code – CE(PC)403)															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	1	1	-	-	2	2	-	-	-	-	3	3	-	3



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CO2	2	1	1	1				-	-		-	2	3	-	2
CO3	1	3	2	1		3	1	-	2	3	1	2	2	2	2
CO4	2	3	3	2	2	3	2	-	2	2	1	3	1	3	2
CO5	2	3	2	-		3	2	-	2	2	1	2	2	3	2
Avg.	2.00	2.20	1.80	1.33	2.00	2.75	1.75	-	2.00	2.33	1.00	2.40	2.20	2.67	2.20

CE(PC)404: Concrete Technology

Course Code – CE(PC)404	Concrete Technology	2L + 1T	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 6. Students will be able to identify various materials for concrete and classify them accordingly. 7. Students will be able to apply fundamental knowledge in assessing various properties of concrete in fresh and hardened state 8. Students will be able to ensure quality control of concrete by performing tests of properties of concrete materials as per IS code 9. Students will be able to gather knowledge about various additive materials that are used in concrete and their proper usage to make the concrete better 10. Students will be able to design concrete mix as per latest IS Codes parameters
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Cement: Manufacturing of cement, Oxides composition of cement and the calculation of compounds, Heat of hydration, Types of cement- OPC, RPC. Low heat cement, PPC, PSC, Sulphate resisting cement, High Alumina cement, Expansive cement, White cement; Test on cement- fineness, consistency, initial setting time & final setting time, soundness test, strength test, specific gravity of cement, storage of cement.	5L + 3T
Module 2	Aggregates: Classification, Grading, alkali-aggregate reaction, deleterious substances in aggregates, physical properties, testing of aggregates- fineness modulus, bulking, specific gravity, sieve analysis, flakiness & elongation index. Quality of Water for mixing and curing - use of sea water for mixing concrete.	3L + 1T



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Module 3:	Properties of fresh concrete: Workability, factors affecting workability, segregation and bleeding, tests on workability- slump test, compacting factor test, vee-bee test, flow table test.	3L + 1T
Module 4:	Properties of Hardened concrete: Tensile & compressive strength, flexural strength, stress-strain characteristics, modulus of elasticity, poisson's ratio, Creep, shrinkage, permeability of concrete, micro cracking of concrete.	3L + 1T
Module 5:	Strength of concrete: curing methods, water-cement ratio. gel-space ratio, maturity of concrete,	3L + 1T
Module 6	Admixtures: types, uses, superplasticizers, plasticizers, Bonding admixtures.	2L + 1T
Module 7	Mix Design – Objective, factors influencing mix proportion - Mix design by I.S. 10262-2019. (with & without admixture)	3L + 1T
Module 8	Non-destructive test: Rebound hammer and Ultra-sonic pulse velocity testing methods. Quality control - Sampling and testing, Acceptance criteria.	3L + 1T
Module 9	Special Concrete – Ferrocement - Fibre reinforced concrete - Polymer concrete - Sulphur Concrete - Self compacting concrete. Ready mix concrete, Batching plant.	4L + 1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Concrete Technology (Theory & Practice)	Shetty, M.S.	S. Chand and Co.
	2	Concrete Technology	Gambhir, M.L.	Tata McGraw Hill
	3	Concrete Technology	A. M. Neville and J.J. Brooks	Pearson Education India Ltd.
	4	Properties of Concrete	A.M.Neville	Pearson India
IS Codes	I.S. 10262-2019			Bureau of Indian Standards

CO-PO Mapping

CO-PO Mapping

Concrete Technology



Department of Civil Engineering

(Course Code – CE(PC)404)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	3	3	3	2	3	1	2	-	-	1	1	2	3	2	3
CO3	3	1	2	1	3	-	-	1	-	1	-	1	2	2	3
CO4	3	-	2	-	3	2	2	-	-	-	-	2	3	3	3
CO5	3	3	-	2	2	2	3	-	1	1	-	2	3	2	3
	3	2.25	2.5	2	2.75	1.67	2.25	1	1	1	1	2	2.4	2.2	2.6

CE(HS)401: Civil Engineering – Societal and Global Impact

Course Code – CE(HS)401	Civil Engineering – Societal and Global Impact	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to understand The impact which Civil Engineering projects have on the Society at large and on the global area and using resources efficiently and effectively. 2. Students will able to understand The extent of Infrastructure, its requirements for energy and how they are met: past, present and future 3. Students will able to understand The potentials of Civil Engineering for Employment creation and its Contribution to the GDP 4. Students will able to understand The Built Environment and factors impacting the Quality of Life
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Syllabus

Sl No.	Course Content	Total Hours
Module1	Introduction to Course and Overview; Understanding the past to look into the future: Preindustrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering break through and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming,	3L



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	its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis;	
Module 2	Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering	3L
Module 3 :	Infrastructure-Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (belowground, underwater); Futuristic systems (ex, HyperLoop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability;	8L
Module 4 :	Environment-Traditional & futuristic methods ; Solid waste management, Water purification, Waste water treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution ; Global warming phenomena and Pollution Mitigation measures, Stationarity and non-stationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.	7L
Module 5 :	Built environment-Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/Sound control in built environment, Security systems; Intelligent/Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability	5L
Module 6	Civil Engineering Projects-Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment (projects, facilities management), Quality of products, Health & safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development	4L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Global Challenges and the Role of Civil Engineering.	Ziga Turk (2014)	Springer



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	2	Engineering impacting Social, Economic and Working Environment	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013)	120th ASEE Annual Conference and Exposition
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CO-PO Mapping

CO-PO Mapping

Civil Engineering – Societal and Global Impact

(Course Code –CE(HS)401)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	1	3	2	3	1	2	3	1	1	2
CO2	2	1	1	3	2	2	3	1	1	1	1	3	3	3	1
CO3	1	1	3	1	2	3	1	1	1	1	1	3	2	1	2
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
Avg.	2	1.25	2.25	2	2.25	1.75	2.5	1.5	1.5	1.25	1.5	3	2.25	1.75	2

CE(MC)401: Management I (Organizational

Course Code – CE(MC)401	Management I (Organizational Behaviour)	2L+0T+0P	0 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will have Ability to understand some of the main theories of organizational Behavior 2. Students will be able to analyze how these theories and empirical evidence can help to understand contemporary organizational issues. 3. Students will be able to develop concept of social sciences (psychology) subject in which they will study the behavior of people/employees at workplace 4. Students will be able to manage effective teams and it helps to understand and predict human behavior in an organization. It studies on how organizations can be structures more accurately, and how several events in their outside situations effect organizations
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Department of Civil Engineering

Syllabus

SI No.	Course Content	Total Hours
Module 1	<p>Introduction to Organizational Behaviour-Concept, Importance, Challenges and Opportunities</p> <p>Personality-Meaning of Personality, Personality Determinants and Traits, Psychoanalytic Theory, Argyris Immaturity to Maturity Continuum Impact on organization.</p> <p>Attitude-Concept, Components, Cognitive Dissonance Theory, Attitude Surveys.</p>	5L
Module 2	<p>Perception- Concept, Nature and Importance, Process of Perception, Factors influencing perception, Perceptual Selectivity, Shortcuts to Judge Others: Halo Effect, Stereotyping, Projection and Contrast Effects, Impact on Organization. Motivation-Definition, Theories of Motivation-Maslow's Hierarchy of Needs Theory, McGregor's Theory X&Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.</p>	6L
Module 3:	<p>Leadership-Concept, Leadership Styles, Theories-Behavioural Theory: Ohio Studies, Michigan Studies, Blake & Mouton Managerial Grid; Contingency Theory: Fielder Theory.</p> <p>Group Behaviour: Definition, Characteristics of Group, Types of Groups: Formal & Informal; Stages of Group Development, Group Decision making, Group Decision Making Vs Individual Decision Making.</p>	8L
Module 4:	<p>Organizational Design-Various organizational structures and their pros and cons. Concepts of organizational climate and culture, Organizational Politics- Concept, Factors influencing degree of Politics</p> <p>Conflict management- Concept, Sources of conflict, Stages of conflict process, Conflict resolution techniques, Tools-Johari Window to analyse and reduce interpersonal conflict, Impact on organization.</p>	5L

Books

Books	Sl.	Book Name	Author	Publishing House
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Department of Civil Engineering

	1	Organization Behaviour	Stephen Robbins	
	2	Organization Behaviour	Luthans	
	3	Organization Behaviour	L.M. Prasad	
	4	Organization Behaviour : Text, Cases & Games	K. Aswathappa	

CO-PO Mapping

CO-PO-PSO Mapping Management I (Organizational Behaviour) (Course Code – CE(MC)401)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	2	--	3	3	-	-	2
CO2	-	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CO3	-	-	-	-	-	2	2	-	-	-	-	3	-	-	2
CO4	-	-	-	-	-	2	-	2	2	2	3	3	-	-	2
Avg.	-	-	-	-	-	2	2	2	2	2	3	3	-	-	2

CE(ES)491: Fluid Mechanics Laboratory

Course Code – CE(ES)491	Fluid Mechanics Laboratory	0L+0T+2P	1 Credit
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Calibrate the notch and orifice meter. 2. Students will be able to Evaluate the performance of pump and turbine. 3. Students will be able to Determine the various hydraulic coefficients. 4. Students will be able to Determine the minor losses through pipes. 5. Students will be able to Measure the water surface profile due to formation of hydraulic jump.
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6. Students will be able to Measure the water surface profile for flow over Broad crested weir.

Syllabus

Sl No.	Course Content	Total Hours
Experiment 1	Calibration of Notches	2
Experiment 2	Calibration of Orifice meter.	2
Experiment 3	Determination of Hydraulic Coefficient of an Orifice	2
Experiment 4	Performance Test on Centrifugal Pump	2
Experiment 5	Performance Test on Reciprocating Pump	2
Experiment 6	Determination of Minor Losses in Pipes due to Sudden Enlargement and Sudden Contraction.	2
Experiment 7	Performance Test on Pelton Wheel Turbine	2
Experiment 8	Measurement of water surface profile for flow over Broad crested weir Quality control - Sampling and testing, Acceptance criteria.	2
Experiment 9	Measurement of water surface profile for a hydraulic jump.	2

Books

	Sl.	Book Name	Author	Publishing House
Books	1	A Textbook of Fluid Mechanics	R. K. Bansal	Laxmi Publications (P) Ltd., New Delhi
	2	Fluid Mechanics	Sadhu Singh.	Khanna Publishing House
	3	Introduction to Fluid Mechanics and Fluid Machines	S. K. Som, G. Biswas and S. Chakraborty	Tata McGraw Hill Education Private Limited, New Delhi, 2012.
	4	Fluid Mechanics and Hydraulic Machines	K. Subramanya	McGraw Hill Education (India)

CO-PO Mapping



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CO-PO Mapping

Fluid Mechanics Laboratory

(Course Code – CE(ES)491)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	3	3	3	2	3	1	2	-	-	1	1	2	3	2	3
CO3	3	1	2	1	3	-	-	1	-	1	-	1	2	2	3
CO4	3	-	2	-	3	2	2	-	-	-	-	2	3	3	3
CO5	3	3	-	2	2	2	3	-	1	1	-	2	3	2	3
CO6	3	3	3	2	2	3		2	-	-	1	2	2	2	3
Avg.	3	2.40	2.6	2	2.60	1.60	2.25	1.5	1	1	1	2	2.0	2.16	2.6

CE(ES)492: Solid Mechanics Laboratory

Course Code – CE(ES)492	Solid Mechanics Laboratory	0L+0T+2P	1 Credits
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Course Outcomes

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to demonstrate the method and findings of tension and compression tests on ductile and brittle materials. 2. The students will be able to explain the method of bending tests on mild steel beam and concrete beam. 3. The students will be able to demonstrate the method and findings of Torsion test on mild steel circular bar and concrete beam. 4. The students will be able to illustrate the concept of hardness and explain the procedure and findings of Brinnel and Rockwell tests. 5. The students will be able to demonstrate the concept and procedure of calculation of spring constant and elaborate its use in Civil Engineering
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Syllabus



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Sl No.	Course Content	Total Hours
Experiment 1	Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars)	2P
Experiment 2	Compression Test on Structural Materials: Timber, bricks and concrete cubes	2P
Experiment 3	Bending Test on Mild Steel	2P
Experiment 4	Torsion Test on Mild Steel Circular Bar	2P
Experiment 5	Hardness Tests on Ferrous and Non-Ferrous Metals: Brinell and Rockwell Tests	2P
Experiment 6	Test on closely coiled helical spring	2P
Experiment 7	Impact Test: Izod and Charpy	2P
Experiment 8	Demonstration of Fatigue Test	2P

CO-PO Mapping

CO-PO Mapping

Solid Mechanics Laboratory

(Course Code – CE(ES)492)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	1	-	1	1	2	2	3
CO2	3	2	2	2	2	1	1	1	1	-	-	1	2	1	3
CO3	3	2	3	2	2	1	-	-	1	-	-	1	2	2	3
CO4	2	3	-	1	1	-	1	1	3	2	2	1	3	1	2
CO5	2	2	-	2	2	1	-	1	-	1	-	1	3	2	2
Avg.	2.6	2.2	2.33	1.8	1.8	1	1	1	1.2	1.5	1	1	2.4	1.6	2.6

CE(ES)493: Engineering Geology Laboratory

Course Code – CE(ES)493	Engineering Geology Laboratory	0L+0T+2P	1 Credits
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Department of Civil Engineering

Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to Define and state the role of engineering geology in civil engineering. 2. Students will able to Understand origin of rocks and geologic structures. 3. Students will able to Apply different tools to identify rocks and minerals in hand specimen and under microscope. 4. Students will able to Analyze the geological structures through drawing the cross sections from the geological Maps.
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Syllabus

Sl No.	Course Content
Experiment1	Identification of minerals in hand specimen
Experiment2	Identification of igneous rocks in hand specimen
Experiment3	Identification of sedimentary rocks in hand specimen
Experiment4	Identification of metamorphic rocks in hand specimen
Experiment5	Study of crystals with the help of crystal models
Experiment6	Study of geologic structures with the help of models
Experiment7	Interpretationofgeologicalmaps:horizontal,vertical,unclinal,foldedandfaultedstructures
Experiment8	Microscopic study of rocks and minerals

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Engineering and General Geology	Parvin Singh	Katson publishing house Delhi
	2	Engineering Geology for Civil Engineers	D. Venkat Reddy	Oxford, IBH
	3	Structural Geology	Marland P. Billings	Wiley eastern Prentice-Hall,

CO-PO Mapping

CO-PO Mapping

Engineering Geology Laboratory

(Course Code - CE(ES)493)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO1	2	1	3	2	2	1	1	2	1	1	2	3	1	1	2
CO2	2	1	1	3	2	2	3	1	1	1	1	3	2	3	1
CO3	1	1	1	2	2	3	1	2	1	1	1	3	2	3	1
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
Avg.	2	1.25	2	2.25	2.25	1.75	2	1.75	1.25	1.25	1.5	3	2	2.25	1.75

CE(PC)493: Surveying & Geomatics

Course Code – CE(PC)493	Surveying & Geomatics	0T+0L+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to State the interdependency and advancement of different surveying methods 2. Students will be able to Comprehend the working principles of different surveying and geomatics instruments and experiments 3. Students will be able to Execute the different methods of surveying and geomatics to measure the features of interest 4. Students will be able to Examine the results obtained from the surveying and geomatics experiments 5. Students will be able to Critically appraise the different techniques of surveying and geomatics in measuring and assessing the features of interest 6. Students will be able to Design and construct solutions for real world problems related to surveying and geomatics.
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Syllabus

Sl No.	Course Content	Total Hours
Experiment 1	Traverse survey by Prismatic Compass: Procedure; Computation and checks on closed traverse; Preparation of field book; Plotting the traverse; Sources of errors.	2
Experiment 2	Theodolite Survey: Closed traverse by transit theodolite, Preparation of field book	2
Experiment 3	Differential Levelling using Dumpy level: Collimation and Rise and Fall methods, Field book preparation	2



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Experiment 4	Total Station Survey: Traversing and Levelling	2
Experiment 5	Visual Image Interpretation	2
Experiment 6	Satellite Image Pre-processing	2
Experiment 7	Digital Image Classification and Accuracy Assessment	2
Experiment 8	Stereoscopic fusion of aerial photographs using mirror stereoscope	2

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Surveying & Levelling	N. N. Basak	McGraw Hill Education (India) Private Limited
	2	Surveying – Vol. I, II & III	B. C. Punmia Ashok Kumar Jain Arun Kumar Jain	Laxmi Publications (P) Ltd.
	3	Surveying – Vol. I & II	S. K. Duggal	McGraw Hill Education (India) Private Limited
	4	Surveying & Levelling – Part I & II	T. P. Kanetkar, S. V. Kulkarni	Pune Vidyarthi Griha Prakashan
	5	Remote Sensing and GIS	Basudeb Bhatta	Oxford University Press
	6	Principles of Geoinformatics	P.K. Garg	Khanna Publishing House

CO-PO Mapping

CO-PO Mapping

Surveying & Geomatics

(Course Code – CE(PC)493)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	2	1	1	3	3	2	-	3	2	1
CO2	3	3	3	-	-	2	1	1	2	2	3	1	2	3	3
CO3	3	2	3	-	-	2	1	1	3	2	3	1	3	2	2
CO4	3	3	3	1	-	2	1	3	3	3	2	3	3	2	3
CO5	2	3	2	-	1	1	3	1	1	3	3	2	1	2	2



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CO6	3	2	3	1	-	1	2	1	2	3	2	2	3	2	2
Avg.	2.83	2.5	2.83	1	1	1.67	1.5	1.33	2.33	2.67	2.5	1.8	2.5	2.17	2.17

CE(PC)494: Concrete Technology Laboratory

Course Code – CE(PC)494	Concrete Technology Laboratory	0T+0L+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ul style="list-style-type: none"> Students will be able to Demonstrate the method and findings of tension and compression tests on cement & concrete ingredients. Students will be able to Understand the concepts of different tests on hardened concrete & setting time. Students will be able to Calculate the specific gravity of cement & concrete ingredients. Students will be able to Find out the mix proportion of high grade of concrete. Students will be able to Measure the workability of the concrete mix.
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Syllabus

SI No.	Course Content	Total Hours
Module – 1	Test on Fine Aggregates <ul style="list-style-type: none"> Bulking, Specific gravity, Bulk Density, Percentage voids, Fineness Modulus. Grading curve. 	5P
Module – 2	Test on Coarse Aggregates <ul style="list-style-type: none"> Specific gravity, Bulk Density, Percentage voids, Fineness Modulus. Grading curve. 	5P
Module – 3	Test on Cement <ul style="list-style-type: none"> Normal consistency, fineness, Initial setting and final setting time of cement. Specific gravity, 	10P



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	<ul style="list-style-type: none"> • soundness and • Compressive strength of Cement. 	
Module – 4	Test on Fresh Concrete <ul style="list-style-type: none"> • Concrete mix design, • Various workability tests – <ol style="list-style-type: none"> 1. slump, 2. compacting factor, 3. Vee-bee test. 	10P
Module – 5	Test on Hardened Concrete <ul style="list-style-type: none"> • Split-tensile strength test, • Flexure test, • NDT Tests (Rebound hammer and Ultra-sonic pulse velocity), • Poission ratio. 	10P

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Concrete Technology (Theory & Practice)	Shetty, M.S.	S. Chand and Co.
	2	Concrete Technology	Gambhir, M.L.	Tata McGraw Hill
	3	Concrete Technology	A. M. Neville and J.J. Brooks	Pearson Education India Ltd.
	4	Properties of Concrete	A.M.Neville	Pearson India
IS Codes	I.S. 10262-2019			Bureau of Indian Standards

CO-PO Mapping

CO-PO-PSO Mapping Concrete Technology Laboratory (Course Code – CE(PC)494)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	2	-	2	3	2	2	3
CO2	3	2	3	2	2	2	2	3	2	-	-	3	2	3	3
CO3	3	3	2	2	2	2	-	-	1	-	-	2	2	2	3
CO4	1	3	1	3	3	-	3	2	3	2	2	2	3	3	2
CO5	1	1	2	2	3	3	-	1	-	2	-	3	3	2	2
Avg.	2.2	2.2	2	2.2	2.4	2.33	2.5	2	2	2	2	2.6	2.4	2.4	2.6



Department of Civil Engineering

5th Semester

CE(PC)501: Design of RC Structure

Course Code – CE(PC)501	Design of Reinforced Concrete Structure	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Understand material properties and design methodologies for reinforced concrete structures.2. Students will be able to Assess different type of loads and prepare layout for reinforced concrete structures3. Students will be able to Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members4. Students will be able to Analyze and design various structural elements of reinforced concrete building like beam, slab, column, footing, and staircase5. Students will be able to Prepare structural drawings and detailing and produce design calculations and drawing in appropriate professional format
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Syllabus

SI No.	Course Content	Total Hours
Module 1:	Introduction: Principles of design of reinforced concrete members - Working stress and Limit State method of design	1L
Module 2:	Working stress method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces - Balanced, under reinforced and over reinforced beam/ slab sections; design of singly and doubly reinforced sections	2L+2T
Module 3:	Limit state method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces; concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP:16).	5L+2T
Module 4:	Beam Design by LSM: Analysis, design and detailing of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method.	3L+2T
Module 5:	Slab Design by LSM : Design and detailing of one-way and two-way slab panels as per IS code provisions	2L+1T



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Module 6:	Continuous slab and beam design by LSM: Design and detailing of continuous beams and slabs as per IS code provisions	2L+1T
Module 7:	Design of Staircases by LSM: Types; Design and detailing of reinforced concrete doglegged staircase	3L+1T
Module 8	Design of Columns by LSM: Design and detailing of reinforced concrete short columns of rectangular and circular cross-sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP 16.	4L+1T
Module 9	Design of Foundation by LSM: Design and detailing of reinforced concrete isolated square and rectangular isolated and combined footing for columns as per IS code provisions by limit state method Design and detailing of Pile foundation as per IS code provisions.	6L+2T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Reinforced Concrete Design	Pillai and Menon	TMH
	2	Reinforced Concrete Design	Krishna Raju &	New Age
	3	R.C.C. Design	B.C. Punmia	Laxmi Publication
	4	Reinforced concrete structures	N. Subramanian	OXFORD University Press
IS Codes	IS: 456 – 2000 IS 875 – I (1987), IS 875 - II (1987), IS 875 - III (2015), SP: 16 Design Aid to IS 456			Bureau of Indian Standards

CO-PO Mapping

CO-PO Mapping

Design of Reinforced Concrete Structure – 1

(Course Code - CE501)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	1	1	-	-	1	-	3	2	1	2
CO2	3	3	1	3	-	2	3	1	1	-	1	3	3	3	1
CO3	1	1	-	-	2	-	1	-	1	1	-	3	1	1	1



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CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
CO5	2	1	2	1	3	1	3	3	3	3	3	3	3	2	3
	2.2	1.6	2	2	2.67	1.25	2.2	2	1.75	1.75	2	3	2.4	1.8	2

CE(PC)502: Engineering Hydrology

Course Code – CE(PC)502	Engineering Hydrology	2L+1T+0P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to study the source, occurrence, movement and distribution of water which is a prime resource for development of a nation. 2. Students will be able to learn about the functioning of reservoirs and estimation of storage capacities. 3. Students will be able to learn about flood hazards, estimation of design floods for various structures and methods of estimating effects of passage of floods through rivers and reservoirs. 4. Students will be able to know the basic principles of measurement of flow in rivers..
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Hydrology: Hydrologic Cycle, Global Water Budget, India's Water Budget	1L
Module 2	Catchment: Definition & Descriptions, Various Types of Catchment, Factors Characterizing a Catchment, Delineation of Catchment Boundary.	2L
Module 3	Measurement of Precipitation: Precipitation, Description and Functioning of Various Types of Rain gauges, Rain gauge Network-Codal Provisions, Optimum Number of Raingauge Stations.	3L
Module 4	Processing of Rainfall Data: Normal Rainfall, Estimation of Missing Rainfall Data, Test for Consistency of Record; Mass Curve of	4L



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	Rainfall, Hyetograph, Point Rainfall; Mean Precipitation over an Area– Arithmetic Mean, Thiessen Polygon and Isohyetal Method.	
Module 5	Losses from Precipitation: Evaporation – Evaporation Process, Factors affecting Evaporation, Measurement of Evaporation– Description and Functioning of Pan Evaporimeter, Pan Coefficient, Evapotranspiration: AET, PET, Measurement of ET, Estimation of ET–Blaney Criddle Formulae; Infiltration– Process, Factors Affecting Infiltration, Infiltration Rate and Infiltration Capacity, Measurement of Infiltration, Infiltration Equations, Infiltration Indices.	6L
Module 6	Streamflow Measurement: Importance, Direct and Indirect Methods, Measurement of Stage– Various Gauges and Recorders, Measurement of Velocity–Current Meters, their Functioning and Calibration; Velocity Distribution, Floats; Streamflow Computation– Area-Velocity Method, Moving Boat Method, Dilution Technique, Electromagnetic Method, Ultrasonic Method; Indirect Methods– Flow Measuring Structures, Slope Area Method; Stage Discharge Relation, Permanent Control, Stage for Zero Discharge, Shifting Control– Backwater Effect, Unsteady Flow Effect, Extension of the Rating Curve.	12L
Module 7	Runoff: Description of the Process, Components of Runoff, Factors Affecting Runoff, Characteristics of Streams, Rainfall Runoff Relationships. Hydrographs: Types, Base Flow Separation, Effective Rainfall.	2L
Module 8	Unit Hydrograph– Definition, Assumptions, Applications– Derivation of Unit Hydrograph, Distribution Graph, Unit Hydrograph of Different Durations– Method of Superposition and S-Curve.	4L
Module 9	Floods: Concept of flood as a natural hazard; Estimation of flood discharge in a river – rational method, empirical formulae, unit hydrograph method; flood frequency studies – return period.	2L
Module 10	Flood Routing: Concept of flood routing in channels and through a reservoir, basic routing equations; reservoir routing – Modified Pul’s method; channel routing – Muskingum method.	5L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Engineering Hydrology (4th Ed.	K. Subramanya	McGraw Hill Education (India) Private Limited



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2	Engineering Hydrology	R. Srivastava and A. Jain	Laxmi Publications (P) Ltd.
3	Hydrology	M. M. Das, M. Das Saikia	PHI Learning Private Limited, New Delhi,
4	Applied Hydrology	V. T. Chow, D. Maidment, L. Mays	Tata McGraw Hill Edition, New Delhi,
5	Remote Sensing and GIS	Basudeb Bhatta	Oxford University Press
6	Principles of Geoinformatics	P.K. Garg	Khanna Publishing House

CO-PO Mapping

CO-PO Mapping

Engineering Hydrology

(Course Code – CE(PC)502)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	1	2	1	1	3	3	2	-	3	2	1
CO2	3	3	3	-	-	2	1	1	2	2	3	1	2	3	3
CO3	3	2	3	-	-	2	1	1	3	2	3	1	3	2	2
CO4	3	3	3	1	-	2	1	3	3	3	2	3	3	2	3
Avg.	3	2.5	3	1	1	2	1	1.5	2.75	2.50	2.5	1.67	2.75	2.25	2.25

CE(PC)503: Structural Analysis – I

Course Code – CE(PC)503	Structural Analysis – I	2L+1T+0P	3 Credits
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Course Outcome (CO)



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Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Distinguish between stable and unstable and statically determinate and indeterminate structures. 2. Students will be able to Apply equations of equilibrium to structures and compute the reactions. 3. Students will be able to Calculate the internal forces in cable and arch type structures. 4. Students will be able to Evaluate and draw the influence lines for reactions, shears and bending moments in beams due to moving loads. 5. Students will be able to Calculate the deflections of truss structures and beams.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Basics of Structural Analysis: Concept of static and kinematic indeterminacy, Determination of degree of indeterminacy for different types of structures. Theorem of minimum potential energy, law of conservation energy, principle of virtual work, the first and second theorems of Castiglano, Betti's law, Clark Maxwell's theorem of reciprocal deflection	3L+1T
Module 2	Analysis of Determinate Structures: Portal Frames, Three hinged arches, Cables	3L+2T
Module 3	Deflection of Determinate Structures: Energy methods. Unit Load method for beams, Deflection of trusses and Simple Portal Frames.	3L+2T
Module 4	Influence Line Diagram: Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shear.	6L+3T
Module 5	Analysis of Statically Indeterminate Beams: Theorem of three moments, Energy methods, Force method (Method of consistent deformation) [For analysis of propped cantilever, fixed beams and continuous beams (maximum two degree of indeterminacy) for simple loading case], Analysis of two hinged arch.	8L+4T
Module 6	Influence Line Diagram for Indeterminate Structures: Muller – Breslau principle.	3L+2T

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Structural Analysis	R. Agor	Khanna Publishing House



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2	Structural Analysis (Vol I & Vol II)	S S Bhavikatti	Vikas Publishing House Pvt. Ltd
3	Theory of Structures	S. Ramamrutham	Khanna Publishers
4	Strength of Materials and Theory of Structures (Vol I & Vol II)	Punmia, Jain, Jain	Laxmi Publication
5	Structural Analysis	R.C. Hibbeler	Prentice Hall
6	Theory of Structures	Timoshenko and Young	McGrawHill

CO-PO Mapping

CO-PO Mapping

Structural Analysis – I

(Course Code - CE(PC)503)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	1	1	-	2	-	1	2	1	1	3
CO2	3	2	2	-	-	1	1	-	2	1	-	2	1	1	3
CO3	3	2	1	1	-	1	1	2	2	-	-	2	1	1	3
CO4	3	2	1	-	1	1	1	-	2	-	1	2	1	1	3
CO5	3	2	-	-	-	1	1	-	2	1	1	2	1	1	3
	3	1.8	1.33	1	1	1	1	2	2	1	1	2	1	1	3

CE(PC)504: Soil Mechanics-II

Course Code – CE(PC)504	Soil Mechanics-II	2L+1T+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to assess the compaction and consolidation characteristics of soil for solving geotechnical problems. 2. The students will be able to calculate earth pressure on rigid retaining walls on the basis of classical earth pressure theories. 3. The students will be able to analyze and design rigid retaining walls (cantilever types) from geotechnical engineering consideration. 4. The students will be able to evaluate the bearing capacity of shallow foundation by applying established theory. 5. The students will be able to estimate settlement in soils by different methods.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	<p>Consolidation of Soil Terzaghi's theory of one dimensional consolidation, Compressibility characteristics of soils, Compression index, Coefficient of compressibility and volume change, Coefficient of consolidation, Degree and rate of consolidation, Time factor, Settlement computation, Consolidometer and laboratory one dimensional consolidation test as per latest IS Code, Determination of consolidation parameters.</p>	5L+3T
Module 2	<p>Compaction of Soil Principles of compaction, Standard and modified proctor compaction test, Field compaction methods, Field compaction control, Factors affecting compaction, Effect of compaction on soil properties.</p>	3L+1T
Module 3	<p>Earth Pressure Theories Plastic equilibrium of soil, Earth pressure at rest, Active and passive earth pressures, Rankine's and Coulomb's earth pressure theories, Different types of backfill, Wedge method of analysis. Analytical and graphical methods for determination of earth pressure against various earth retaining structures. Stability of retaining walls: Cantilever retaining wall.</p>	7L+3T
Module 4	<p>Bearing capacity of shallow foundations Bearing capacity, Definition, Factors affecting bearing capacity, Modes of failures, Methods of determining bearing capacity of soils. Terzaghi's bearing capacity theory, Effect of depth of embedment, Eccentricity of load, Foundation shape on bearing capacity, Effect of 11 water table and eccentric loads. Isolated footings with combined action of loads and moments, Bearing capacity as per IS: 6403.</p>	7L+4T
Module 5	<p>Settlement Allowable bearing pressure and settlement analysis (as per IS: 8009), Immediate and consolidation settlements, Rigidity and depth factor</p>	2L+1T



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	corrections, Settlement values as per IS: 1904 recommendations.	
Module 6	Stability of slopes Types of failure, Analysis of finite and infinite slopes, Swedish and friction circle method, Ordinary method of slices, Factor of safety, Taylor's stability number, Bishop's simplified method of stability analysis.	3L+2T

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Textbook of Soil Mechanics and Foundation Engineering (Geotechnical Engineering Series)	V.N.S. Murthy	CBS Publishers
	2	Soil Mechanics and Foundations	Punmia B.C. and Jain A. K	Laxmi Publications (P) Ltd
	3	Basic and Applied Soil Mechanics	Gopal Ranjan & A.S.R. Rao	New Age International Pvt. Ltd, Publishers
	4	Principles of Geotechnical Engineering	B.M. Das	Thomson Brooks / Cole

CO-PO Mapping

CO-PO Mapping

Soil Mechanics-II

(Course Code – CE(PC)504)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	1	1	-	-	1	-	3	2	1	2
CO2	3	3	2	3	-	2	3	1	1	-	1	3	3	3	2
CO3	2	2	-	-	2	-	1	-	1	1	-	3	1	1	2
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3



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CO5	2	3	2	2	3	1	3	3	3	3	3	3	3	2	3
Avg.	2.4	2.2	2.33	2.25	2.67	1.25	2.2	2	1.75	1.75	2	3	2.4	1.8	2.4

CE(PC)505: Environmental Engineering-II

Course Code – CE(PC)505	Environmental Engineering-II	1L+0T+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to define the basic concepts and terminologies of waste water engineering and hazardous waste management. 2. The students will be able to describe different home plumbing systems for water supply and wastewater disposal 3. The students will be able to apply the methods of quantifying sanitary sewage and storm sewage. 4. The students will be able to solve different mathematical problems regarding different components of sewerage system 5. The students will be able to compare between different wastewater samples based on their physical, chemical and biological characteristics.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Sewage and Drainage Definition of Common Terms: Sewage or Sanitary Sewage, Drainage or Storm Sewage, Sullage, Black Water, Grey Water Sewerage Systems: Separate system, Combined System, Partially Separate System; applicability, advantages and disadvantages	1L+1T
Module 2	Sewage and Drainage Quantity Quantity estimation for sanitary sewage; Quantity estimation for storm sewage	3L+1T
Module 3	Conveyance of Sewage Sewers: Shapes; Design parameters; Operation and maintenance of sewers; Sewer appurtenances Hydraulic Design of Sewers: Partial flow diagrams and Nomograms	4L+2T



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Module 4	Wastewater Characteristics Physical, chemical and biological characteristics of municipal and domestic sewage; Effluent discharge standards	4L+2T
Module 5	Wastewater Treatment Primary, secondary and tertiary treatment of wastewater; aerobic and anaerobic treatment options Primary and Secondary Treatment of Domestic Wastewater: Typical Flow Chart of STP; Screen and Bar Racks; Grit Chamber; Primary and Secondary Sedimentation Tank; Activated Sludge Process; Trickling Filter	8L+4T
Module 6	Sludge Handling and Disposal Sludge Thickening; Sludge Digestion; Sludge Drying Bed	3L+1T
Module 7	Building Plumbing Introduction to various types of home plumbing systems for water supply and waste water disposal; high rise building plumbing; Pressure reducing valves; Break pressure tanks; Storage tanks; Building drainage for high rise buildings; various kinds of fixtures and fittings used	3L+1T
Module 8	Hazardous waste Types and nature of hazardous waste as per the HW Schedules of regulating authorities	3L+1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Environmental Engineering	S.C. Sharma	Khanna Publishing House
	2	Environmental Engineering. Volume-1 and Volume-2	Garg, S.K.	Khanna Publishers
	3	Environmental Engineering	Peavy, H.S, Rowe, D.R, Tchobanoglous, G	Tata McGraw Hill Indian Edition
	4	Introduction to Environmental Engineering and Science	Masters, G.M., Ela, W.P.	Prentice Hall / Pearson

CO-PO Mapping



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CO-PO Mapping

Environmental Engineering-II

(Course Code – CE(PC)505)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	2	-	-	-	2	3	1	2	1
CO2	3	3	3	2	3	-	2	-	-	2	2	2	3	2	3
CO3	3	2	2	1	3	-	-	1	1	1	1	1	2	2	3
CO4	3	-	2	-	3	2	2	2	-	-	-	2	3	3	3
CO5	3	3	-	2	2	2	3	1	1	1	-	2	3	2	3
Avg.	2.8	2.5	2.5	2	2.75	2	2.25	1.33	1	1.33	1.67	2	2.4	2.2	2.6

CE(PC)506: Transportation Engineering

Course Code – CE(PC)506	Transportation Engineering	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to Understand the knowledge of planning, design and the fundamental properties of highway materials in highway engineering. 2. Students will able to Apply the knowledge of geometric design and draw appropriate conclusion. 3. Students will able to Interpret the concept of different methods in design, construction of the pavement. 4. Students will able to Interpret traffic parameters by applying the knowledge in traffic planning and intersection design.
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Syllabus

Sl No.	Course Content	Total Hours
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Department of Civil Engineering

Module1	Introduction to Highway Engineering Scope of Highway Engineering; Jayakar Committee Report: Recommendations – CRF, IRC, CRRI; Scope of Motor Vehicle Act; Recommendations of Nagpur Road conference; Road Classification as per third 20 years road development plan (1981-2001); Basic types of Road Patterns and its scope of application	2L+1T
Module2	Highway alignment Factors controlling Highway Alignment; Engineering Surveys for Highway Alignment.	1L+1T
Module3	Geometric Design Cross-sectional elements of highway; Design Parameters (as per IRC) – Vehicle dimensions, Carriageway width, Design speed, Frictional coefficients (Lateral and Longitudinal) etc.; Design Principles of Horizontal Alignment: Camber, Sight Distance (PIEV theory, SSD, OSD, ISD); Horizontal Curves– [Radius, Super elevation, Extra widening, Set back distance, Transition curve]; Design Principles of Vertical Alignment: Gradients; Grade Compensation; Vertical Curves– Summit Curve, Valley curve.	8L+4T
Module4	Traffic Engineering Traffic studies: Fundamental parameters of Traffic Flow (speed, flow, density, capacity) and their basic relations; Basics of Spot Speed Studies- Speed and Delay Study-O&D study; Intersections and Channelization: At Grade and Grade Separated intersections; Conflict points; Salient features of Rotary; Traffic Signs; Signal Design – Basic concepts of IRC design method, 2 phase signal design by Webster method.	7L+3T
Module 5	Pavement Design Pavement materials: Bitumen, Aggregate, Subgrade soil; Types of Pavement: Flexible and Rigid pavements and their typical cross-sections; Design parameters: Wheel Load, ESWL, Tyre Pressure, CBR, Resilient Modulus & Poisson's Ratio of various layers, Subgrade Modulus etc. Design of Flexible Pavement using IRC 37:2018 Design of Rigid Pavement: Wheel Stresses, Frictional Stresses and Warping Stresses; Expansion, Contraction and Construction Joints; Design of Rigid Pavement thickness, Dowel Bar and Tie Bar. Distresses in Pavements	8L+5T
Module 6	Sustainability Scope of adoption of sustainable construction techniques by using recyclable hazardous materials- fly ash, plastics, recyclable construction materials.	1L+1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Traffic Engineering and Transport Planning	Kadiyali L.R	Khanna Publishers
	2	Highway Engineering	Khanna, S.K. and C.E.G. Justo	Nem Chand and Bros



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	3	Transportation Engineering–An Introduction	Jotin Khisty C.and B.Kent Lall	Prentice Hall of India Pvt. Ltd
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CO-PO Mapping

CO-PO Mapping

Transportation Engineering

(Course Code – CE(PC)506)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	2	2	1	2	1	2	3	2	1	3
CO2	3	3	2	2	1	1	1	2	2	2	1	3	3	3	2
CO3	2	2	1	2	1	1	3	3	1	1	1	3	2	2	2
CO4	2	1	3	1	3	2	1	1	3	2	2	3	1	2	1
Avg.	2	2.25	1.75	1.75	1.5	1.5	1.75	1.75	2	1.5	1.5	3	2	2	2

CE(MC)501: Constitution of India/ Essence of Indian Knowledge Tradition

Course Code – CE(MC)501	Constitution of India/ Essence of Indian Knowledge Tradition	0L+0T+0P	0 Credits
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Course Outcome (CO)



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Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Understand the emergence and evolution of Indian Constitution.2. Students will be able to evaluate the structure and composition of Indian Constitution3. Students will be able to analyse federalism in the Indian context.4. Students will be able to analyse the three organs of the state in the contemporary scenario
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Syllabus

Sl No.	Course Content	Total Hours
Module 1:	Indian Constitution Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	
Module 2:	Union Government and its administration Structure of the Indian Union- Union Federalism, Centre-State relationship President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. State government and its administration: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions	
Module 3:	Supreme Courts Organization of supreme court, procedure of the court, independence of the court, jurisdiction and power of supreme court. High court: Organization of high court, procedure of the court, independence of the court, jurisdiction and power of supreme court. Subordinate courts: constitutional provision, structure and jurisdiction. National legal services authority, Lok adalats, family courts, gram nyayalays. Public interest litigation (PIL): meaning of PIL, features of PIL, scope of PIL, principle of PIL, guidelines for PIL	
Module 4:	Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	

Books

Books	Sl.	Book Name	Author	Publishing House
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Department of Civil Engineering

	1	Indian polity	M, Laxmikanth	MC Graw Hill education
	2	Introduction to the constitution of	DD Basu	Lexis Nexis Books

CO-PO Mapping

CO-PO Mapping

Constitution of India/ Essence of Indian Knowledge Tradition

(Course Code - CE(MC)501)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	1	2	-	2	2	-	1	1	1	3	2	1	3
CO2	-	-	1	2	-	2	1	-	2	1	-	3	1	2	2
CO3	-	-	2	2	-	2	1	-	3	1	-	3	2	3	1
CO4	-	-	2	2	-	1	1	-	3	2	-	3	2	1	2
Avg.	-	-	1.5	2	-	1.75	1.25	-	2.25	1.25	1	3	1.75	1.75	2

CE(PC)591: RC Design Sessional

Course Code – CE(PC)591	RC Design Sessional	0L+0T+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand material properties and design methodologies for reinforced concrete structures. 2. Students will be able to assess different type of loads and prepare layout for reinforced concrete structures. 3. Students will be able to Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members. 4. Students will be able to analyse and design various structural elements of reinforced concrete building like beam, slab, column, footing, and staircase. 5. Students will be able to assessment of serviceability criteria for reinforced concrete beam and slab.
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| | 6. Students will be able to prepare structural drawings and detailing and produce design calculations and drawing in appropriate professional format. |
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Syllabus

Sl No.	Course Content	Total Hours
Module 1:	Design of a small RCC framed building using Limit State method of design including preparation of necessary working drawing and report in accordance with CE(PC)501	

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Reinforced Concrete Design	Pillai and Menon	TMH
	2	Reinforced Concrete Design	Krishna Raju & Pranesh	New Age
	3	R.C.C. Design	B.C. Punmia	Laxmi Publication
	4	Reinforced concrete structures	N. Subramanian	OXFORD University Press
IS Codes	IS: 456 – 2000 IS 875 – I (1987), IS 875 - II (1987), IS 875 - III (2015), SP: 16 Design Aid to IS 456			Bureau of Indian Standards

CO-PO Mapping

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RC Design Sessional

(Course Code - CE(PC)591)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	2	1	-	-	1	-	3	1	1	3
CO2	3	3	2	1	2	-	2	-	1	-	1	3	2	3	2
CO3	2	1	-	-	1	-	1	2	-	1	-	3	1	1	2
CO4	2	3	3	2	3	1	2	1	2	1	2	3	3	1	3
CO5	2	1	-	-	1	-	1	2	-	1	-	3	1	1	3



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CO6	2	3	3	2	3	1	2	1	2	1	2	3	3	1	3
Avg.	2.17	2	2.67	1.75	2	1.33	1.5	1.5	1.67	1	1.67	3	1.83	1.33	2.67

Course Code – CE(PC)594: Soil Mechanics Laboratory

Course Code – CE(PC)594	Soil Mechanics Laboratory	0L + 0T + 2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to identify different types of soil & can determine the moisture content. 2. Students will be able to determine the specific gravity of cohesionless & cohesive soil. 3. Students will be able to determine the in-situ density of soil. 4. Students will be able to perform the grain size distribution of cohesionless & fine-grained soil. 5. Students will be able to determine Atterberg's limits & coefficient of permeability of soil. 6. Students will be able to determine the compaction characteristics of soil.
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Syllabus

Sl No.	Course Content	Total Hours
Experiment 1	Field identification of different types of soil as per Indian Standards [collection of field samples and identifications without laboratory testing].	2
Experiment 2	Determination of natural moisture content.	2
Experiment 3	Determination of specific gravity of cohesionless and cohesive soils.	2
Experiment 4	Determination of in-situ density by core cutter method and sand replacement method.	2
Experiment 5	Determination of grain size distribution by sieve and hydrometer analysis.	2



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Experiment 6	Determination of Atterberg limits (liquid limit, plastic limit and shrinkage limit).	2
Experiment 7	Determination of co-efficient of permeability by constant and variable head permeability tests.	2
Experiment 8	Determination of compaction characteristics of soil by standard proctor compaction test.	2
Experiment 9	Determination of unconfined compressive strength of soil by unconfined compression test.	2
Experiment 10	Determination of shear strength parameters of soil by direct shear test.	2
Experiment 11	Determination of undrained shear strength of soil by vane shear test.	2
Experiment 12	Determination of shear strength parameters of soil by unconsolidated undrained triaxial test.	2
Experiment 13	Determination of California Bearing Ratio (CBR) of soil.	2
Experiment 14	Determination of relative density of soil.	2
Experiment 15	Standard Penetration Test.	2

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Soil Mechanics Laboratory Manual	Braja Mohan Das	Oxford university press
	2	Soil Testing: Laboratory Manual & Question Bank	K.V.S. Apparao	Laxmi Publications
IS Codes	SP: 36 (Part - I and Part - II)		Bureau of Indian Standards	

CO-PO Mapping

CO-PO Mapping

Soil Mechanics Laboratory

(Course Code - CE(PC)594)



Department of Civil Engineering

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	2	-	1	1	1	-	1	1	3	2	1	2
CO2	3	3	1	-	-	2	3	1	1	-	1	3	3	3	1
CO3	1	1	-	1	2	1	1	3	1	1	3	3	1	1	1
CO4	3	2	3	2	3	1	3	2	-	2	2	-	2	2	3
CO5	1	2	2	-	-	1	-	2	-	1	3	3	3	2	1
CO6	2	1	2	1	3	1	-	-	3	-	3	3	3	2	2
Avg.	2	1.67	1.8	1.5	2.67	1.67	2	1.8	1.67	1.25	2.167	3	2.34	1.84	1.7

CE(PC)595: Environmental Engineering Laboratory

Course Code – CE(PC)595	Environmental Engineering Laboratory	1L+0T+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The student will be able to determine the physical characteristics for a given sample of water and wastewater. 2. The students will be able to determine various chemical characteristics for a given sample of water and wastewater. 3. The students will be able to examine the bacteriological characteristics for a given sample of water and wastewater. 4. The students will be able to examine the suitability of a few treatment options for a given sample of water and wastewater. 5. The students will be able to compare the determined quality parameters with standards to decide on the suitability of use for the tested water and disposal of tested wastewater.
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Syllabus

SI No.	Course Content	Total hours
Experiment 1	Determination of turbidity for a given sample of water	2P
Experiment 2	Determination of electrical conductivity for a given sample of water	2P



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Experiment 3	Determination of Total Solids, Suspended Solids, Dissolved Solids and Volatile Solids in a given sample of water	2P
Experiment 4	Determination of pH for a given sample of water	2P
Experiment 5	Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water	2P
Experiment 6	Determination of acidity for a given sample of water	2P
Experiment 7	Determination of hardness for a given sample of water	2P
Experiment 8	Determination of concentration of Iron in a given sample of water	2P
Experiment 9	Determination of concentration of Chlorides in a given sample of water	2P
Experiment 10	Determination of the Optimum Alum Dose for a given sample of water through Jar Test	2P
Experiment 11	Determination of the Chlorine Demand and Break-Point Chlorination for a given sample of water	2P
Experiment 12	Determination of amount of Dissolved Oxygen (DO) in a given sample of water	2P
Experiment 13	Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater	2P
Experiment 14	Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater	2P
Experiment 15	Determination of Colliform Bacteria: presumptive test, Confirmative test and Determination of MPN	2P

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Environmental Engineering	S.C. Sharma	Khanna Publishing House
	2	Environmental Engineering. Volume-1 and Volume-2	Garg, S.K.	Khanna Publishers
	3	Environmental Engineering	Peavy, H.S, Rowe, D.R, Tchobanoglous, G	Tata McGraw Hill Indian Edition
	4	Introduction to Environmental Engineering and Science	Masters, G.M., Ela, W.P.	Prentice Hall / Pearson



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CO-PO Mapping

CO-PO Mapping

Environmental Engineering Laboratory

(Course Code – CE(PC)595)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	1	-	1	1	2	2	3
CO2	3	2	2	2	2	1	1	3	1	-	-	1	2	1	3
CO3	3	2	2	2	2	1	-	2	1	-	-	1	2	2	3
CO4	2	1	1	1	1	-	2	1	3	2	2	-	3	1	2
CO5	1	1	1	2	2	1	1	1	-	1	2	-	3	2	2
Avg.	2.2	1.6	1.6	1.8	1.8	1	1.33	1.75	1.2	1.5	1.67	1	2.4	1.6	2.6

CE(PC)596: Transportation Engineering Laboratory

Course Code – CE(PC)596	Transportation Engineering Laboratory	0L+0T+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to Identify engineering properties of aggregate. 2. Students will able to Identify the grade & properties of bitumen. 3. Students will able to Perform quality control tests on pavements and pavement materials. 4. Students will able to Understand the importance of soil quality for the design of pavement.
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Syllabus



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Sl No.	Course Content	Total Hours
Introduction	Introduction on pavement construction materials	2
Experiment1	Shape test of aggregate	2
Experiment2	Crushing Strength Test of aggregate	2
Experiment3	Impact test of aggregate	2
Experiment4	Los Angeles Abrasion test of aggregate	2
Experiment5	Specific Gravity and Water Absorption test of aggregate	2
Experiment6	Specific Gravity test	2
Experiment7	Penetration test	2
Experiment8	Static or Kinematic viscosity	2
Experiment 9	Softening point test	2
Experiment 10	Flash and Fire Point test	2
Experiment 11	Ductility test	2
Experiment 12	CBR value of sub-grade (Soaked and unsoaked)	4
Experiment 13	Marshall Stability test	4
Demonstration	Demonstration on Stripping value and Loss on heating tests of bitumen, Benkelman Beam and Bump Integrator test.	

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Highway Engineering	Khanna,S.K.and C.E.G.Justo	Nem Chandand Bros
	2	Traffic Engineering and Transport Planning	KadiyaliL.R	Khanna Publishers

CO-PO Mapping

CO-PO Mapping

Transportation Engineering Laboratory

(Course Code –CE(PC)596)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	1	1	2	3	1	3	3	2	1	3
CO2	3	3	1	3	2	2	3	1	1	3	1	3	2	2	2
CO3	1	1	1	1	2	1	1	2	1	1	3	3	1	3	1
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	2
Avg.	2.25	1.75	1.75	2	2.25	1.25	2	1.75	1.75	1.75	2.25	3	2	2	2



Department of Civil Engineering

CE(PC)597: Computer Application in CE

Course Code – CE(PC)597	Computer Application in CE	0L+0T+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Identify and formulate Civil Engineering problems solvable by computers.2. Students will be able to Perform linear algebra and matrix operations and their application to solve Civil Engineering problems.3. Students will be able to Solve sets of linear equations and determine roots and nonlinear equations4. Students will be able to Construct, interpret and solve simple optimization problems5. Students will be able to Develop programs for Civil Engineering analysis and design problems.6. Students will be able to Use various software used in industries for analysis and design.
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Syllabus

SI No.	Course Content	Total Hours
Module 1:	Introduction: Concept of problem-solving using computer, use of programming language and software for problem solving; Identification of various design and analysis problems in different fields of Civil Engineering to be solved using computers; Procedure, formulae and data related to the analysis and design of such problems.	8
Module 2:	Use of spreadsheets: Learning spreadsheets like MS Excel, matrix analysis, use of Goal Seek and Solver, Optimization Tools; Plotting. Applications to problems involving tabular data, CE estimation, surveying, and design problems.	6
Module 3:	Programming Languages: Learning at least one language: Fortran 2003/2008/2018, C++11/C++14, Python 3, VBA 7.0; Computing platforms like Matlab/Scilab/MathCAD; Solving analysis and design problems in areas like surveying, hydraulics, structural analysis, RCC design, soil mechanics and foundation, transportation, water resources, etc.	12



Department of Civil Engineering

Module 4:	Use of Software: Familiarity with widely used Civil Engineering software like STAAD Pro, HECRAS, HEC-HMS, SWMM, Mx Roads, etc.; Solving at least two such analysis/design problems	4
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Books

Books	Sl.	Book Name	Author	Publishing House
	1	Computer Application in Civil Engineering	Dr. Ritu Agarwal & Khushbu Naruka Dr. Hari Singh Parihar	Neelkanth Publishers

CO-PO Mapping

CO-PO Mapping

Computer Application in CE

(Course Code - CE(PC)597)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	2	-	-	-	1	3	1	2	2
CO2	1	3	3	1	3	-	2	1	2	2	-	3	2	3	2
CO3	2	1	2	1	2	1	3	3	3	3	3	3	3	3	2
CO4	3	2	3	2	3	1	1	2	2	2	2	3	3	2	3
CO5	2	3	2	1	1	1	1	-	1	1	-	3	3	2	3
CO6	2	1	2	1	3	1	-	-	2	3	-	3	3	3	2
Avg.	2.16	2	2.5	1.5	2.33	1	1.8	2	2	2.2	2	3	2.5	2.5	2.33

6th Semester



Department of Civil Engineering

CE(PC)601: Construction Engineering & Management

Course Code – CE(PC)601	Construction Engineering & Management	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ul style="list-style-type: none">• Students will be able to assess an idea of how structures are built and projects are developed on the field and of modern construction practices• Students will be able to develop a good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required, and project economics• Students will develop the ability to plan, control, and monitor construction projects with respect to time and cost and also optimize construction projects based on costs• Students will be able to analyse how construction projects are administered with respect to contract structures and issues.• Students will be able to develop ideas to put forward ideas and understandings to others with effective communication processes
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	Planning: General consideration, Definition of aspect, prospect, roominess, grouping,	2L
Module – 2	Regulation and Bye laws Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks, ventilation, Requirements for stairs, lifts in public assembly building, offices.	4L
Module – 3	Fire Protection	2L



Department of Civil Engineering

	Firefighting arrangements in public assembly buildings, planning, offices, auditorium.	
Module – 4	<p>Planning & Scheduling of constructions Projects Planning by CPM</p> <p>Preparation of network, Determination of slacks or floats. Critical activities. Critical path. Project duration.</p> <p>Planning by PERT</p> <p>Expected mean time, probability of completion of project, Estimation of critical path, problems.</p>	6L
Module – 5	<p>Construction Methods basics</p> <p>Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.</p>	4L
Module – 6	<p>Construction plants & Equipment</p> <p>Plants & equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses.</p> <p>Plants & Equipment for concrete construction</p> <p>Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control.</p>	3L
Module – 7	<p>Contracts Management basics</p> <p>Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.</p>	4L
Module – 8	<p>Management</p> <p>Professional practice, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contracts.</p>	3L
Module – 9	<p>Departmental Procedures</p> <p>Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbitration.</p>	2L

Books



Department of Civil Engineering

	Sl.	Book Name	Author	Publishing House
Books	1	Construction Engineering & Management	S.V. Deodhar & S.C.Sharma	Khanna Publishing House
	2	Building Construction	Varghese, P.C	Prentice Hall India
	3	Construction Technology	Chudley, R	ELBS Publishers
IS Codes	National Building Code			Bureau of Indian Standards

CO-PO Mapping

CO-PO Mapping

Construction Engineering & Management

(Course Code - CE(PC)601)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	-	-	2	1	2	3	1	-	-	2	2	2
CO2	2	2	1	1	2	1	3	-	1	-	1	2	3	3	1
CO3	1	1	2	-	2	-	1	3	-	-	3	2	1	2	3
CO4	3	2	-	2	2	-	3	-	2	2	2	-	3	2	3
CO5	2	2	1	-	-	3	3	3	3	-	-	3	2	2	2
	1.8	1.8	1.25	1.5	2	2	2.2	2.67	2.25	1.5	2	2.34	2.2	2.2	2.2

CE(PC)602: Engineering Economics, Estimation & Costing

Course Code – CE(PC)602	Engineering Economics, Estimation & Costing	2L+0T+0P	2 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses 2. Students will be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives. 3. Students will be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives. 4. Students will be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure. 5. Students will be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure. 6. Students will be able to understand how competitive bidding works and how to submit a competitive bid proposal.
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Syllabus

SI No.	Course Content	Total Hours
Module 1:	Basic Principles and Methodology of Economics. Demand/Supply – elasticity – Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes	3L
Module 2:	Basic Principles and Methodology of Economics. Demand/Supply – elasticity – Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes	3L
Module 3:	Estimation / Measurements for various items Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying	9L
Module 4:	Specifications Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.	3L
Module 5:	Rate analysis Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity.	3L
Module 6:	TenderPreparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions,	3L



Department of Civil Engineering

	termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management	
Module 7:	Valuation Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalised value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table	3L
Module 8	Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.	2L

Books

	Sl.	Book Name	Author	Publishing House
	Books	1	Estimating, Costing Specifications & Valuation	M Chakravarty
2		Typical PWD Rate Analysis		
3		Estimating and Costing in Civil Engineering (Theory & Practice)	Dutta, B.N.	UBS Publishers
4		Sociology & Economics for Engineers	Premvir Kapoor	Khanna Publishing House
5		Distributors, Estimating and Costing in Civil Engineering: Theory and		UBS PublisherS

CO-PO Mapping

CO-PO Mapping

Engineering Economics, Estimation & Costing

(Course Code - CE(PC)602)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	1	3	-	2	1	2	2	-	3	2	3	3
CO2	1	3	3	1	3	-	2	1	2	2	-	3	2	3	3
CO3	1	3	3	1	3	-	2	1	2	1	2	3	2	3	3
CO4	3	1	2	3	-	2	2	1	1	1	3	3	3	2	2



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CO5	1	1	1	-	1	2	2	1	2	2	3	3	3	2	3
CO6	1	-	1	-	1	2	2	1	2	2	3	3	2	1	3
Avg	1.33	2.2	2.16	1.5	2.2	2	2	1	1.83	1.67	2.75	3	2.33	2.33	2.83

CE(PC)603: Water Resources Engineering

Course Code – CE(PC)603	Water Resources Engineering	2L	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Understand the fundamentals of flow in open channels. 2. Students will be able to Understand the concepts of irrigation. 3. Students will be able to Estimate the quantity of water required by different crops in different seasons, and accordingly the irrigation water requirement. 4. Students will be able to Design channels and other irrigation structures required for irrigation, drainage, soil conservation, flood control and other water-management projects. 5. Students will be able to Learn about groundwater resources, aquifers and wells..
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	OPEN CHANNEL FLOW: Channel Characteristics and parameters, Energy-depth relationships, Specific Energy concept, Critical Flow, Hydraulic Jump, Uniform flow, Efficient sections, Slope profiles, Gradually Varied Flow, Water surface profiles.	8L
Module – 2	IRRIGATION: Definition, Necessity, Scope, Benefits of Irrigation; Types, techniques and sources of irrigation; Development of irrigation in India.	3L
Module – 3	SOIL-WATER-PLANT RELATIONSHIP: Types of crops, cropping seasons, water requirement of crops, base period, kor period, Duty, Delta, Commanded area, Net Irrigation Requirement, Field Irrigation Requirement, Gross Irrigation Requirement, Intensity of irrigation, Consumptive use of water, estimation of evapotranspiration, Blaney-Criddle method, Modified Penman's method, Irrigation efficiencies, Frequency of irrigation.	6L
Module – 4	CANAL IRRIGATION: Classification of irrigation canals, canals in alluvium; Design of	6L



Department of Civil Engineering

	unlined canals: Kennedy's method, Lacey's method; Lined canals: advantages, materials used, typical sections, design of lined canals, economics of canal lining; Canal sections – filling, cutting, partial cutting and partial filling.	
Module – 5	LAND DRAINAGE: Water logging issues in irrigation, provision of drains, design and maintenance of open drains, closed drains, discharge and spacing of closed drains.	4L
Module -6	GROUNDWATER: Occurrence of groundwater– Aquifers, Various Types of Aquifers, Aquifer Parameters: Specific Yield, Specific Retention, Storage Coefficient, Transmissivity.	4L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Irrigation and Water Power Engineering	B. C. Punmia, A. K. Jain and P. B. Lal	Laxmi Publications (P) Ltd., New Delhi, 2019.
	2	Irrigation, Water Resources and Water Power Engineering	P. N. Modi.	Standard Book House, New Delhi. 2019
	3	Irrigation Engineering and Hydraulic Structures	S. K. Sharma	S Chand Publishing, New Delhi, 2017.2012..
	4	Irrigation Engineering	N. N. Basak	Tata McGraw Hill Education India Private

CO-PO Mapping

CO-PO Mapping

Water Resources Engineering

(Course Code – CE(PC)603)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	1	-	1	1	2	2	3
CO2	3	2	2	2	2	1	1	1	1	-	-	1	2	1	3
CO3	3	2	2	2	2	1	-	-	1	-	-	1	2	2	3
CO4	1	1	1	1	1	-	1	1	3	2	2	1	3	1	2
CO5	1	1	1	2	2	1	-	1	-	1	-	1	3	2	2
Avg.	2.2	1.6	1.6	1.8	1.8	1	1	1	1.2	1.5	1	1	2.4	1.6	2.6



Department of Civil Engineering

CE(PC)604: Design of Steel Structures

Course Code – CE(PC)604	Design of Steel Structures	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Use of all loadings and limit state design method for steel structure 2. Students will be able to Analyze and design the Tension and compression member, resources required and project economics 3. Students will be able to Explain the behavior of various connections and able to solve the problems various fasters (Bolted, welded & eccentric) used in steel construction. 4. Students will be able to Use of knowledge of analysis in structural planning and design of various components of buildings. 5. Students will be able to Analyze and design of steel composite problems such as various girders.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Materials and Specification: Rolled steel sections, mechanical properties of steel and their specifications for structural use. Codes of practices. Design of Steel structures using tubular, rectangular and square section	1L
Module 2	Structural connections: Riveted, welded and bolted including High strength friction grip bolted joints. – types of riveted & bolted joints, assumptions, failure of joints, efficiency of joints, design of bolted, riveted & welded joints for axial load. Eccentric connection:- Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.	6L
Module 3	Design of Tension members: Design of tension members, I.S code provisions. Permissible stresses, Design rules, Examples.	3L
Module 4	Design of Compression members: Effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Design of one component, two components and built up compression members under axial load. Examples. Built up columns under eccentric loading: Design of lacing and batten plates, Different types of Column Bases- Slab Base , Gusseted Base, Connection details	6L



Department of Civil Engineering

Module 5	Design of Beams: Permissible stresses in bending, compression and tension. Design of rolled steel sections, plated beams. simple Beam end connections, beam -Column connections. I.S code provisions	4L
Module 6	Design of Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded& bolted.	4L
Module 7	Design of Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions.	4L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Steel structures	N. Subramanian	OXFORD University
	2	Design Of Steel Structures	S.K.Duggal	TMH
	3	Design Of Steel Structures	Bhavikatti	I.K. Publishing House
IS Codes	IS: 456 – 2000 IS 875 – I (1987), IS 875 - II (1987), IS 875 - III (2015), S.P.: 6(1) – 1964 Structural Steel Sections			Bureau of Indian Standards

CO-PO Mapping

CO-PO Mapping

Design of Steel Structures

(Course Code – CE(PC)604)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	1	2	2	1	-	-	2	3	1	1	3
CO2	3	3	2	2	1	-	1	2	-	-	1	3	3	3	2
CO3	2	2	-	2	-	-	3	3	-	-	-	3	3	2	2
CO5	2	1	3	-	3	2	-	-	3	2	2	3	1	2	1
CO6	3	-	2	2	3	-	3	-	2	-	1	3	3	2	2
	2.6	2	2	2	2	2	2.25	2	2.5	2	1.5	3	2.2	2	2



Department of Civil Engineering

CE(PE)601A: Stability of Slopes

Course Code – CE(PE)601A	Stability of Slopes	2L	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Understand the fundamental theories and knowledge in the stability analysis of soil slopes.2. Students will be able to Measure the finite and infinite slope stability.3. Students will be able to Develop the analytical and numerical skills in treating a complicated practical slope problem.4. Students will be able to Evaluate the safety and design proper slope protection measures.5. Students will be able to Analyze the strength parameters in slope stability..
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Introduction: slope failure- causes, short- and long-term failure.	2L
Module 2	Landslides: types, multiple and complex slides, rate of land movement, factor of safety, examples	4L
Module 3	Slope stability analysis: basic concepts, finite and infinite slopes, analysis of infinite slopes-dry or moist cohesive slope, non-cohesive slope, cohesive slope with seepage;	8L
Module 4	Analysis of finite slopes: planar failure surface, circular failure surface, friction circle method, Taylors stability chart, locaton of critical circle, total stress analysis,	8L
Module 5	Method of Slices: Fellenius method, Bishop's simplified method, effective stress stability chart.	4L
Module 6	Non-circular failure surfaces, selection of strength parameter in slope stability, various slope protection measures..	2L

Books

Books	Sl.	Book Name	Author	Publishing House
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Department of Civil Engineering

1	Soil Mechanics and Foundation Engineering	P. Purushothama Raj	Pearson publication
2	Principles of Foundation Engineering	Braja M. Das	Thomson Asia Pvt. Ltd., Singapore, 2005.
3	Soil strength and slope stability	J.M. Duncan, S.G. Wright	John Wiley & Sons (Imprint: Hoboken, N.J.), 2005
4	The Stability of Slopes.	E.N. Bromhead	Blackie Academic & Professional
5	Slope Analysis.	R. Chowdhury	Elsevier Scientific Publishing
6	Theory of Structures	Timoshenko and Young	McGrawHill

CO-PO Mapping

CO-PO Mapping

Stability of Slopes

(Course Code - CE(PE)601A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	1	1	-	2	-	1	2	1	1	3
CO2	3	2	2	-	-	1	1	-	2	1	-	2	1	1	3
CO3	3	2	1	1	-	1	1	2	2	-	-	2	1	1	3
CO4	3	2	1	-	1	1	1	-	2	-	1	2	1	1	3
CO5	3	2	-	-	-	1	1	-	2	1	1	2	1	1	3
Avg.	3	1.8	1.33	1	1	1	1	2	2	1	1	2	1	1	3

CE(PE)601B: Foundation Engineering

Course Code – CE(PE)601B	Foundation Engineering	1L+0T+2P	2 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to determine the load carrying capacity of pile foundation. 2. The students will be able to compute the efficiency and settlement of pile group. 3. The students will be able to understand different subsoil exploration methods and interpret field and laboratory test data to obtain design parameters for geotechnical analysis. 4. The students will be able to correlate bearing capacity of shallow foundation from field test data. 5. The students will be able to analyze and design sheet pile structure on the basis of earth pressure theories.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Introduction Classification, selection- shallow and deep foundations.	2L
Module 2	Deep foundations Pile foundation: Types of piles, material, Suitability and uses, Method of installation of piles - classification of piles based on material, Installation Techniques – Selection and uses, Determination of types and lengths of piles, Load transfer mechanism, Determination of load carrying capacities of piles by static and dynamic formulae as per IS codes, Pile spacing and group action, Group efficiency, Negative skin friction, Pile load test, Settlement of pile group, Lateral load capacity of pile by IS: 2911 and Reese & Matlock methods, Uplift capacity of pile - introduction.	9L
Module 3:	Site Investigation & Soil Exploration Planning of sub-surface exploration, Methods of boring, sampling, Different types of samples, Spacing, Depth and number of exploratory borings, Bore log, Preparation of sub-soil investigation report. In-situ tests Standard penetration test, Static cone penetration test, Dynamic cone penetration test, Field vane shear test, Plate load test. Indirect methods of soil exploration Geophysical method: seismic refraction and electrical resistivity methods.	6L
Module 4:	Shallow Foundations Bearing Capacity from SPT, SCPT and Plate load Test data.	3L
Module 5:	Sheet pile structures Type of sheet piling, Design of sheet pile, Cantilever sheet piling, Anchored sheet piling, Free earth and fixed earth support methods, Analysis with anchored bulk heads.	4L



Department of Civil Engineering

Module 6	Introduction to Ground Improvement Techniques Introduction, Economic considerations, Consolidation by preloading and sand	6L
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Books

Books	Sl.	Book Name	Author	Publishing House
	1	Textbook of Soil Mechanics and Foundation Engineering (Geotechnical Engineering Series)	V.N.S. Murthy	CBS Publishers
	2	Soil Mechanics and Foundations	Punmia, B.C. and Jain A. K	Laxmi Publications (P) Ltd
	3	Basic and Applied Soil Mechanics	Gopal Ranjan & A.S.R. Rao	New Age International Pvt. Ltd, Publishers
	4	Principles of Geotechnical Engineering	B.M. Das	Thomson Brooks / Cole

CO-PO Mapping

CO-PO Mapping

Foundation Engineering

(Course Code – CE(PE)601B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	1	1	2	2	2	-	2	2	3	2	2	2
CO2	3	3	2	1	-	2	-	2	1	1	-	3	2	2	3
CO3	3	3	3	-	2	2	-	2	-	-	1	3	3	2	3
CO4	3	-	2	-	1	2	1	2	1	1	1	3	2	3	3



Department of Civil Engineering

CO5	2	2	2	2	1	2	1	2	1	-	-	3	2	2	3
Avg.	2.6	2.75	2.2	1.33	1.25	2	1.33	2	1	1.33	1	3	2.2	2.2	2.8

CE(PE)601C: Ground Improvement Technique

Course Code – CE(PE)601C	Ground Improvement Technique	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to gain competence in properly devising alternative solutions to difficult and earth construction. 2. Students will be able to evaluate their effectiveness before, during and after construction. 3. Students will be able to understand different approaches to the ground modification. 4. Students will be able to Understand the soil stabilization for reinforced earth construction.
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Syllabus

SI No.	Course Content	Total Hours
Module – 1	Introduction: ground modification by vibro-replacement, stone columns, preloading and prefabricated drains, Reinforced earth structures.	4L
Module – 2	In-situ densification: Introduction, Compaction: methods and controls Densification of granular soil: Vibration at ground surface, Impact at ground surface, Vibration at depth (Vibroflotation), Impact at depth.	6L
Module – 3	Geo-textiles:	6L



Department of Civil Engineering

	Introduction to geotextiles and geomembranes, applications of geotextiles, design methods using geotextiles, geogrids, geonets, geomembranes, geotubes.	
Module – 4	Grouting: Over view: Suspension and Solution grout, Grouting equipment and methods, Grout design and layout, Grout monitoring schemes.	6L
Module – 5	Soil stability: Reinforced earth fundamentals, Soil nailing, Soil and Rock Anchors, Underpinning.	4L
Module – 6	Densification of Cohesive Soils: Preloading and dewatering, Design of Sand drains and Stone columns, Electrical and thermal methods.	4L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Construction and Geotechnical methods in foundation engineering	R.M. Koener	McGraw Hill Publication
	2	Reinforced Earth	T S Ingold	T Thoam Telford Publication
	3	Ground Improvement Techniques	P. Purushothama Raj	Laxmi Publications Pvt Limited, 2nd edition

CO-PO Mapping

CO-PO Mapping

Ground Improvement Technique

(Course Code - CE(PE)601C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	1	2	2	-	2	-	3	-	1	1	2
CO2	2	2	-	-	-	2	-	1	1	2	1	2	3	3	1
CO3	2	2	1	3	2	-	1	-	-	1	-	3	1	1	3



Department of Civil Engineering

CO4	1	2	3	3	3	1	-	1	2	-	2	3	3	1	3
Avg.	1.75	1.75	2.34	2.67	2	1.67	1.5	1	1.67	1.5	2	2.67	2	1.5	2.25

CE(PE)602A: Building Construction Practice

Course Code – CE(PE)602A	Building Construction Practice	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<p>CO1. Students will be able to understand the different technical terms related to construction & earthwork, site clearance procedure.</p> <p>CO2. Students will be able to Understand the concept of various methods of construction of sub structure.</p> <p>CO3. Students will be able to understand different Techniques of construction of super structure like Box jacking & Tunnelling techniques.</p> <p>CO4. Students will be able to Understand the Support structure for heavy Equipment and conveyors.</p>
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Syllabus

SI No.	Course Content	Total Hours
Module – 1	<p>Introduction</p> <p>Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints –pre cast pavements – Building foundations – basements temporary shed –centering and shuttering – slip forms – scaffoldings – de-shuttering forms –Fabrication and erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection.</p>	12L
Module – 2	<p>Sub Structure Construction</p>	10L



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	Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunnelling techniques – Piling techniques -well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points –Dewatering and stand by Plant equipment for underground open excavation.	
Module – 3	<p>Super Structure Construction</p> <p>Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks.</p>	8L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Building Materials	S. K. Duggal	New Age International Publishers
	2	Building Materials and construction	Sushil Kumar	Standard Publishers
	3	Building Construction	Dr.B. C. Punmia	Laxmi Publications (P) ltd

CO-PO Mapping

CO-PO Mapping

Building Construction Practice

(Course Code - CE(PE)602A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	3	3	2	2	1	-	1	2	-	1	2	2
CO2	1	2	1	1	-	2	-	1	1	2	1	2	2	2	1
CO3	2	1	1	3	2	-	2	-	2	1	-	2	1	1	2



Department of Civil Engineering

CO4	1	1	2	-	2	-	2	1	2	1	2	3	1	1	2
	1.25	1.25	1.5	2.34	2.34	2	2	1	1.67	1.25	1.67	2.34	1.25	1.5	1.75

CE(PE)602B: Structural Analysis-II

Course Code – CE(PE)602B	Structural Analysis-II	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The Students will be able to Apply the Slope Deflection and Moment Distribution Method to analyze indeterminate structures as well as suspension bridge and stiffness girders. 2. The Students will be able to The Students will be able to Apply and analyze the concepts of curved beam analysis in hooks, rings and Bow girders. 3. The Students will be able to Develop the concept bending in unsymmetrical beams. 4. The Students will be able to Develop the fundamental concepts of plastic analysis using kinematic method and apply them in frames and continuous beam analysis. 5. The Students will be able to analyze the indeterminate structures (continuous beams and frames) using flexibility and stiffness matrix method.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Analysis of statically Indeterminate Structures: Moment distribution method- solution of continuous beam, effect of settlement and rotation of support, frames with or without side sway. Slope deflection method: method and application in continuous beams and frames. Suspension Bridge and stiffening girders.	8L
Module 2	Curved Beam analysis: Hooks, rings and Bow girders. Unsymmetrical bending.	8L
Module 3	Plastic analysis of structures: beams and portal frames.	5L



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Module 4	Approximate method of analysis of structures: Portal and Cantilever methods.	4L
Module 5	Matrix methods of structural analysis – Stiffness and flexibility approaches for analysis of beam.	5L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Structural Analysis (Vol I & Vol II)	S S Bhavikatti	Vikas
	2	Theory of Structures	S. Ramamrutham	Khanna Publishers
	3	Strength of Materials and Theory of Structures (Vol I & Vol II)	Punmia, Jain, Jain	Laxmi Publication
	4	Structural Analysis	R.C. Hibbeler	Prentice Hall
	5	Theory of Structures	Timoshenko	and Young
	6	Structural Analysis	Pandit and Gupta	TMH

CO-PO Mapping

CO-PO Mapping

Structural Analysis-II

(Course Code – CE(PE)602B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	1	1	-	2	-	2	3	1	2	3
CO2	3	2	-	-	2	1	1	1	2	-	-	2	3	2	3
CO3	3	2	1	1	-	1	1	-	2	1	2	2	1	2	2
CO4	3	2	-	-	-	1	1	-	2	-	-	2	2	1	3
CO5	3	2	1	-	-	1	1	-	2	1	-	3	1	2	2



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Avg.	3	1	1	1.5	2	1	1	1	2	1	2	2.4	1.6	1.8	2.6
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CE(PE)602C: Industrial Structures

Course Code – CE(PE)602C	Industrial Structures	2L+0T+0P	2 Credits
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Course Outcome (CO)	
Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand how to identify and apply the industrial design codes relevant to the design of Reinforced concrete members. 2. Students will be able to understand how to familiar with the professional and contemporary design issues and fabrication of Reinforced concrete members. 3. Students will be able to understand how to identify and apply the industrial design codes relevant to the design of Reinforced concrete members.

Syllabus

SI No.	Course Content	Total Hours
Module – 1	<p>Overall Review of RC Design:</p> <p>Review of Limit State Design of Beams, Slabs & Columns according to IS 456-2000. Yield line theory, Biaxial Bending & Slender Column.</p> <p>Analysis and Design of beams curved in plan:</p> <p>Design principle, structural design of beams curved in plan of circular and rectangular types.</p> <p>Flat slabs:</p> <p>Introduction, components – IS code provisions Design method –</p> <p>Design for flexure and shear and Detailing.</p>	8L
Module – 2	<p>Deep beams:</p>	7L



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	<p>Introduction, Flexural and shear stresses in deep beam and Design and Detailing.</p> <p>Water tank:</p> <p>Introduction, Types, Analysis and Design of water tanks e.g., Underground & Elevated water tank (Circular, Rectangle and Intz).</p>	
Module – 3	<p>Raft Foundation:</p> <p>Introduction, Types and Design of raft foundation. Design of folded plate</p> <p>Design of shear wall as per IS 13920</p>	7L
Module – 4	<p>Design of bunkers and silos:</p> <p>Introduction, Difference between Bunkers and Silo (rectangular, square and circular bunker and silo design for storage of cement).</p> <p>Analysis and design of chimneys:</p> <p>Introduction and different type of linings, wind load calculation on chimney (Static and dynamic) Analysis and design of chimney linings, foundation types.</p>	8L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	R.C.C. Design	B.C. Punmia	Laxmi Publication
	2	Reinforced concrete structures	N. Subramanian	OXFORD University Press
IS Codes	<ol style="list-style-type: none"> 1. IS: 456 – 2000 (latest revision) 2. IS 875 – I (1987), II (1987), -III (2015), -IV (1987), V (1987) 3. SP: 16 Design Aid to IS 456 4. IS 1893-Part-I: 2016, IS 1893-Part-II: 2014 5. IS 3370 –I (1967), II (2009), III (1967), IV (1967) 			

CO-PO Mapping

CO-PO Mapping

Industrial Structures



Department of Civil Engineering

(Course Code - CE(PE)602C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	-	2	1	2	-	1	3	-	1	1	2
CO2	1	1	2	1	-	2	-	1	3	2	1	1	3	2	3
CO3	2	1	1	3	2	-	2	-	2	1	3	2	1	1	1
Avg.	1.67	1.67	1.67	2.34	2	2	1.5	1.5	2.5	1.34	2.34	1.5	1.67	1.34	2

CE(OE)601A: Soft Skills and Interpersonal Communication – I

Course Code – CE(OE)601A	Soft Skills and Interpersonal Communication – I	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Communicate in an official and formal environment and Analyze the dynamics of business communication 2. Students will be able to Write business letters, MOM, agenda, CV, Reports, and Proposals with incorporation of principles of communication. 3. Students will be able to Appreciate the use of language to create beautiful expressions and Analyze and appreciate literature. 4. Students will be able to Learn application of grammar and Learn to articulate opinions with clarity.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Communication Skill Definition, nature & attributes of Communication Process of Communication Models or Theories of Communication Types of Communication Levels or Channels of	3L



Department of Civil Engineering

	Communication Barriers to Communication	
Module 2	<p>Business Communication- Scope & Importance Writing Formal Business</p> <p>Letters Writing Reports Organizational Communication: Agenda & minutes</p> <p>of a meeting, notice, memo, circular Project Proposal Technical Report</p> <p>Writing Organizing e-mail messages E-mail etiquette Tips for e-mail</p> <p>Effectiveness communication, Usability, Human factors, Managing technical communication projects, time estimation, Single sourcing, Localization.</p>	8L
Module 3	<p>Language through Literature Modes of literary & non-literary expression</p> <p>Introduction to Fiction, (An Astrologer's Day by R.K. Narayan and Monkey's Paw by W.W. Jacobs), Drama (The Two Executioners by Fernando Arrabal) or (Lithuania by Rupert Brooke) & Poetry (Night of the Scorpion by Nissim Ezekiel and Palanquin Bearers by Sarojini Naidu)</p>	8L
Module 5	<p>Grammar in usage (nouns, verbs, adjectives, adverbs, tense, prepositions,</p> <p>voice change) - to be dealt with the help of the given texts..</p>	10L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Theories of Communication: A Short	Armand Matterlart and	Michele Matterlart
	2	Professional Writing Skills	Chan, Janis Fisher, and Diane Lutovich	San Anselmo, CA: Advanced Communication Designs,
	3	Effective Business Communications	Kulbhushan Kumar	Khanna Publishing House
	4	Writing and Speaking at Work: A Practical Guide for Business Communication	Edward P. Bailey	Prentice-Hall
	5	Intercultural Business Communication	Lillian Chaney and Jeanette Martin	Prentice-Hall

CO-PO Mapping



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CO-PO Mapping

Soft Skills and Interpersonal Communication – I

(Course Code – CE(OE)601A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	1	1	1	-	1	3	3	2	2	2	2	1
CO2	-	2	-	-	-	1	-	1	3	3	1	2	3	1	2
CO3	-	2	-	1	1	-	-	-	1	3	-	2	2	2	3
CO4	-	1	-	-	1	1	-	-	3	3	-	2	2	1	2
Avg.	-	1.75	-	1	1	1	-	1	2.5	3	1.5	2	2.25	1.5	2

CE(OE)601B: Introduction to Philosophical Thoughts

Course Code – CE(OE)601B	Introduction to Philosophical Thoughts	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Learn about the culture of our country. 2. Students will be able to Develop an insight into the philosophical roots of our country. 3. Students will be able to Learn about the impact of philosophical knowledge for developing a healthy mind. 4. Students will be able to Understand the traditional practices of our country
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Introduction to Indian Philosophy: Brief discussion on Veda and Upanishads; Origin of Indian Philosophy	1L
Module 2	Charvaka Philosophy: Epistemology; Metaphysics	2L



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Module 3	Samkhya Philosophy: Metaphysics; Theory of Causation. --Prakṛti, Purusa, Evolution; Epistemology	3L
Module 4	Yoga Philosophy: Organization of the YogaSutras; Psychology of Yoga -- Stages of Citta, Forms of Citta, Modifications of Citta, Kinds of Klesas; The Eight-Fold Yoga; God and Liberation	3L
Module 5	Nyaya Philosophy : Epistemology -- Perception (Pratyaksa), Inference (Anumāna), Comparison (Upamāna), Testimony (Sabda); Theory of Causation (Asatkāryavāda); Self and Liberation; The Concept of God	5L
Module 6	Mimansa Philosophy: Epistemology -- Validity of Knowledge; Sources of Valid Knowledge (Pramāna) – Perception, Inference, Comparison, Verbal Testimony, Postulation (Arthapati), Non Apprehension (Anupalabधि); Theories of Error (Khyativāda) – Akhyativāda, AnirvacaniyaKhyativāda, Viparitakhyativāda; Metaphysics -- Theory of Causation; Nature of Self; God and Liberation	4L
Module 7	Vaisesika Philosophy: Metaphysics and the Categories -- Substance (Dravya), Quality (Guṇa), Action (Karma), Generality (Sāmānya), Particularity (Vaiśeṣa), Inherence (Samavāya), Nonexistence (Abhāva); Epistemology; The Concept of God; Bondage and Liberation	3L
Module 8	Buddhist Philosophy:Epistemology -- Dependent Origination; Four Noble Truths; Eight Fold Paths; Ethics; Karma and Rebirth; Liberation	4L
Module 9	Jaina Philosophy: Syādavāda; Anekāntavāda; Ethics; Karma and Liberation	3L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Living Philosophy: A Historical Introduction to Philosophical Ideas	Lewis Vaughn	
	2	Thinking Things Through: An Introduction to Philosophical Issues and Achievements	Clark Glymour	
	3	An Historical Introduction to Philosophical Thinking	Chaïm Perelman	

CO-PO Mapping



Department of Civil Engineering

CO-PO Mapping

Introduction to Philosophical Thoughts

(Course Code – CE(OE)601B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	3	1	-	2	2	3	1	2	-	3	2	2	2
CO2	-	-	3	2	-	1	2	3	2	1	-	3	2	1	2
CO3	-	-	2	1	-	2	2	3	1	2	-	3	1	2	2
CO4	-	-	2	-	-	2	2	3	1	2	-	3	2	2	2
Avg.	-	-	2.5	1.33	-	1.75	2	3	1.25	1.75	-	3	1.75	1.75	2

CE(PC)693: Water Resource Engineering Laboratory

Course Code – CE(PC)693	Water Resource Engineering Laboratory	0L+0T+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Delineate the watershed of any reservoir using DEM. 2. Students will be able to Determine the average rainfall over a catchment. 3. Students will be able to Use the rain gauge properly for a specified purpose. 4. Students will be able to Measure the rate of infiltration of water through the soil. 5. Students will be able to Measure the sunshine hours in a particular day.
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Syllabus

SI No.	Course Content	Total Hours
Experiment 1	Catchment area delineation (Manually and using DEM)	2
Experiment 2	Calculation of average rainfall over a catchment area with arithmetic mean method, Thiessen polygon method and Isohyetal Method.	2



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Experiment 3	Use of different type of Rain gauges. Permissible stresses, Design rules, Examples.	2
Experiment 4	Measurement of infiltration rate using double ring infiltrometer	2
Experiment 5	Measurement of evaporation using evaporimeter	2
Experiment 6	Measurement of bright sunshine hours using sunshine recorder.	2

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Irrigation and Water Power Engineering	B. C. Punmia, A. K. Jain and P. B. Lal	Laxmi Publications (P) Ltd., New Delhi, 2019.
	2	Irrigation, Water Resources and Water Power Engineering	P. N. Modi.	Standard Book House, New Delhi, 2019
	3	Irrigation Engineering and Hydraulic Structures	S. K. Sharma	S Chand Publishing, New Delhi, 2017.2012..
	4	Irrigation Engineering	N. N. Basak	Tata McGraw Hill Education India Private

CO-PO Mapping

CO-PO Mapping

Water Resource Engineering Laboratory

(Course Code - CE(PC)693)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	1	1	-	2	-	1	2	1	1	3
CO2	3	3	2	-	-	1	1	-	2	1	-	2	1	1	3
CO3	3	3	1	1	-	1	1	2	2	-	-	2	1	1	3
CO4	3	3	1	-	1	1	1	-	2	-	1	2	1	1	3
CO5	3	3	-	-	-	1	1	-	2	1	1	2	1	1	3
Avg.	3	3	1.33	1	1	1	1	2	2	1	1	2	1	1	3



Department of Civil Engineering

CE(PC)694: Steel Structure Design Sessional

Course Code – CE(PC)694	Steel Structure Design Sessional	0T+0L+2P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. The students will identify different bolted and welded connections, analyses and design them for axial and eccentric loads.2. The students will be able to Design different steel sections subjected to axial compression and tension following Indian codes of practices.3. The students will be able analyze structural components subjected to axial compression, bending and tension.4. The students will be able analyze behavior of structures subjected to lateral loading system as well as gravity loading system5. The students will be able to Design different components of an industrial building.
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	Design of a factory shed including preparation of necessary working drawings and report in accordance with CE(PC)604	-

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Steel structures	N. Subramanian	OXFORD University Press
	2	Design Of Steel Structures	S.K.Duggal	TMH
IS Codes		IS: 456 – 2000 IS 875 – I (1987), IS 875 - II (1987), IS 875 - III (2015), S.P.: 6(1) – 1964 Structural Steel Sections		Bureau of Indian Standards

CO-PO Mapping



Department of Civil Engineering

CO-PO Mapping

Steel Structure Design Sessional

(Course Code – CE(PC)694)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	3	3	3	2	3	1	2	-	-	1	1	2	3	2	3
CO3	3	1	2	1	3	-	-	2	-	1	-	1	2	2	3
CO4	3	-	2	-	3	2	2	-	-	-	-	2	3	3	3
CO5	3	3	-	2	2	2	3	-	2	1	-	2	3	2	3
	3	2.25	2.5	2	2.75	1.67	2.25	2	2	1	1	2	2.4	2.2	2.6

CE(PC)695: Quantity Survey Estimation and Valuation Sessional

Course Code – CE(PC)695	Quantity Survey Estimation and Valuation Sessional	0L+1T+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand introduction to quantity surveying 2. Students will be able to know analysis and schedule of rates 3. Students will be able to know specification of materials 4. Students will be able to understand about specification of works 5. Students will be able to understand the introduction to valuation
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Syllabus

Sl No.	Course Content	Total Hours
Module 1:	Quantity Surveying: Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment	2
Module 2:	Quantity estimate of a single storied building	2



Department of Civil Engineering

Module 3:	Bar bending schedule.	2
Module 4:	Details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities.	2
Module 5:	Estimate of quantities of road, Underground reservoir, Surface drain, Septic tank.	2
Module 6:	Analysis and schedule of rates: Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring and finishing	2
Module 7:	Specification of materials: Brick, cement, fine and coarse aggregates	2
Module 8	Specification of works: Plain cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, colour washing, distempering, lime punning, painting and varnishing	2
Module 9	Valuation: Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalised value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table	2

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Estimating, Costing Specifications & Valuation	M Chakravarty	
	2	Typical PWD Rate Analysis		
	3	Estimating and Costing in Civil Engineering (Theory & Practice)	Dutta, B.N.	UBS Publishers
	4	Sociology & Economics for Engineers	Premvir Kapoor	Khanna Publishing House
	5	Distributors, Estimating and Costing in Civil Engineering: Theory and		UBS PublisherS

CO-PO Mapping

CO-PO Mapping

Quantity Survey Estimation and Valuation Sessional

(Course Code - CE(PC)695)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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Department of Civil Engineering

CO1	2	-	-	1	-	2	1	-	-	1	-	3	2	1	2
CO2	1	3	3	1	3	-	2	1	2	2	-	3	2	3	3
CO3	3	2	2	1	-	2	2	1	-	-	1	3	2	1	3
CO4	3	1	2	1	-	2	2	1	-	-	1	3	2	1	3
CO5	2	1	1	1	-	1	3	1	3	3	2	3	3	2	3
Avg	2.2	1.75	2	1	3	1.75	2	1	2.5	2	1.33	3	2.2	1.6	2.8

7th Semester



Department of Civil Engineering

CE(OE)701A: Metro Systems & Engineering

Course Code – CE(OE)701A	Metro Systems & Engineering	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The Students will be able to understand the basics of metro system and concepts of routing and financial criteria 2. The Students will be able to determine the need of various fields of engineering that are associated to metro system. 3. The Students will be able to analyze the various technical components that are needed to develop a proper metro system 4. The Students will be able to gain ideas of environmental aspect of proper metro system and its design
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financial.	4L
Module 2	CIVIL ENGINEERING Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management	12L
Module 3:	ELECTRONICS AND COMMUNICATION ENGINEERING Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	5L
Module 4:	MECHANICAL & TV + AC	5L



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	Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators	
Module 5:	ELECTRICAL: OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics	5L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Metro Rail in India for Urban Mobility	M. M. Agarwal, M. M. Agarwal, K. K. Miglani .	Prabha & Co.
	2	World Metro Systems	Paul E. Garbutt	Capital Transport Publishing

CO-PO Mapping

CO-PO Mapping

Metro Systems & Engineering

(Course Code – CE(OE)701A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	3	-	2	1	-	2	-	3	2	2	3
CO2	1	2	2	1	-	3	1	2	2	2	-	3	1	1	3
CO3	3	1	2	1	-	2	2	1	-	-	2	3	2	2	1
CO4	3	1	1	1	-	-	3	3	3	3	2	3	1	2	3
Avg.	2	1.25	1.75	1	3	2.5	2	1.75	2.5	2.34	2	3	1.5	1.75	2.5

CE(OE)701B: ICT for Development

Course Code – CE(OE)701B	ICT for Development	2T+0L+0P	2 Credits
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Course Outcome (CO)



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Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to about the types of ICT in relation to e-learning and web commerce2. Students will be able to about the system of networking and digital communication3. Students will know about the different existing theories giving rise to the concept of digital communication4. Students will develop knowledge about the application of computer mediated information and use of multimedia in digital communication
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Introduction to ICT: New media and ICT, Different types of ICT. Use of ICT for development; e-learning; Web commerce; Mobile telephony and Development: telecom industry in India. ICT Projects implemented in India and Northeast – Problems and Prospects	7L
Module 2	Digital Revolution and Digital Communication: Basics of New media theories – Information Society; Surveillance society; Digital Divide, Knowledge society; Network society. Works of Machlup, Bell, Negroponte and Castells	6L
Module 3:	Technology and Development: ICT for Development its societal implications; Evolution of ICT in Development Endeavour; ICT and Millennium Development Goals. Democratic and decentralized processes in development. Technology and culture: community and identity; participatory culture and ICT, community informatics	8L
Module 4:	Computer Mediated Communication and development: Different types of CMC; Important theoretical framework of CMC, cyber platform and communities, Social Networking Site; Convergent media, Multimedia platforms, Scope of convergent journalism for Development; Characteristics of convergent journalism; Different types of convergent journalism: precision journalism; annotative and open-source journalism; wiki journalism; open source journalism; citizen journalism; back- pack journalism, Convergent technologies and applications; Multimedia convergence and Interactivity	10L

Books

Books	Sl.	Book Name	Author	Publishing House
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Department of Civil Engineering

1	Information and Communication Technology for Development (ICT4D)	Richard Heeks	
2	The Development Dimension ICTs for Development: Improving Policy Coherence	OECD, Organisation for Economic Co-operation and Development	OECD Publishing

CO-PO Mapping

CO-PO Mapping

ICT for Development

(Course Code – CE(OE)701B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2		1	1	1	3	1	1	1	3	2	1	2
CO2	1	2	2	2	2	1	2	3	2	1	1	3	2	2	1
CO3	1	2	3	3	1	2	2	3	1	-	1	3	1	3	1
CO4	1	3	3	2	2	2	1	3	2	2	1	3	2	2	1
Avg.	1	2	2.5	2.33	1.5	1.5	1.5	3	1.5	1	1	3	1.75	2	1.25

CE(OE)701C: Cyber Law & Ethics

Course Code – CE(OE)701C	Cyber Law & Ethics	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will Have general knowledge on cyber legal literacy. 2. Students will be able to Understand computer ethics, policies, and fundamental duties. 3. Students will be able to Understand the concepts of Intellectual property to protect the traditional knowledge
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Department of Civil Engineering

4. Students will be able to Get aware of Indian IT Acts and Standards.

Syllabus

Sl No.	Course Content	Total Hours
Module 1	Introduction: Basics of Law, Understanding Cyber Space, Defining Cyber Laws, Scope and Jurisprudence, Concept of Jurisdiction, Cyber Jurisdiction, Overview of Indian Legal System, Introduction to IT Act 2000, Amendments in IT Act, Cyber Laws of EU – USA – Australia - Britain, other specific Cyber laws	6L
Module 2	Computer Ethics, Privacy and Legislation: Computer ethics, moral and legal issues, descriptive and normative claims, Professional Ethics, code of ethics and professional conduct. Privacy, Computers and privacy issue, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, Legal Policies, legislative background	7L
Module 3:	Intellectual Property Rights Issues: Copyrights, Jurisdiction Issues and Copyright Infringement, Multimedia and Copyright issues, WIPO, Intellectual Property Rights, Understanding Patents, Understanding Trademarks, Trademarks in Internet, Domain name registration, Software Piracy, Legal Issues in Cyber Contracts, Authorship, Document Forgery	7L
Module 4:	Indian IT Act and Standards: Indian IT ACT, Adjudication under Indian IT ACT, IT Service Management Concept, IT Audit standards, ISO/IEC 27000 Series, COBIT, HIPPA, SOX, System audit, Information security audit, ISMS, SoA (Statement of Applicability), BCP (Business Continuity Plan), DR (Disaster	6L
Module 5:	International Laws governing Cyber Space: Introduction to International Cyber Law, UNCITRAL, Cyber Laws: Legal Issues and Challenges in India, Net neutrality, Role of INTERPOL.	4L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Computer Ethics	Deborah G. Johnson	Pearsons Education
	2	Information Security and Cyber Laws	Gupta & Gupta	Khanna Publishing House



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3	Cyber Law Simplified	Vivek Sood	McGraw Hill Education
4	Cyber frauds, cybercrimes & law in India	Pavan Duggal,	Saakshar Law Publications
5	The Internet Law of India: Indian Law Series	Shubham Sinha	CreateSpace

CO-PO Mapping

CO-PO Mapping

Cyber Law & Ethics

(Course Code – CE(OE)701C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	2	-	3	1	1	1	2	2	2	2
CO2	-	-	-	-	1	2	-	3	1	-	1	2	1	1	1
CO3	-	-	-	-	1	2	-	3	1	1	1	2	1	1	1
CO4	-	-	-	-	-	2	-	3	-	-	-	2	2	1	1
Avg.	-	-	-	-	1	2	-	3	1	1	1	2	1.5	1.25	1.25

CE(PE)701A: Computational Hydraulics

Course Code –CE(PE)701A	Computational Hydraulics	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Identify the complexities involved in fluid flow problems. 2. Students will be able to Model the specific flow problem in terms of defining the governing equations, initial and boundary conditions and appropriate solution schemes to use.
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Department of Civil Engineering

	<p>3. Students will be able to Develop finite difference formulation of ordinary and partial differential equations of flow problems.</p> <p>4. Students will be able to Develop finite volume formulation of ordinary and partial differential equations of flow problems.</p>
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Syllabus

Sl No.	Course Content	Total Hours
Module 1:	Introduction: Modelling Theory - Physical modelling, analytical modelling, numerical modelling; classification of models based on i) Scale (space and time), ii) Solution (analytical and numerical); Concept of computational hydraulics; Processes involved in model development and application.	4L
Module 2:	Modelling Fluid Flow Problems: Governing equations- Conservation of mass, conservation of momentum, conservation of energy; Mathematical classification of flow equations, solution of ordinary differential equations and partial differential equations, boundary conditions; Solution of Saint-Venant Equations - Kinematic wave solution, Diffusive wave solution and full dynamic solution; Characteristic form of Saint-Venant Equations.	8L
Module 3:	Numerical Solution Schemes: Discrete solution of governing equations, Space discretization - Structured grids and unstructured grids, grid generation, time discretization.	2L
	Finite Difference Method: General concept, approximation of derivatives; Finite difference formulation for ordinary differential equations - Explicit schemes, Implicit schemes, Mixed schemes and weighted average schemes; Finite difference formulation for partial differential equations - initial conditions, boundary conditions, explicit and implicit schemes; The Preissmann Scheme, The Abbott-Ionescu scheme.	8 L
	Example Applications: Ordinary differential equation - Solution of linear reservoir problem; Partial differential equation - Solution of simple wave propagation, Solution of diffusion equation.	6L
Module 4:	Finite Volume Method: General concept, Steps in application of Finite Volume Method- Surface and volume integrals, Discretization of convective fluxes, Discretization of diffusive fluxes, evaluation of time derivative, boundary conditions.	8L
	Example Application: Solution of Advection-Diffusion Equation in 1-D.	4L

Books



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	Sl.	Book Name	Author	Publishing House
Books	1	Computational Hydraulics	M. B. Abbott and A. W. Minns	Routledge, London, 2016
	2	Computational Hydraulics – An Introduction	C. B. Vreugdenhil,	Springer – Verlag, New York, 1989
	3	Computational Hydraulics	C. A. Brebbia and A. J. Ferrante,	Butterworth-Heinemann, 2013.
	4	Computational Methods for Fluid Dynamics,	J. H. Ferziger and M. Peric	Springer, London, 2002.

CO-PO Mapping

CO-PO Mapping

Computational Hydraulics

(Course Code - CE(PE)701A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	3	-	1	2	-	-	1	-	3	1	2	3
CO2	2	2	3	3	2	1	2	1	1	-	1	3	2	3	3
CO3	1	2	3	1	2	-	1	-	-	1	-	3	2	3	3
CO4	1	2	3	1	2	-	1	-	-	1	-	3	2	3	3
Avg.	1.25	1.75	3	2	2	1	1.5	1	1	1	1	3	1.75	2.75	3

CE(PE)701B: Disaster Preparedness and Planning

Course Code – CE(PE)701B	Disaster Preparedness and Planning	2L+1T+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand the basic concepts and terminologies disaster management. 2. Students will be able to understand and describe the categories of disaster. 3. Students will realize the roles and responsibilities of a civil engineer towards society in time of a disaster. 4. Students will be able to analyze relationship between development and disasters. 5. Students will apply different concepts of disaster management.
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Syllabus

Sl. No.	Course Content	Total Hours
Module – 1	Introduction, Basic Concepts and Definitions Disaster, Hazard, Vulnerability, Risks, Severity, Frequency and details, Capacity, Impact, Prevention, Mitigation.	3L+1T
Module – 2	Disasters and their Classification Natural Disasters: Floods, Draught, Cyclones, Volcanoes, Earthquakes, Tsunami, Landslides, Coastal Erosion, Soil Erosion, Forest Fires Manmade Disasters: Industrial Pollution, Artificial Flooding in Urban Areas, Nuclear Radiation, Chemical Spills, Transportation Accidents, Terrorist Strikes Hazard and vulnerability profile of India, Mountain and coastal areas, Ecological fragility.	5L+3T
Module – 3	Disaster Impacts Disaster Impacts: Environmental, Physical, Social, Ecological, Economic, Political Health, Psycho-social issues; Demographic aspects (gender, age, special needs); Hazard locations; Global and national disaster trends; Climate change and urban disasters.	7L+3T
Module – 4	Disaster Risk Reduction (DRR) Phases of disaster management cycle; Prevention, Mitigation,	7L+3T



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	Preparedness, Relief and recovery; Structural and non-structural measures; Risk analysis, Vulnerability and capacity assessment; Early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.	
Module – 5	Disasters, Environment and Development Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), Sustainable and environmental friendly recovery; Reconstruction and development methods.	6L+4T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Disaster Management	S.C. Sharma	Khanna Publishing House
	2	Disaster Risk Reduction in South Asia	Pradeep Sahni	Prentice Hall
References	1. Disaster Medical Systems Guidelines, Emergency Medical Services Authority, State of California, EMSA no.214, June 2003. 2. IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings, Inter Agency Standing Committee (IASC) (Feb. 2007).			

CO-PO Mapping

CO-PO Mapping

Disaster Preparedness and Planning

(Course Code - CE(PE)701B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	1	-	2	3	1	1	3	3	1	3	2
CO2	2	2	-	1	-	2	-	1	-	2	1	1	3	2	3



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CO3	1	1	1	-	2	1	3	-	2	3	-	-	3	1	2
CO4	2	2	1	-	2	-	2	-	3	1	3	2	1	2	1
CO5	1	2	1	2	-	2	1	2	-	1	3	-	2	1	2
	1.4	1.8	1	1.67	1.67	1.67	2	2	2	1.6	2.5	2	2	1.8	2

CE(PE)701C: Hydraulic Structure

Course Code – CE(PE)701C	Hydraulic Structure	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Identify the characteristics of various types of dams and their selection procedure. 2. Students will be able to Perform the reconnaissance survey and, geophysical investigations necessary for selection of suitable dam site 3. Students will be able to Estimate forces acting on a gravity dams and perform stability analysis. 4. Students will be able to. Estimate the seepage loss through embankment dams and suggest necessary remedial measures. 5. Students will be able to Calculate the discharge through the overflow section and design the appropriate energy dissipation structures.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Storage Structures: Dams, Types of Dams – Embankment dams, gravity dams, various components and their functions	1L + 1T
Module 2	Selection of Dam Site: Site investigations, initial study, reconnaissance survey, geophysical investigations, preliminary selection, evaluation of selected site - various types of foundation testing, field testing and borrow pit investigations, detailed investigations; assessment of foundation characteristics and suitability; selection of type of dam.	4L + 2T



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Module 3	Gravity Dam: Definition, Features of some important gravity dams, Forces acting on a gravity dam, estimation of forces due to: self-weight, water pressure on upstream and downstream face, Uplift pressure, wave pressure, silt pressure, wind pressure, earthquake forces, hydrodynamic forces; Stability analysis - load combinations, codal provisions, modes of failures - overturning, sliding, tension and compression failures, factors of safeties, principal stresses; Elementary profile of a gravity dam - forces acting, minimum base width - no tension, no sliding basis, principal stresses..	8L + 4T
Module 4	Embankment Dams: Definitions, Features of some important embankment dams; Types of embankment dams and their sectional features; Design criteria; Freeboard - necessity, estimation procedure; Seepage analysis - Laplace's flow equations, drainage blanket and rock toe, phreatic line, graphical procedure of drawing phreatic line, estimation of seepage loss; Stability analysis of embankment dams – slip circle method; Seepage Control - cut-offs, slurry trench, sheet piling, grouting, slope protection	6L + 2T
Module 5	Diversion headworks: Necessity and uses, different types, layout and different components; weirs on permeable foundation, Creep theories, Khosla's method; Different types of modules, Canal escapes, Silt control devices.	5L + 3T
Module 6	Spillways and Energy Dissipation Structures: Necessity, types, selection, spillway gates; High overflow ogee spillway - profile, discharge computation, flow equations, factors affecting coefficient of discharge, codal provisions. stilling basins (USBR and BIS) types	4L + 2T

Books

Sl.	Book Name	Author	Publishing House
1	Hydraulic Structures)	Novak, A. I. B. Moffat, C. Nalluri and R. Narayan P	E & FN Spon, UK, 2010
2	Hydraulic Structures	S. H. Chen	Springer Nature, USA, 2015.
3	Irrigation Engineering and Hydraulic Structures	S. K. Sharma	S. Chand Publishing, New Delhi, 2017.
4	Dams and Appurtenant Hydraulic Structures	A. Tanchev	CRC Press, USA, 2014
5	Fluid Mechanics & Hydraulic Machines	S.S. Rattna	Khanna Publishing House



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	6	Fluid Mechanics and Hydraulic Machines	K. Subramanya	McGraw Hill Education (India) Private Limited,
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CO-PO Mapping

CO-PO Mapping															
Hydraulic Structure															
(Course Code – CE(PE)701C)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	1	1	-	2	-	2	3	1	2	3
CO2	3	2	-	-	2	1	1	1	2	-	-	2	3	2	3
CO3	3	2	1	1	-	1	1	-	2	1	2	2	1	2	2
CO4	3	2	-	-	-	1	1	-	2	-	-	2	2	1	3
CO5	3	2	1	-	-	1	1	-	2	1	-	3	1	2	2
Avg.	3	1	1	1.5	2	1	1	1	2	1	2	2.4	1.6	1.8	2.6

CE(PE)702A: Pre-stressed Concrete

Course Code –CE(PE)702A	Pre-stressed Concrete	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to learn the introduction of pre-stressed concrete member and its deflection properties 2. Students will be able to Develop the design criteria of pre-stressed concrete section for flexure and shear properties 3. Students will be able to Analyze the anchorage zone stress for post-tensioned members 4. Students will be able to Impart knowledge regarding the methods of Analysis of Statically Indeterminate Structures.
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Department of Civil Engineering

	<p>5. Students will be able to Impart knowledge regarding the composite construction of Pre-stress and In-situ concrete.</p> <p>6. Students will be able to Impart knowledge regarding Design of Pre-stressed concrete poles and sleepers and introduction of partial pre-stressing.</p>
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Syllabus

Sl No.	Course Content	Total Hours
Module 1:	Introduction of Pre-stressed concrete: Materials, Pre-stressing system, analysis of Pre-stress and bending stress, losses Shear and torsional resistance: design of shear reinforcement, design of reinforcement for torsion shear and bending. Deflections of Pre-stressed concrete members: Importance, factors, short term and long term deflection	8L+4T
Module 2:	Shear and Torsional Resistance: Design of Shear Reinforcement, Design of Reinforcement for Torsion, Shear and Bending. Limit State Design Criteria: Inadequacy of Elastic and Ultimate Load Method, Criteria for Limit States, Strength and Serviceability. Design of Pre-stressed Concrete Section: for Flexure & methods by Lin and Magnel	8L+4T
Module 3:	Anchorage Zone stresses in post tensioned members: Stress distribution in end block, anchorage zone reinforcement	3L+1T
Module 4:	Statically Indeterminate Structures: Advantages of Continuous Member, Effect of Pre-stressing, Methods of Achieving Continuity and Method of Analysis of Secondary Moments	4L+2T
Module 5:	Composite Construction of Pre-stressed and In-situ Concrete: Types, Analysis of Stresses	3L+1T
Module 6:	Pre-stressed Concrete Poles and Sleepers: Design of Sections for Compression and Bending. Introduction to Partial Pre-stressing.	2L+2T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Pre-stressed Concrete	N. KrishnaRaju	TMH
	2	Pre-stressed Concrete	Ramamuthram	Dhanpat Rai Publishing
	3	Pre-stressed Concrete	Srikant Vanakudre	Khanna Publishing House
	4	Fundamentals of Pre-stressed Concrete	N.C.Sinha and S.K.Roy	S. Chand



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	5	Pre-stressed Concrete	Karuna Moy Ghosh	PHI
	6	Design of Pre-stressed Structures	T.Y.Lin and N.H.Burns	
IS Codes	IS: 1343 : 2012			Bureau of Indian Standards

CO-PO Mapping

CO-PO Mapping

Pre-stressed Concrete

(Course Code - CE(PE)702A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	2	1	-	-	1	-	3	2	1	2
CO2	1	3	3	-	2	-	2	-	1	1	-	3	1	3	3
CO3	1	3	3	1	3	-	2	1	2	2	-	3	2	3	3
CO4	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
CO5	3	-	1	1	2	1	2	1	2	1	-	3	2	1	2
CO6	3	-	3	1	2	1	2	1	2	1	-	3	2	1	3
	2.16	2.67	2.6	1.2	2.4	1.25	2	1.25	1.8	1.33	2	3	2	1.83	2.67

CE(PE)702B: Repairs & Rehabilitation of Structures

Course Code – CE(PE)702B	Repairs & Rehabilitation of Structures	2L+1T+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand the various distress and damages to concrete and masonry structures. 2. Students will understand the importance of maintenance of structures, types and properties of repair materials etc. 3. Students will realize the assessing damage to structures and various repair techniques.
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	<p>Introduction:</p> <p>Overview of distress, deterioration in concrete structures,</p> <p>Scenario of distressed structures world over, need for repairs and upgrading of structures, General introduction to process (Road-map) to a durable concrete repair.</p>	3L+1T
Module – 2	<p>Deterioration of concrete structures:</p> <p>Types of deterioration – Signs, causes & symptoms, Mechanism of deterioration, contributing factors like permeability, inadequate durability & micro-structure of concrete. Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, abrasion, erosion, cavitation, crystallization of salts, Efflorescence, exposure to severe environment like marine exposure. Chemical deterioration due to corrosion of reinforcement (chloride induced, carbonation induced), Alkali-silica reaction, sulphate attack, Acid attack Deterioration due to water leakage, fire – detection & mitigation of the same. Deterioration due to ageing, inadequate maintenance, Design & construction deficiencies, overloading etc. Types of cracks, causes & characteristics of cracking in various structural components like beam, column, slab, masonry walls. Measurement of cracks, interpretation of the cause of particular type of crack.</p>	6L+3T
Module – 3	<p>Conditional/damage assessment & Evaluation of structures:</p> <p>Structural assessment: Conditional evaluation / Structural Appraisal of the structure – Importance, objective & stages, Conditional/damage assessment procedure, Preliminary & Detailed investigation – Scope, Objectives, Methodology & Rapid visual inspection of structures</p> <p>Damage Assessment allied Tests (Destructive, Semi-destructive, Nondestructive): Field & laboratory testing procedures for evaluating the</p>	6L+3T



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	structure for strength, corrosion activity, performance & integrity, durability Interpretation of the findings of the tests.	
Module – 4	<p>Repairs, rehabilitation & Retrofitting of concrete structures:</p> <p>Repair materials - Criteria for durable concrete repair, Methodology, performance requirements, repair options, selection of repair materials, Preparatory stage of repairs, Different types of repair materials & their application, types of repair techniques.</p> <p>Retrofitting/Strengthening:</p> <p>Need for retrofitting, Design philosophy of strengthening structures, Techniques available for strengthening including conventional and advanced techniques. Seismic retrofit of concrete structures: Deficiencies in structure requiring seismic retrofit, Design philosophy, Techniques to enhance the seismic resistance of structures, advanced techniques for making seismic resistant structures.</p>	9L+3T
Module – 5	<p>Protection & maintenance of structures –</p> <p>Importance of protection & maintenance, Categories of maintenance, Building maintenance. Corrosion mitigation techniques to protect the structure from corrosion.</p> <p>Long term health monitoring / Structural health monitoring (SHM)–</p> <p>Definition and motivation for SHM, Basic components of SHM and its working mechanism, SHM as a tool for proactive maintenance of structures.</p>	4L+2T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Failures and repair of concrete structures	S. Champion	John Wiley and Sons
	2	Diagnosis and treatment of structures in distress	R.N. Raikar	R & D Centre of Structural Designers and Consultants Pvt. Ltd.
	3	Maintenance, Repair & Rehabilitation and Minor works in Building	P.C. Varghese	PHI
IS Codes	Handbook on repair and rehabilitation of RCC buildings by CPWD, Government of India			

CO-PO Mapping



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CO-PO Mapping

Repairs & Rehabilitation of Structures

(Course Code - CE(PE)702B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	1	1	2	-	1	1	3	3	1	2	1
CO2	2	2	3	2	-	2	-	1	-	-	2	2	1	3	2
CO3	1	1	1	-	-	1	2	-	3	3	3	3	1	1	1
Avg.	1.34	1.34	1.67	2	1	1.34	2	1	2	2	2.67	2.67	1	2	1.34

CE(PE)702C: Finite Element Method

Course Code – CE(PE)702C	Finite Element Method	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The Students will be able to Obtain an understanding of the fundamental theory of the FEA method. 2. The Students will be able to Develop the ability to generate the governing FE equations for systems governed by partial differential equations. 3. The Students will be able to Understand the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Introduction to Finite Element Analysis: Basic Concepts of Finite Element Analysis and its necessity	2L
Module 2	Numerical tools for Finite Element Formulation: Vibrational Principle: Ritz method, Weighted residual method: Galerkin approach, Petrov-Galerkin approach.	5L+2T
Module 3	Finite element Formulation: Formulation of Euler-Bernoulli beam	7L+3T



Department of Civil Engineering

	element and Timoshenko beam element, Imposition of boundary conditions.	
Module 4	Elements and their properties: One dimensional and Two dimensional elements (Bar element, Beam element, Plate element), Interpolation functions, Numerical integration.	7L+3T
Module 5	Finite element solutions: Formulation of stiffness matrix and solution of beam, plate and truss problems, Problems on Plates with cutout. Introduction to the software SAP2000.	7L+4T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	An Introduction to the Finite Element Method	Reddy J.N	McGraw
	2	Matrix and Finite Element Analyses of Structures	Mukhopadhyay	Oxford
	3	Concepts and Applications of Finite Elements Analysis	Cook R.D, Malkus, Plesha and Witt	Wiley
	4	Finite Element Analysis: Theory and Programming	Krishnamoorty C. S.	McGraw Publication
	5	Introduction to Finite Elements in Engineering	Chandrupatla elegundu	and
	6	Finite Element Method with Applications in Engineering	Desai	Pearson

CO-PO Mapping

CO-PO Mapping

Finite Element Method

(Course Code – CE(PE)702C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	1	1	1	2	-	-	2	3	1	3
CO2	3	1	3	3	3	-	2	1	1	1	2	2	2	2	2
CO3	3	1	3	2	2	1	1	1	-	2	1	3	2	2	2
Avg.	3	1	3	2	2.5	1	1.33	1	1.5	1.5	1.5	2.33	2.33	1.67	2.33



Department of Civil Engineering

CE(PE)703A: Air and Noise Pollution and Control

Course Code – CE(PE)703A	Air and Noise Pollution and Control	2L+1T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to define the basic concepts and terminologies regarding air pollution and noise pollution. 2. The students will be able to describe the physics of air pollution and noise pollution. 3. The students will be able to apply the methods of air pollution and noise pollution measurements. 4. The students will be able to analyze different concepts of air and noise pollution solving mathematical problems. 5. The students will be able to compare air and noise quality with allowable standards and limits.
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Syllabus

Sl. No.	Course Content	Total Hours
Module 1	Air Pollutants Sources; Classification; Effects on Human, Vegetation, Material, Effects of Air pollution on Atmosphere: Photochemical Smog, Ozone Layer Depletion, Acid Rain, Greenhouse Effect and Global Warming	4L+2T
Module 2	Air Pollution Meteorology Lapse Rate; Atmospheric Stability; Inversion; Plume Pattern	3L+1T
Module 3	Dispersion of Air Pollutants Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height	3L+1T
Module 4	Air Quality Methods of Measurement: Gaseous pollutants, Particulate pollutants, Air Quality Standards and Indices: Ambient Air Quality Standard, NAAQS, Emission Standard, Air Quality Indices	4L+2T
Module 5	Air Pollution Control Control of Gaseous Pollutants: Adsorption, Absorption, Condensation, Control of Particulate Pollutants: Settling chambers, Cyclone separators, Wet collectors, Fabric filters, Electrostatic precipitators	5L+3T



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	Control of Pollution from Automobiles	
Module 6	Physics of Noise Basics of Acoustics; Sound Pressure, Power and Intensity and their Interrelations	1L+1T
Module 7	Measurement of Noise Noise Level; Interrelation between Noise, Pressure, Power and Intensity Levels; Noise Meter; Noise Networks; Frequency Band Analysis; Decibel Addition Measurement of Community Noise: LN, Leq, Ldn., LNP	4L+2T
Module 8	Source and Effect of Noise Psychoacoustics and noise criteria; effects of noise on health; annoyance rating schemes	1L+1T
Module 9	Noise Pollution Control Noise Standards and Limits; Methods of Noise Pollution Control	3L+1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Air Pollution and Control	Keshav Kant, Rajni Kant	Khanna Publishing House
	2	Environmental Engineering	S.C. Sharma	Khanna Publishing House
	3	Introduction to Environmental Engineering and Science	Masters, G.M., Ela, W.P.	Prentice Hall / Pearson
	4	Environmental Engineering. Volume-1 and Volume-2.	Garg, S.K.	Khanna Publishers

CO-PO Mapping

CO-PO Mapping

Air and Noise Pollution and Control

(Course Code – CE(PE)703A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	2	-	-	-	1	3	1	2	1



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CO2	3	3	3	2	3	1	2	-	-	1	2	2	3	2	3
CO3	3	2	2	1	3	-	-	1	1	1	2	1	2	2	3
CO4	2	-	1	-	3	2	2	-	-	-	-	2	3	3	3
CO5	2	3	-	1	2	2	3	2	1	2	-	2	3	2	3
Avg.	2.4	2.5	2.25	1.75	2.75	1.67	2.25	1.5	1	1.33	1.67	2	2.4	2.2	2.6

CE(PE)703B: Physico-Chemical Processes for Water and Wastewater Treatment

Course Code – CE(PE)703B	Physico-Chemical Processes for Water and Wastewater Treatment	2T+1L+0P	3Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Define the basic concepts and terminologies regarding physico-chemical treatment of water and wastewater 2. Students will be able to Describe the physics, chemistry and hydraulics of different unit operations and processes for water and wastewater treatment 3. Students will be able to Analyze different physico-chemical water and wastewater treatment options solving mathematical problems 4. Students will be able to Design different physico-chemical treatment processes to treat water and wastewater
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	Introduction and Basic Concepts Water purification in natural systems, physical processes, chemical processes and biological processes; Primary, secondary and tertiary treatment; Unit operations, unit processes	2L+2T -



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Module – 2	Aeration Aeration and Gas Transfer	2L
Module – 3	Sedimentation Sedimentation, different types of settling; sedimentation tank design	3L+1T
Module – 4	Clariflocculation Coagulation and flocculation; Coagulation processes, Stability of colloids; Destabilization of colloids; Destabilization in water and wastewater treatment; Transport of colloidal particles; Design aspects	4L+2T
Module – 5	Filtration Filtration processes; Hydraulics of flow through porous media; Rate control patterns and methods; Filter effluent quality parameters; Mathematical model for deep granular filters; Slow sand filtration, Rapid sand filtration, Precoat filtration; design aspects	4L+2T
Module – 6	Disinfection Types of disinfectants; Kinetics of disinfection; Chlorination and its theory; Design of Chlorinators	3L+1T
Module – 7	Precipitation Hardness removal; Iron, Manganese, and Heavy metal removal	3L+1T
Module – 8	Adsorption Adsorption equilibria and adsorption isotherm; Rates of adsorption; Sorption kinetics in batch reactors; Continuous reactors; Factors affecting adsorption	3L+1T
Module – 9	Ion Exchange Processes Materials and reactions; Methods of operation; Application; Design aspects	3L+1T
Module – 10	Membrane Processes Reverse osmosis, Ultrafiltration, Electrodialysis	3L+1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Elements of Water Pollution Control Engineering	O.P. Gupta	Khanna Publishing House
	2	Environmental Engineering. Volume-1 and Volume-2.	Garg, S.K.	Khanna Publishers
	3	Environmental Engineering	Peavy, H.S, Rowe, D.R, Tchobanoglous, G	Tata McGraw Hill Indian Edition



Department of Civil Engineering

	4	Manual on Water Supply and Treatment	CPHEEO	Govt. of India
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CO-PO Mapping

CO-PO Mapping

Physico-Chemical Processes for Water and Wastewater Treatment

(Course Code – CE(PE)703B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	3	3	3	2	3	1	2	-	-	1	1	2	3	2	3
CO3	3	1	2	1	3	-	-	2	-	1	-	1	2	2	3
CO4	3	-	2	-	3	2	2	-	-	-	-	2	3	3	3
Avg.	3	2.33	2.5	2	3	1.5	2	2	0	1	1	2	2.25	2.25	2.5

CE(PE)703C: Water and Air Quality Modelling

Course Code – CE(PE)703C	Water and Air Quality Modelling	2L + 1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Define the basic concepts and terminologies regarding water and air quality modelling 2. Students will be able to Describe the background mechanisms in modeling water and air quality 3. Students will be able to Analyze different water and air quality models solving mathematical problems 4. Students will be able to Apply the concepts of air and water quality modeling in air and water pollution control and management
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Introduction to Water Quality Models Introduction to mathematical models; Water quality model development; Calibration and verification; Cost benefit analysis using models; Model requirements and limitations	4L+2T
Module 2	Dissolved Oxygen Model for Streams Sources and sinks of dissolved oxygen; Estimation of system parameters; Streeter Phelps model, oxygen 'sag' curve, Determination of deoxygenation and re-aeration coefficients; Benthic oxygen demand; Mass transport mechanisms	6L+2T
Module 3:	Models for Estuary and Lakes Physical chemical and biological processes in estuaries and lakes □.	4L+2T
Module 4:	Introduction to Air Quality Models Micrometeorological processes, Wind rose, Dispersion, coefficients and Stability classes	4L+2T
Module 5:	Dispersion Models Point Source Gaussian Dispersion Model, Stack height computation; Line Source Models; Box Models	7L+3T
Module 6:	Air Quality Models Regional air quality models, Source inventories and significance	4L+2T

Books



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Books	Sl.	Book Name	Author	Publishing House
	1	Air Pollution and Control	Keshav Kant, Rajni Kant.	Khanna Publishing House
	2	Elements of Water Pollution Control Engineering	O.P. Gupta	Khanna Publishing House
	3	Environmental Engineering	S.C. Sharma	Khanna Publishing House
	4	Environmental Engineering. Volume-1 and Volume-2.	Garg, S.K.	Khanna Publishers

CO-PO Mapping

CO-PO Mapping

Water and Air Quality Modelling

(Course Code – CE(PE)703C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	1	3	1	1	3	3	3	3
CO2	3	3	3	1	3	-	-	-	2	1	1	3	1	3	3
CO3	3	3	3	3	3	1	-	-	3	1	1	3	2	3	3
CO4	3	3	2	2	3	-	1	1	3	3	1	3	2	3	2
Avg.	3	3	2.5	2	3	1	1	1	2.75	1.5	1	3	2	3	2.75

CE(PE)704A: Structural Dynamics

Course Code – CE(PE)704A	Structural Dynamics	2L+1T+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The Students will be able to understand Fundamental theory of dynamic equation of motion 2. The Students will be able to analysis methods for dynamic systems 3. The Students will be able to generate ideas about Dynamic properties and behavior of civil structures 4. The Students will be able to develop Modelling approach of dynamic response in civil engineering applications
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Syllabus

SI No.	Course Content	Total Hours
Module – 1	Basics of Structural Dynamics: Introduction of Structural Dynamics, Differential Equations in Civil Engineering, Types of Analysis/Static and Dynamic load, Degrees of Freedom (Ex: Generation of Stiffness matrix), Dynamic Equilibrium Equation.	3L+2T
Module – 2	Free Vibration of SDOF: Undamped free Vibration, Natural Period/Frequency, Energy in Free Vibration, Damped Free Vibration, Types of damping, Logarithmic decrement equation Forced Vibration of SDOF: Undamped Forced vibration, Amplitude & Phase Angle, Dynamic amplification factor for deflection (Rd), Damped Forced vibration, Relationship between Rd, Rv and Ra	8L+4T
Module – 3	Force Transmission, Vibration Measurement: Resonant frequency and Half power band width, Force Transmission and Isolation, Design of Vibration Measuring Instruments	3L+1T
Module – 4	Response to Arbitrary Motions: Response to Unit Impulse, : Response to Arbitrary Force (Duhamel's Integral), Response to Step and Ramp Forces, Response to Rectangular Pulse, Half Sinusoidal wave	2L
Module – 5	Numerical Methods of Solution: Time Stepping Methods, Central Difference Method, Newmark's Method	2L
Module – 6	Response Spectrum: Concept of Response Spectrum, Uses of Response Spectrum, Special Cases in Spectrum, Development of Tripartite Plot, :Example: Base Shear and Base Moment, Response of Structure in Frequency Domain	3L+2T
Module – 7	Multi-Degree of Freedom Systems: Equation of Motion for MDOF System, Solution of Equation, Natural Frequencies and mode Shapes (60), Modal Orthogonality, Approximate Method for finding Natural frequency.	2L+1T
Module – 8	Earthquake Response of MDOF Systems: Time History Analysis, Response Spectrum Analysis, 3D Dynamic Analysis	2L
Module 9	Dynamic Response of Continuous Systems: Vibration of Continuous systems, Shear behaviour and bending behaviour, Generalized SDOF	2L
Module 10	Dynamics of Rigid Blocks: Dynamics of Rigid Blocks, Non Structural Elements, : Floor Response Spectrum	2L



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Module 11	Vibration Control: : Introduction to Vibration Control, Active Control, Passive Control, Design of Tuned Mass Damper	2L+1T
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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Structural Dynamics (Theory and Computation)	Mario Paz.	CBS Publishers
	2	Dynamics of Structure (Theory and Application to Earthquake Engineering)	A.K.Chopra	Pearson Education
	3	Dynamics of Structures	Ashok K. Jain	Pearson Education

CO-PO Mapping

CO-PO Mapping

Structural Dynamics

(Course Code – CE(PE)704A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	-	2	2	-	2	2	3	2	3	1
CO2	2	2	2	1	1	1	-	2	2	2	-	2	3	2	2
CO3	2	1	2	2	3	2	2	1	2		2	2	2	3	2
CO4	2	2	2	1	-	-	-	2	-	1	-	3	2	2	3
	2.25	1.5	2	1.5	2.33	1.5	2	1.75	2	1.67	2	2.5	2.25	2.5	2

CE(PE)704B: Advanced Structural Analysis

Course Code –CE(PE)704B	Advanced Structural Analysis	2L+1T+0P	3 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to know increase their basic Knowledge. 2. Student will be able to apply stiffness and flexibility method using system approach. 3. Student will understand the yield conditions from their knowledge of stress-strain relations. 4. Student will be able to solve simple plate and shell problems
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Syllabus

SI No.	Course Content	Total Hours
Module 1:	Matrix methods of structural analysis: Application of matrix methods to plane truss, beams, continuous frames	9L+5T
Module 2:	Finite difference and relaxation technique-application to simple problems.	6L+3T
Module 3:	Theory of plate bending: Navier's Sol utions. Levy's solution. Plate buckling problem. Membrane theory of domes and cylindrical shells.	7L+3T
Module 4:	Theory of Elasticity: Three dimensional stress and strain analysis, stress strain transformation, stress invariants, equilibrium and compatibility equations. Two dimensional problems in Cartesian and polar coordinates. Plane stress, plane stain problems, St. Venant's principle	6L+1T

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Matrix, finite element, computer and	Mukhopadhyay	ANE Books
	2	Intermediate Structural analysis	Wang	McGrawHill
	3	Theory of Plates and Shells	Timoshenko & Krieger	McGrawHill
	4	Structural Analysis	R Agor	Khanna Publishing House
	5	Theory of Elasticity	Timoshenko & Goodier	McGrawHill
	6	Analysis of Structures	T.S. Thandavamoorthy	Oxford University Press

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Advanced Structural Analysis

(Course Code - CE(PE)704B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	1	3	-	2	1	2	2	-	3	2	3	3
CO2	2	1	2	1	3	1	3	3	3	3	3	3	3	3	2
CO3	1	2	3	1	2	-	1	-	-	1	-	3	2	3	3
CO4	1	2	3	1	2	-	1	-	-	1	-	3	2	3	3
Avg	1.25	2	2.75	1	2.5	1	1.75	2	2.5	1.75	3	3	2.25	3	2.75

CE(PE)704C: Coastal Hydraulics and Sediment Transport

Course Code – CE(PE)704C	Coastal Hydraulics and Sediment Transport	2L+1T+0P	3 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Explain and quantify coastal wave processes including wave generation, propagation, refraction, shoaling, diffraction, and breaking. 2. Students will be able to Explain and quantify coastal wave properties important to coastal engineering, including wave heights, speeds, induced water velocities, pressures, making appropriate approximations for deep and shallow waters. 3. Students will be able to Characterize and quantify basic coastal sediment transport processes and rates 4. Students will be able to Analyze coastal sites to determine design waves by utilizing historical and bathymetric data. Estimate hydrodynamic forces on coastal structures
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Syllabus



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SI No.	Course Content	Total Hours
Module 1	Introduction: Basic understanding of wave mechanics including wave generation, propagation, form and assessment in the coastal zone. Statistical and spectral analysis of recorded wave data and prediction in coastal zone.	6L
Module 2	Tides and currents: The equilibrium tide, Dynamic modifications of the equilibrium tide, Modification of tidal pattern, Tidal streams, Tidal bores	6L
Module 3	Waves: The linear theory of waves, Waves of finite height, Wind waves, Waves in shoaling water, Refraction of waves, Reflection of waves, Diffraction of waves, Oscillations in a harbour, Ship waves.	8L
Module 4	Sediment Transport: Basic concepts, Transport modes, Material in suspension, Bed-Load, Turbidity and density currents, Banks and channels in river estuaries, Regime of the sea-bed; Vertical distribution of suspended sediment in waves and current over a plane bed..	8L
Module 5	Littoral drift: Definition of limit for littoral drift, The effect of grain size, The beach profile, Longshore transport of material, Coastal features.	8L
Module-6	Coastal Structures: Types and use; Effect of construction of coastal structures on stability of shoreline/ beaches, shoreline configuration.	6L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Coastal hydrodynamics	J. S. Mani	Prentice-Hall of India Ltd, 2012
	2	Advances in Coastal Hydraulics	V. Panchang, J. Kaihatu	World Scientific Publishing Company,
	3	Basic Coastal Engineering	R. M. Sorensen	Springer, 2010
	4	Computational Modelling in Hydraulic and Costal Engineering	C. Kouttias and P. D. Scarlatos	CRC Press, 2016.

CO-PO Mapping

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Coastal Hydraulics and Sediment Transport

(Course Code – CE(PE)704C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	1	-	1	1	1	2	-	-	2	3	1	3



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CO2	3	1	3	3	3	-	2	1	1	1	2	2	2	2	2
CO3	3	1	3	2	2	1	1	1	-	2	1	3	2	2	2
CO4	3	1	3	2	1	1	-	1	3	-	3	1	1	3	1
	3	1	3	2	2.0	1	1.33	1	2.0	1.5	2.0	2.33	2.0	2.0	2.0

CE(PE)705A: Railway and Airport Engineering

Course Code – CE(PE)705A	Railway and Airport Engineering	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to Explain the basics in planning functional components of Railway and Airport. 2. Students will able to Illustrate the engineering concepts of construction, operation and maintenance of Railway and Airport components. 3. Students will able to Interpret the geometric design parameters of Railway 4. Students will able to Decide the runway orientation of proposed runway on the basis of previous wind data analysis. 5. Students will able to Assess the basic runway length parameters.
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Syllabus

SI No.	Course Content	Total Hours
Module1	<p>Railway Engineering Introduction to Railway Engineering: Socio-economic impact of Indian Railways; Zonal classification of Indian Railways; Railway track gauge; Classification of Indian Railways based on Speed Criteria. Permanent Way (P-way): Components – Rails, Rail joints, Sleepers, Ballast, Fastenings, Sub-grade. Track Alignment and Engineering Survey: Basic requirement of good alignment; Factors in selection of good alignment; Engineering Survey. Track Stresses; Geometric Design: Gradient, Speed, Degree of Curve, Super-elevation,</p>	20L



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	Transition curve, Widening of gauge on curves, Shift. Points and Crossings; Station and Yards; Signaling and Control Systems.	
Module2	Airport Engineering Airport Site Selection; Airport layout; Functions and planning of the Airfield components – runway, taxiway and Aprons, hanger, terminal building and control tower; Design of Runway and Taxiway; Runway orientation: Wind rose diagrams.	10L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	A Textbook of Railway Engineering	Saxena S.P.& Arora S.P	Dhanpat Rai & Sons
	2	Airport Planning & Design	Khanna S.K , Arora M.G & JainS.S	Nemchand Brothers

CO-PO Mapping

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Railway and Airport Engineering

(Course Code –CE(PE)705A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2	2	1	1	1	3	1	2	3	3	2	3
CO2	3	3	1	3	2	2	3	1	1	3	1	3	2	3	1
CO3	1	1	1	1	2	1	1	1	1	1	2	3	1	1	1
CO4	3	2	3	2	3	1	3	2	2	2	2	3	2	1	3
CO5	2	1	2	1	3	1	3	3	3	3	3	3	3	2	2
Avg.	2.2	1.6	1.8	1.8	2.4	1.2	2.2	1.6	2	2	2	3	2.2	1.8	2

CE(PE)705B: Pavement Design



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Course Code – CE(PE)705B	Pavement Design	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to develop a fundamental understanding of the Pavement Materials used for road construction. 2. Students will able to visualize the relationship between key materials and their properties along with the behavior of pavement component systems. 3. Students will able to instill an appreciation of an analytical approach to greater understanding of the factors that affects the material characteristics during the thickness design. 4. Students will able to know about the Equipment Used in the Construction of Roads and their Operational approach. 5. Students will able to learn about the various construction procedures of both Flexible and Rigid pavements
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Syllabus

SI No.	Course Content	Total Hours
Module 1	Introduction Basic road construction materials: Types of basic materials, Suitability of different materials depends on their availability and characteristics, Economic, Environmental, and Social issues of material usage, Life cycle analysis and its use in design	3L
Module 2	Soil Classification; Index & Engineering properties of soil, Properties of sub-grade; Suitability of different type of soil for the construction of highway embankments and pavement layers; Field compaction and control. Introduction to Soil Stabilization: Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. A critical look at the different laboratory and in-situ procedures for evaluating the mechanical properties of soils viz. CBR, Plate Load test, Resilient modulus, DCPT	7L
Module 3:	Aggregate Characterization: Origin, classification, properties. Tests and specifications on road aggregates for flexible and rigid pavements. Importance of aggregate gradation problems on Rothfutch's and Critical sieve methods and Shape Factor in mix-design	6L



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Module 4:	Bitumen Binders Different types, properties and uses, Tests on bitumen, Rheological and pavement performance related properties, Criteria for selection of different binders. Marshall Method of mix-design, Additives & Modifiers in Bituminous mixes, problems on mix design	6L
Module 5:	Cement Requirements, design of mix for CC pavement, use of additives, IRC specifications & Tests, joint filler and sealer materials.	3L
Module 6:	Modern trend of using Modified, Sustainable and Environment friendly materials Geo-Synthetics: Geo-synthetic clay liner – Construction details – Geo Synthetic Materials – Functions – Property characterization Modified bitumen: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Long term and short term ageing and its effect on bitumen performance Plastic waste: Types of polymer, applicability of polymer based waste product in different layers of pavement.	4L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Highway Engineering	Khanna, S.K .and C.E.G .Justo	Nem Chandand Bros
	2	Traffic Engineering and Transport Planning	Kadiyali L.R	Khanna Publishers
IS code	IS73, revised 2006, IS2720, IS2386, IS 1201 to 1220, IS8887-1995, IS217-1986			
	IRC:51-1992, 63-1976, 74-1979, 88-1984,			
	IRCSP:53 – 2002, IRCSP:58 – 2000,			
	“Guidelines for use of Geo-textiles in Road Pavements and Associated works”-2002; IRC			
	State of art, special report 3 – “compaction of earth work and subgrade”-IRC, HRB, 1999			
	MoRTH ‘Specifications for Roads and Bridges Works’-Indian Roads Congress			

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Department of Civil Engineering

Pavement Materials

(Course Code –CE(PE)801D)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	1	2	2	2	2	2	3	2	3	1
CO2	2	2	2	1	1	1	1	2	2	2	2	2	3	2	2
CO3	2	1	2	2	3	2	2	1	2	3	2	2	2	3	2
CO4	2	2	2	1	1	1	2	2	3	1	3	3	2	2	3
CO5	3	2	2	1	2	2	2	1	1	3	3	2	2	3	1
Avg.	2.4	1.6	2	1.4	1.8	1.4	1.8	1.6	2	2.2	2.4	2.4	2.2	2.6	1.8

CE(PE)705C: Transport System Planning

Course Code –CE(PE)705C	Transport System Planning	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand the knowledge of planning, design and the fundamental properties of highway materials in highway engineering. 2. Students will be able to apply the knowledge of geometric design and draw appropriate conclusion. 3. Students will be able to interpret the concept of different methods in design, construction of the pavement. 4. Students will be able to interpret traffic parameters by applying the knowledge in traffic planning and intersection design.
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Syllabus

Sl No.	Course Content	Total Hours
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Department of Civil Engineering

Module – 1	<p>Introduction</p> <p>Importance of transportation, transportation planning methodology, hierarchical levels of planning and its relation to rural, urban areas. Long range planning, Passenger and goods transportation, General concept and process of transport planning, Land-use transport interactions, Socio-economic characteristics of Land use.</p>	5L
Module – 2	<p>Transportation System</p> <p>Multi modal transportation system; Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System Elevated, Surface and Underground construction, integrated Operating Characteristics of Terminal and Transfer facilities.</p>	10L
Module – 3	<p>Transport planning</p> <p>Studies: Urban Travel Characteristics, Private and Public Behavior analysis, Transportation demand Surveys, Delineation of the urban area, zoning, Origin-Destination Studies, Home Interviews, trip Classification.</p> <p>Methodology: Study of existing network-trip generation techniques, Category analysis, multiple regression techniques, Modal split analysis, Trip distribution techniques, Growth Factor model, Gravity models, Opportunity models and multiple regression models.</p>	15L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Highway Engineering	L.R. Kadiyali	Khanna Book Publishing
	2	A Text Book for Transportation Engineering	A.K.Upadhayaya	Lakshmi Prakashani
	3	Transportation Engineering	L.R. Kadiyali	Khanna Book Publishing

CO-PO Mapping



Department of Civil Engineering

CO-PO Mapping

Transport System Planning

(Course Code - CE(PE)705C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	3	-	2	1	2	-	1	3	-	1	1	2
CO2	1	1	2	1	2	3	2	-	3	-	1	1	2	1	3
CO3	1	1	2	-	-	1	-	3	2	1	-	2	1	2	1
CO4	1	1	1	2	2	1	2	-	2	-	-	2	3	2	2
Avg.	1.25	1	1.75	2	2	1.75	1.67	2.5	2.34	1	2	1.67	1.75	1.5	2

CE(IN)791: Industrial Internship (after sixth semester)

Course Code – CE(IN)791	Industrial Internship (after sixth semester)	0L+0T+0P	1 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Explore the preferred field of specialization and develop analytical/ hardware/ software/ experimental/ observation skills. 2. Students will be able to Manage technical content and work 3. Students will be able to Prepare and present technical report.
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CO-PO Mapping

CO-PO-PSO Mapping

Industrial Internship

(after sixth semester)

(Course Code - CE(IN)791)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	2	3	3	2	-	3	3	3	3



Department of Civil Engineering

CO2	2	2	2	3	2	2	3	1	3	-	2	3	3	3	3
CO3	2	2	2	3	3	-		2	3	2	-	3	3	2	2
Avg	2.33	2	2	2.67	2.67	2	2.5	2	3	2	2	3	3	2.67	2.67

CE(PROJ)792: Project-1 (Project work)

Course Code – CE(PROJ)791	Project-1 (Project work)	0L+0T+10P	5 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Practice acquired knowledge within the chosen area of technology for project development policy. 2. Students will be able to Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach 3. Students will be able to Reproduce, improve and refine technical aspects for engineering projects 4. Students will be able to Work as an individual or in a team in development of technical projects 5. Students will be able to Communicate and report effectively project related activities and findings.
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CO-PO Mapping

CO-PO-PSO Mapping Project-1 (Project work) (Course Code - CE(PROJ)792)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3	3	3	2	-	3	3	2	2
CO2	3	2	2	3	1	2	2	1	3	2	-	3	3	3	2
CO3	2	2	-	1	2	-	1	-	2	1	-	3	3	2	2
CO4	1	2	2	3	2	2	2	3	3	2	2	3	3	1	2
CO5	2	1	3	1	3	2	2	3	2	3	2	3	3	2	3
Avg.	2.2	2	2.5	2	2	2	2	2	2.6	2	2	3	3	2	2.2



Department of Civil Engineering

8th Semester

CE(HS)801: Professional Practice, law & Ethics

Course Code – CE(HS)801	Professional Practice, law & Ethics	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students will be able to Have general knowledge and legal literacy and thereby to take up competitive examinations.2. Students will be able to Understand state and central policies, fundamental duties. Understand Electoral Process, special provisions3. Students will be able to Understand Engineering ethics and responsibilities of Engineers. Understand Engineering Integrity & Reliability4. Students will be able to Understand the concepts of Intellectual property to protect the traditional knowledge
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	<p>Professional Practice – Respective roles of various stakeholders: Government(constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice);professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction);Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)</p> <p>Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional</p>	4L



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	Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.	
Module 2	<p>General Principles of Contracts Management</p> <p>: Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and subcontracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /“Red Flag” conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non- performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;</p>	18L
Module 3:	<p>Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:</p> <p>Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.</p>	5L
Module 4:	<p>Engagement of Labour and Labour & other construction-related Laws:</p> <p>Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub- contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen’s Compensation Act, 1923; Building &</p>	2L



Department of Civil Engineering

	Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	
Module 5:	<p>Law relating to Intellectual property:</p> <p>Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;</p>	1L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Professional Ethics & Human Values	Premvir Kapoor	Khanna Publishing House
	2	Legal Aspects of Building and Engineering Contracts	B.S. Patil	
	3	The National Building Code	BIS	
	4	Indian Contract Act	Dutta	Eastern Law House
	5	The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration	Kwatra G.K.	Indian Council of Arbitration

CO-PO Mapping



Department of Civil Engineering

CO-PO Mapping

Professional Practice, law & Ethics

(Course Code – CE(HS)801)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-		-	-	-	-	1	2	1
CO2	-	-	-	-	-	-	-		-	-	-	-	2	1	2
CO3	-	-	-	-	-	-	-	3	-	-	-	-	1	1	2
CO4	-	-	-	-	-	-	-	1	-	-	-	-	1	2	1
Avg.	-	-	-	-	-	0.75	0.50	1	-	-	-	-	1.25	1.5	1.5

CE(PE)801A: GIS & Remote Sensing

Course Code –CE(PE)801A	GIS & Remote Sensing	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to Define and state the scope GIS & remote sensing in civil engineering 2. Students will be able to Understand the basic principles of remote sensing and GIS 3. Students will be able to Apply the various methods of remote sensing and GIS to different geospatial datasets 4. Students will be able to Analyze the different results obtained from different remote sensing data sources 5. Students will be able to Evaluate the different results in solving real world problems. 6. Students will be able to Design and construct optimum solutions for real world problems that can be resolved by GIS & remote sensing
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Syllabus



Department of Civil Engineering

SI No.	Course Content	Total Hours
Module 1:	Fundamentals of Remote Sensing: Energy sources and radiation principles; Electromagnetic Spectrum; Energy interactions in the atmosphere and with earth surface features; Atmospheric windows; Spectral response patterns and spectral signatures	3L
Module 2:	Digital Image Processing: Image rectification and restoration; Image enhancement; Image classification; Accuracy assessment; Digital change detection; Spatial, spectral, radiometric and temporal resolution characteristics of IRS, Landsat and Sentinel data.	6L
Module 3:	Advanced Remote Sensing: Microwave remote sensing: Frequency and wavelengths, polarization, range and azimuth resolution, relief displacement, foreshortening, layover, shadows and speckles; Synthetic Aperture Radar (SAR); Indian microwave sensors; Working principles of LiDAR remote sensing	3L
Module 4:	Advanced Digital Image Processing: Principal Component Analysis (PCA); Colour Space Transformation; Fourier Transformation; Image fusion; Hybrid classification system	3L
Module 5:	GIS: Definition, components and applications of GIS; Spatial and attribute data; Raster vs. Vector GIS; Concept of topology; Non-topological data structures	3L
Module 6:	Database and Coordinate System: Concepts of Relational Data Base Management System (RDBMS) and geodatabase; Spatial and attribute query; Datum and projection; Universal Transverse Mercator (UTM) grid system; On-the-fly projection	3L
Module 7:	Spatial Data Analysis: Concepts of local, focal, zonal and global analysis; Proximity analysis; Distance measurement; Raster and vector overlay; Spatial interpolation; DEM and TIN, Cost surface analysis	6L
Module 8	Applications of GIS & Remote Sensing: Watershed analysis; Runoff and erosion modelling, Location and allocation analysis; Atmospheric pollution monitoring; Urban growth modelling; Carbon sequestration and climate change	5L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Principles of Geoinformatics	P.K. Garg	Khanna Publishing House
	2	Remote Sensing and Image	Thomas M. Lillesand	
	3	Introduction to Geographic Information Systems	Kang-tsung Chang	Tata McGraw-Hill Publishing Company



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4	Remote Sensing and GIS	Basudeb Bhatta	Oxford University Press
5	Remote Sensing of Environment: An Earth Resource Perspective	J. R. Jensen	Pearson
6	Applications of Geomatics in Civil Engineering	J. K. Ghosh I. de Silva (Eds.)	Springer
7	Introductory Digital Image Processing: A Remote Sensing	J. R. Jensen	Pearson
8	Principles of Geoinformatics	P.K. Garg	Khanna Publishing House

CO-PO Mapping

CO-PO Mapping

GIS & Remote Sensing

(Course Code - CE(PE)801A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	2	1	-	-	1	-	3	2	1	2
CO2	3	2	2	1	-	2	2	1	-	-	1	3	2	1	3
CO3	1	3	3	-	2	-	2	-	1	1	-	3	1	3	3
CO4	1	3	3	1	3	-	2	1	2	2	-	3	2	3	3
CO5	2	1	2	1	3	1	3	3	3	3	3	3	3	3	2
CO6	2	1	3	1	3	1	3	3	3	3	3	3	3	3	3
Avg.	1.83	2	2.6	1	2.75	1.5	2.16	2	2.25	2	2.33	3	2.16	2.33	2.67

CE(PE)801B: Rock Mechanics

Course Code – CE(PE)801B	Rock Mechanics	2L+0T+0P	2 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The students will be able to define the characteristics and the mechanical properties (strength and failure criteria) of rock mass, rock matrix and discontinuities. 2. The students will be able to explain methods for in situ investigation and laboratory testing of rock matrix and discontinuities. 3. The students will be able to use rock mass classification systems (RMR, Q, and GSI). 4. The students will be able to conduct rock slope stability analyses. 5. The students will be able to analyse the stress distribution (isotropic, anisotropic) in situ and around an opening in rock (competent rock, jointed rock mass, blocky rock)
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Composition of rocks, Engineering classification and Limitation of Geologic classification of rocks	4L
Module 2	Rock coming, various methods of obtaining rock cores, Engineering Properties of rock, stress -strain relations, elastic theory application to design in rock.	6L
Module 3:	Strength and failure of rocks, Uniaxial and triaxial strength of rocks, failure theories of rocks and propagation of cracks, Griffith Chack theory -Water in rock, Structural feature of mass rocks and their effects on engineering properties.	8L
Module 4:	Measurement of stresses -rock mass, various types of measuring devices, evaluation of properties of rocks in the field.	6L
Module 5:	Strain and displacement of the rock mass, rock reinforcement and support, subsidence.	6L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Rock Mechanics in Engineering Practice	K.G.Stagg and O.C.Zienkiewicz,	John Wiley and Sons



Department of Civil Engineering

	2	Engineering Behavior of Rocks	W. Farmer,	Chapman and Hall Ltd
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CO-PO Mapping

CO-PO Mapping

Rock Mechanics

(Course Code – CE(PE)601B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	2	-	-	-	1	3	1	2	1
CO2	3	3	3	2	3	1	2	-	-	1	1	2	3	2	3
CO3	2	1	2	1	3	-	-	1	-	1	-	1	2	2	3
CO4	3	-	2	-	3	2	2	-	-	-	-	2	3	3	3
CO5	3	3	2	2	2	2	3	-	1	1	-	2	3	2	3
Avg.	2.6	2.25	2.4	2	2.75	1.67	2.25	1	1	1	1	2	2.4	2.2	2.6

CE(PE)801C: Environmental laws and Policy

Course Code –CE(PE)801C	Environmental laws and Policy	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to apply the relevant measures to mitigate pollution from different sources. 2. Students will be able to understand the effects of the various pollutants on the environment as a whole according to the formulated guidelines. 3. Students will be able to give recommendations for alternatives to reduce pollution. 4. Students will be able to formulate standards of the various parameters corresponding to their impact on the environment with changing time.
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Department of Civil Engineering

Syllabus

Sl No.	Course Content	Total Hours
Module 1	Introduction: Environment, Nature, Ecosystem, Origin of Environmental laws, Concept of laws and policies, Environment and Governance.	3L
Module 2	Sustainable Development and Environment: Understanding of Climate change Concept of Carbon Footprint, Carbon Credit, Carbon Offsetting Use of Hybrid Energy (Conventional +Non-Conventional) Use of Clean Development Mechanism.	6L
Module 3:	Environmental Laws (Indian Perspective): Indian Environmental Laws and Policies.	8L
Module 4:	Environmental Laws (International Perspective): Fundamental Principles and Application of International Environmental Law, Introduction to Trade and Environment Right to Environment as Human Right International Humanitarian Law and Environment and Conflict Management Focus on International Protocols- UNFCCC & Kyoto Protocol, Treaty on Antarctic & Polar Regions, UN Conventions of Law of the Sea and Regional Sea Convention, Law on International Water Courses.	11L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Environmental Law and Policy	Aruna Venkat	PHI Publication.
	2	Environmental Law and Policy	James Salzman & Burton H. Thompson (Jr.)	Foundation Press.
	3	Climate Change, Law, Policy and Governance	Usha Tandon	Eastern Book Company.

CO-PO Mapping



Department of Civil Engineering

CO-PO Mapping

Environmental laws and Policy

(Course Code – CE(PE)801C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	2	3	-	-	1	3	1	2	1
CO2	3	3	3	2	3	1	2	-	-	1	1	2	1	2	3
CO3	1	1	2	1	3	1	-	1	-	1	-	1	2	2	1
CO4	2	1	2	-	3	2	2	3	-	3	-	2	3	1	3
Avg.	2.25	1.75	2.5	2	3	1.34	2	2.34	-	1.67	1	2	1.75	1.75	2

CE(PE)801D: Pavement Materials

Course Code – CE(PE)801D	Pavement Materials	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to develop a fundamental understanding of the Pavement Materials used for road construction. 2. Students will able to visualize the relationship between key materials and their properties along with the behavior of pavement component systems. 3. Students will able to instill an appreciation of an analytical approach to greater understanding of the factors that affects the material characteristics during the thickness design. 4. Students will able to know about the Equipment Used in the Construction of Roads and their Operational approach. 5. Students will able to learn about the various construction procedures of both Flexible and Rigid pavements
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Department of Civil Engineering

Syllabus

Sl No.	Course Content	Total Hours
Module1	Introduction Basic road construction materials: Types of basic materials, Suitability of different material depends on their availability and characteristics, Economic, Environmental, and Social issues of material usage, Life cycle analysis and its use in design	3L
Module2	Soil Classification; Index & Engineering properties of soil, Properties of sub-grade; Suitability of different type of soil for the construction of high way embankments and pavement layers; Field compaction and control. Introduction to Soil Stabilization: Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. A critical look at the different laboratory and in-situ procedures for evaluating the mechanical properties of soils viz. CBR, Plate Load test, Resilient modulus, DCPT	7L
Module3	Aggregate Characterization: Origin, classification, properties. Tests and specifications on road aggregates for flexible and rigid pavements. Importance of aggregate gradation problems on Rothfutch's and Critical sieve methods and Shape Factor in mix design	6L
Module4	Bitumen Binders Different types, properties and uses, Tests on bitumen, Rheological and pavement performance related properties, Criteria for selection of different binders. Marshall Method of mix design, Additives & Modifiers in Bituminous mixes, problems on mix design	6L
Module 5	Cement Requirements, design of mix for CC pavement, use of additives, IRC specifications & Tests, joint filler and sealer materials.	3L
Module 6	Modern trend of using Modified, Sustainable and Environment friendly materials Geo-Synthetics: Geo-synthetic clay liner – Construction details – Geo Synthetic Materials – Functions – Property characterization Modified bitumen: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Long term and short term ageing and its effect on bitumen performance Plastic waste: Types of polymer, applicability of polymer based waste production different layers of pavement.	4L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Highway Engineering	Khanna, S.K. and C.E.G. Justo	Nem Chand and Bros
	2	Traffic Engineering and Transport Planning	Kadiyali L. R	Khanna Publishers



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IS code	IS73, revised 2006, IS2720, IS2386, IS 1201 to 1220, IS8887-1995, IS217-1986
	IRC:51-1992, 63-1976, 74-1979, 88-1984,
	IRCSP:53 – 2002, IRCSP:58 – 2000,
	“Guidelines for use of Geotextiles in Road Pavements and Associated works”-2002; IRC
	State of art, special report 3 – “compaction of earth work and subgrade”-IRC, HRB, 1999
	MoRTH ‘Specifications for Roads and Bridges Works’-Indian Roads Congress

CO-PO Mapping

CO-PO Mapping

Pavement Materials

(Course Code – CE(PE)801D)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	1	2	2	2	2	2	3	2	3	1
CO2	2	2	2	1	1	1	1	2	2	2	2	2	3	2	2
CO3	2	1	2	2	3	2	2	1	2	3	2	2	2	3	2
CO4	2	2	2	1	1	1	2	2	3	1	3	3	2	2	3
CO5	3	2	2	1	2	2	2	1	1	3	3	2	2	3	1
Avg.	2.4	1.6	2	1.4	1.8	1.4	1.8	1.6	2	2.2	2.4	2.4	2.2	2.6	1.8

CE(OE)801B: Bridge Engineering

Course Code – CE(OE)801B	Bridge Engineering	2L+0T+0P	2 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. The Students will be able to Discuss basic definitions, types, and components of bridges. 2. The Students will be able to Discuss sub-surface investigations required for bridge construction. 3. The Students will be able to Understand standard specification and loads for bridge design. 4. The Students will be able to Perform design of different types bearings and joints for bridges. 5. The Students will be able to Perform design of various reinforced concrete and steel bridges.
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	Introduction: Definition and basic forms, components of a typical bridge, classification of bridges, site investigation, bridge hydrology and hydraulics. Loads: I.R.C loads, impact factors, wind loads, longitudinal forces, lateral forces and centrifugal forces. Bearings: Types of bearings, details of bearing, joints, design examples	3L
Module – 2	Design of reinforced concrete solid slab bridge: Introduction, general design features, economic span, effective width method, simply supported and cantilever slab bridges, analysis and design.	7L
Module – 3	Design of box culvert bridge: Introduction, design method and design example.	4L
Module – 4	Design of a T beam bridge: Introduction, components, design of interior panel of slab, longitudinal and cross girders, Pigeaud's method, design example.	6L
Module – 5	Design of composite bridge: General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam.	4L
Module – 6	Design of steel bridges: General features, types of stress, design of railway truss bridge and plate girder bridge	6L
Module – 7	Design of cable stayed bridge: General features, Philosophy of design.	2L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Pre-stressed Concrete	Shrikant Vanakudre	Khanna Book Publishing Co



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2	Pre-stressed Concrete Bridges	N. Krishnaraju	CBS Publisher
3	Essential Bridge Engineering	Jhonson Victor D.	Oxford, IBH Publishing Co
4	Design of Bridge Structures	Jagadish and Jayaram	PHI

CO-PO Mapping

CO-PO Mapping

Bridge Engineering

(Course Code – CE(OE)801B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	2	2	2	-	2	2	3	2	2	3
CO2	3	3	2	1	-	2	-	2	1	1	-	3	2	1	3
CO3	3	3	2	-	2	2	-	2	-	-	1	3	3	2	3
CO4	3	3	2	-	1	2	1	2	1	1	1	3	2	1	3
CO5	3	2	2	1	1	2	1	2	1	-	-	3	2	2	3
Avg.	3	2.6	2	1	1.25	2	1.33	2	1	1.33	1.33	3	2.2	1.6	3

CE(OE)801C: Deep Foundations

Course Code – CE(OE)801C	Deep Foundations	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	1. The students will be able to explain the concept of bearing capacity for deep foundation.
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Department of Civil Engineering

	<ol style="list-style-type: none"> 2. The students will be able to estimate the safe bearing capacity including settlement consideration for deep foundations. 3. The students will be able to select a suitable deep foundation system for various site conditions and also analysis of that. 4. The students will be able to explain in what circumstances pile is needed and how to estimate pile and pile group capacity under various soil conditions
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Piles: types - load carrying capacity of pile - static and dynamic formula - pile load test - penetration test - pile groups - Efficiency - Feld's rule –Converse Labarre formula, Settlement of piles and pile groups - Negative skin friction – under-reamed piles, pile cap	10L
Module 2	Drilled Pier: Introduction, uses, types, bearing capacity, settlement, construction procedures.	6L
Module 3:	Cassion foundations: Types & selections, forces & moments, depth determination.	4L
Module 4:	Well foundations: The Types, components, design of well foundations – grip, size, steining, curb, cutting edge, top & bottom plug, well cap; stability analysis of well foundation, construction, shift & tilts.	8L

Books

Books	Sl.	Book Name	Author	Publishing House
	1	Principles of Foundation Engineering	Braja M. Das	Thomson Asia Pvt. Ltd., Singapore, 2005.
	2	Geotechnical Engineering, Principles and Practices,	Donald P. Coduto, Man- Chu Ronald Yeung and	PHI Learning Private limited, 2011.
	3	Soil Mechanics and Foundation Engineering	P. Purushothama Raj	Pearson publication

CO-PO Mapping



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CO-PO Mapping

Deep Foundations

(Course Code – CE(OE)801B)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	-	-	1	3	1	1	3	3	1	3
CO2	3	2	3	1	3	-	2	-	2	1	1	3	1	2	3
CO3	3	3	3	3	2	1	2	-	3	1	1	3	2	3	3
CO4	3	3	2	2	1	2	1	2	3	3	1	2	2	3	2
Avg.	2.75	2.5	2.5	2	2.25	1.5	1.67	1.5	2.75	1.5	1	2.75	2	2.25	2.75

CE(OE)801D: Groundwater Contamination

Course Code – CE(OE)801D	Groundwater Contamination	2L+0T+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand the principles and theories regarding groundwater contamination with 2. Students will be able to formulate the various remedial measures for groundwater contamination
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Syllabus

Sl No.	Course Content	Total Hours
Module – 1	Introduction: Definition of groundwater, hydrological properties of various water bearing strata, vertical distribution of subsurface water, groundwater in hydrologic cycle	2L
Module – 2	Groundwater Hydraulics: Darcy's Law, Dupuit's assumption, Application of Darcy's Law for simple flow systems, governing differential equations for confined and	7L



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	unconfined aquifers, steady and unsteady flow solutions for fully penetrating wells, partially penetrating wells, Interference of wells, Test pumping analysis with steady and unsteady flows, Delayed yield, method of images	
Module – 3	Groundwater quality: Indian & International standards	3L
Module – 4	Groundwater pollution: Sources, Remedial and preventive measures	3L
Module – 5	Groundwater conservation: Groundwater budget, seepage from surface water, artificial recharge with reclamation	3L
Module – 6	Models for Groundwater flow: Sampling & Monitoring methods, transport mechanisms, modeling (advective and dispersive transport), (adsorption and chemical reaction), biodegradation kinetics, numerical flow and transport modeling, waste site characterization/investigation, groundwater remediation, legal issues in groundwater contamination: Example: Base Shear and Base Moment, Response of Structure in Frequency Domain	10L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Elements of Hydrology and Groundwater	R.N. Saxena & D.C. Gupta.	PHI
	2	Groundwater Contamination, Performance, Limitations and Impacts	Anna L Powell	Nova Science Publishers
	3	Groundwater Contamination and Remediation	Edited by Timothy D. Scheibe & David C. Mays	MDPI

CO-PO Mapping

CO-PO Mapping

Groundwater Contamination

(Course Code – CE(OE)801D)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	-	2	2	-	2	2	3	2	3	1
CO2	2	2	2	1	1	1	-	2	2	2	-	2	3	2	2
	2.5	1.5	2	1.5	1.5	1	2	2	2	2	2	2.5	2.5	2.5	1.5



Department of Civil Engineering

CE(OE)802A: Soft Skills and Personality Development

Course Code – CE(OE)802A	Soft Skills and Personality Development	2T+0L+0P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none">1. Students be able to understand and apply their knowledge to find problem solutions.2. Students would be able to apply their best managerial attributes in decision making.3. Students will be able to the Ability to gain skills with use of communications. For managers tasked with leading projects or overseeing teams of people, communication becomes even more important, with effective communication skills considered a must-have.4. Students will be aware of the most crucial aspects of managing a team and provide them a growing path towards learning effective leadership skills.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Self-Growth i) Self Growth- Maslow's Hierarchy of Needs Theory ii) Anger, Stress & Time Management- Theories and application iii) SWOT Analysis	6L
Module 2	Stepping Up i) Growth & Environment ii) Competitive Spirit iii) Responsibility Factor	7L
Module 3:	Professional Communication i) Impression Management- theory on social psychology ii) Employability Quotient iii) Cross-cultural communication	6L
Module 4:	Leadership & Team Playing	



Department of Civil Engineering

	i) Leadership & Team Playing: Theories, Styles, Stages ii) Motivation, Negotiation Skills, Conflict Management iii) Planning & Envisioning: Initiative and Innovation in the Work Environment- De Bono's Six Thinking Hats	6L
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Books

Books	Sl.	Book Name	Author	Publishing House
	1	Personality Development and Soft Skills	Barun K. Mitra	Oxford University
	2	Soft Skills: An Integrated Approach to Maximise Personality	Gajendra Singh Chauhan and Sangeeta Sharma	Wiley
	3	The Ace of Soft Skills: Attitude, Communication and Etiquette for Success	Gopaldaswamy Ramesh and Mahadevan Ramesh	Pearson

CO-PO Mapping

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Soft Skills and Personality Development

(Course Code - CE(OE)802A)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	2	1
CO2	-	-	-	-	-	-	-	-	2	-	-	-	1	2	2
CO3	-	-	-	-	-	-	-	-	-	3	-	-	2	1	2
CO4	-	-	-	-	-	-	-	-	3	-	-	-	2	2	1
Avg.	1	0	2.5	3	0	0	1.5	1.75	1.5						

CE(OE)802B: Earthquake Engineering



Department of Civil Engineering

Course Code – CE(OE)802B	Earthquake Engineering	2T+0L+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to provide a coherent development to the students for the courses in sector of earthquake engineering. 2. Students will be able to present the foundations of many basic engineering concepts related earthquake Engineering. 3. Students will be able to learn an experience in the implementation of engineering concepts which are applied in field of earthquake engineering. 4. Students will involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.
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Syllabus

Sl No.	Course Content	Total Hours
Module 1	Seismology: Earth's Interior and Plate Tectonics; Causes of Earthquakes and Seismic Waves; Measurement of Earthquakes and Measurement parameters; Modification of Earthquake due to the Nature of Soil; Seismic Hazard Analysis.	4L
Module 2	Earthquake Inputs: Time History Records and Frequency Contents of Ground Motion; Power Spectral Density Function of Ground Motion; Concept of Response Spectrums of Earthquake; Combined D-V-A Spectrum and Construction of Design Spectrum; Site Specific, Probabilistic and Uniform Hazard Spectrums; Predictive Relationships for earthquake parameters.	4L
Module 3	Dynamics for Earthquake Analysis: Equations of Motion for SDOF and MDOF Systems; Undamped Free Vibration of SDOF and MDOF Systems; Mode Shapes and Frequencies of MDOF System; Rayleigh Damping Matrix; Direct Time Domain Analysis of MDOF System; Direct Frequency Domain Analysis of MDOF System; Modal Analysis in Time and Frequency Domain.	4L
Module 4	Response Analysis for Specific Ground Motion: Equations of Motion for Single and Multi- Support Excitations and Solutions; Equations of Motion in State Space and Solutions; Computational	4L



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	Steps for the Solutions using MATLAB; Time History Analysis of 3D Tall Buildings.	
Module 5	Response Spectrum Method of Analysis: Concept of Equivalent Lateral Force for Earthquake; Modal Combination Rules; Response Spectrum Method of Analysis of Structures and Codal Provisions; Response Spectrum Method of Analysis for Torsionally Coupled Systems; Response Spectrum Method of Analysis for Non-Classically Damped Systems.	4L
Module 6	Seismic Soil - Structure Interaction: Fundamentals of Seismic Soil-Structure Interaction; Direct Method of Analysis of Soil-Structure Interaction using FEM and Use of ABAQUS, Sub structuring Method of Analysis of Soil- Structure Interaction Problem.	4L
Module 7	Inelastic Response of Structures for Earthquake Forces: Fundamental Concepts of Inelastic Response Analysis for Earthquake Forces; Solutions of Incremental Equations of Motions for SDOF Systems; Solutions of Incremental Equations of Motions for MDOF Systems; Push over Analysis; Concepts of Ductility and Inelastic Spectrum.	5L
Module 8	Base isolation for earthquake resistant design of structures: Base isolation concept, isolation systems and their modelling; linear theory of base isolation; stability of elastomeric bearings; codal provisions for seismic isolation, practical applications.	5L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Earthquake resistant design of Structures	Agarwal and Shrikhande	PHI
	2	Earthquake-resistant design of structures	S.K. Duggal	Oxford University Press
	3	Elements of Earthquake Engineering	Jai Krishna, A. R.Chandrashekhar and Brijesh Chandra	South Asian Publishers
IS Codes	4	IS1893: Part I (2016)	Bureau of Indian Standards	
	5	IS 13920: 2016		
	6	IS 4326		



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CO-PO Mapping

CO-PO Mapping															
Earthquake Engineering															
(Course Code – CE(OE)802B)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	2	1	1	3	3	2	-	3	2	1
CO2	2	3	3	-	-	2	1	1	2	2	3	1	2	3	3
CO3	3	2	2	-	-	2	1	1	3	2	3	1	3	2	2
CO4	3	3	3	1	-	2	1	3	3	3	2	3	3	2	3
Avg.	2.75	2.5	2.75	1	-	2	1	1.5	2.75	2.5	2.5	1.67	2.75	2.25	2.25

CE(OE)802C: Urban Transport Planning

Course Code – CE(OE)802C	Urban Transport Planning	2T+0L+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand the how to apply up-to-date information for planning and operation of urban transport. 2. Students will be able to understand the to execute various transportation related surveys. 3. Students will be able to understand the how evaluate relative importance of various modes and their capacities. 4. Students will be able to understand to solve travel demand forecasting problems.
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Syllabus

SI No.	Course Content	Total Hours
Module 1	<p>Introduction</p> <p>Urban morphology - Urbanization and travel demand – Urban activity systems and travel patterns – Systems approach – Trip based and Activity based approach</p>	4L
Module 2	<p>Urban Transportation Planning</p> <p>Goals, Objectives and Constraints - Inventory, Model building, Forecasting and Evaluation - Study area delineation – Zoning - UTP survey.</p> <p>Trip generation models – Trip classification - productions and attractions – Trip rate analysis - Multiple regression models - Category analysis.</p> <p>Trip distribution models – Growth factor models, Gravity model and Opportunity modes.</p> <p>Modal split models – Mode choice behavior – Trip end and trip interchange models - Probabilistic models – Utility functions - Logit models - Two stage model.</p> <p>Traffic assignment – Transportation networks – Minimum Path Algorithms - Assignment methods – All or Nothing assignment, Capacity restrained assignment and Multi path assignment - Route-choice behavior.</p>	21L
Module 3	<p>Scope of UTP in present scenario</p> <p>Financing of Project – urban development planning policy - Case studies.</p>	5L

Books

	Sl.	Book Name	Author	Publishing House
Books	1	Transportation Engineering	L.R. Kadiyali	Khanna Publication
	2	Traffic Engineering and Transport Planning	L.R. Kadiyali	Khanna Publication



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3	Urban Transportation: Planning, Operation and Management	S Ponnuswamy and Johnson Victor	Tata McGraw-Hill Publication
4	Transportation Planning: Principles, Practices and Policies	Pradeep Kumar Sarkar and Vinay Maitri	

CO-PO Mapping

CO-PO Mapping

Urban Transport Planning

(Course Code – CE(OE)802C)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	2	-	-	-	1	-	1	1	2	2	3
CO2	3	2	3	-	2	3	1	1	3	-	-	1	3	1	3
CO3	2	3	3	2	2	1	-	-	1	-	-	1	2	2	3
CO4	1	1	1	1	1	-	1	1	3	2	2	1	3	1	2
Avg.	2	2	2.25	2	1.75	2	1	1	2	2	1.5	1	2.5	1.5	2.75

CE(OE)802D: Environmental Impact Assessment and Life Cycle Analysis

Course Code – CE(OE)802D	Environmental Impact Assessment and Life cycle Analysis	2T+0L+2P	2 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to understand and evaluate the impact of any activity (large or small scale) on the surrounding environment. 2. Students will be able to formulate mitigation strategies to protect the environment leading to sustainability.
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Department of Civil Engineering

3. Students will be able to understand the intricacies of Life Cycle Analysis and apply basic knowledge for coherent existence.

Syllabus

SI No.	Course Content	Total Hours
Module 1	Introduction Definition, Objective with legal aspect of Environmental Impact Assessment (EIA).	2L
Module 2	Methodology for EIA with Base Line Studies, Screening, Scoping and Public Consultation.	4L
Module 3	EIA Analysis Data Collection & Environmental Impact Analysis, preparation of EIA report.	5L
Module 4	EIA Mitigation and Audit- Mitigation and Impact Management with various case studies, Environmental Audit.	5L
Module 5	Introduction to Life Cycle Analysis (LCA): History, Definition, Standards and structure of LCA Goal and Scope of LCA: System of a product with boundary, unit process and functional unit.	2L
Module 6	Life Cycle Interpretation and Inventory: Limitation of LCA, Identification of significant issues, Evaluation, Reporting, Critical Review. Inventory: Data Collection, Data Bases, Allocation, Validation.	3L
Module 7	LCA Impact Assessment and Practice: Categories, Classification, Normalization, LCA Management, Life Cycle thinking, Sustainability.	4L
Module 8	Introduction: Definition, Objective with legal aspect of Environmental Impact Assessment (EIA).	2L



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Books

	Sl.	Book Name	Author	Publishing House
Books	1	Environmental Impact Assessment	R. R. Barthwal	New Age International Publication
	2	Environmental Impact Assessment: Theory and Practice	M. Anji Reddy	B. S. Publication
	3	Life Cycle Assessment (LCA): A Guide to Best Practice	Walter Klöpffer, Birgit Grahl	Wiley Publishers

CO-PO Mapping

CO-PO Mapping

Environmental Impact Assessment and Life Cycle Analysis

(Course Code - CE(OE)802D)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	1	1	-	2	-	1	2	1	2	3
CO2	3	2	2	-	-	1	2	-	3	1	-	2	2	1	2
CO3	2	2	1	2	-	1	1	2	2	-	-	2	1	1	3
Avg.	2.67	1.67	1.5	2	-	1	1.34	2	2.34	1	1	2	1.34	1.34	2.67

CE(CV)891: Comprehensive Viva Voce

Course Code – CE(CV)891	Comprehensive Viva Voce	0L+0T+10P	1 Credits
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Course Outcome (CO)



Department of Civil Engineering

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will be able to demonstrate knowledge in the program domain. 2. Students will be able to present his views cogently and precisely. 3. Students will be able to Exhibit professional etiquette suitable for career progression.
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CO-PO Mapping

CO-PO Mapping

Comprehensive Viva Voce

(Course Code - CE(CV)891)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	1	3	2	2	2	2	3	3	2	3
CO2	3	1	1	2	1	2	3	2	1	2	-	3	3	2	3
CO3	3	1	1	2	-	1	2	2	2	3	1	3	3	2	3
Avg	3	1.33	1.67	2	2	1.33	2.67	2	1.67	2.33	1.5	3	3	2	3

CE(PROJ)881: Project Part II

Course Code – CE(PROJ)881	Project Part II	0L+0T+10P	5 Credits
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Course Outcome (CO)

Course Outcome (CO)	<ol style="list-style-type: none"> 1. Students will able to Practice acquired knowledge within the chosen area of technology for project Development. 2. Students will able to Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
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Department of Civil Engineering

	<ol style="list-style-type: none"> 3. Students will able to Reproduce, improve and refine technical aspects for engineering projects. 4. Students will able to Work as an individual or in a team in development of technical projects. 5. Students will able to Report project related activities effectively to peers and mentors.
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CO-PO Mapping

CO-PO Mapping															
Project Part II															
(Course Code – CE(PROJ)881)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	3	3	3	3	3	3									



Department of Civil Engineering

Code of Conducts of the Students

1. PREPARATION

All students must understand that it is their responsibility to follow this Code of Ethics and Conduct (hence referred to as the 'Code') and the rights, obligations, and limitations that it entails.

That the Institute's goal in implementing this Code is to pioneer and administer an equitable, conscientious, effective, and timely student discipline procedure, as well as to provide a system that encourages student progress through individual and communal accountability.

All students are expected to be well-versed in this Code, which may also be found on the Institute's official website.

2. JURISDICTION

2.1 The Institute shall have jurisdiction over the conduct of students associated/enrolled with the Institute, and shall be aware of all acts of misconduct, including incidents of ragging or otherwise, that occur on the Institute campus or in connection with Institute-related activities and functions.

2.2 The Institute may have jurisdiction over conduct that occurs off-campus that violates the ideal student conduct and discipline as outlined in this Policy and other regulations, as if the conduct occurred on campus, which shall include:

- a) Any violations of the Sexual Harassment Policy of the Institute against other students of the Institute.
- b) Physical assault, threats of violence, or conduct that threatens the health or safety of any person including other students at the Institute.
- c) Possession or use of weapons, explosives, or destructive devices off campus.
- d) Manufacturing, selling, or distributing illegal narcotics, alcohol, or other substances.
- e) Conduct that has a negative impact on members of the off-campus community or is a nuisance to them.

The Institute shall consider the seriousness of the alleged offence, the risk of harm involved, whether the victim(s) are members of the campus community, and/or whether the off-campus conduct is part of a series of actions that occurred both on and off-campus when deciding whether to exercise such off-campus jurisdiction in the situations enumerated herein.

3. BEHAVIOR AND ETHICS



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3.1 This Code applies to all types of student conduct on Institute grounds, including Institute-sponsored activities, functions hosted by other recognized student organizations, and any off-campus conduct that has or may have serious consequences or a negative impact on the Institute's interests or reputation.

3.2 Each student must sign a declaration recognizing this Code and promising to follow it at the time of admission:

- a) He/she must be regular and complete his/her studies at the Institute.
- b) If a student is obliged to abandon studies for any justifiable reason, he/she may be removed from the Institute with the Principal's written agreement.
- c) As a result of such relief, the student will be required to pay any outstanding hostel/mess dues, and if the student was admitted on a scholarship, the grant will be cancelled.

3.3. The Institute believes that implementing behavioral norms would help to create a safe and efficient environment. All students must maintain academic integrity, respect all individuals and their rights and property, and ensure the safety of others, among other things.

3.4 All students shall refrain from engaging in all forms of wrongdoing, including engaging in any off-campus activities that could jeopardize the Institute's interests and reputation.

3.5 Discrimination (physical or verbal) based on a person's gender, caste, race, religion, or religious beliefs, color, region, language, disability, or sexual orientation, marriage, or family status, physical or mental disability, gender identity, or other factors.

3.6 Deliberately causing damage to Institute property or the property of other students and/or faculty members.

3.7 Any disruptive behavior in a classroom or at an Institute-sponsored event.

3.8 Inability to produce the Institute's identity card or refusal to produce it when asked by campus security officers.

3.9 Participating in activities without the Institute's consent, such as:

3.9.1 Organizing gatherings and processions.

3.9.2 Accepting membership in religious or terrorist organizations that the Institute/Government of India has outlawed.

3.9.3 Contrary to law or policy, illegal possession, carrying, or use of any weapon, ammunition, explosives, or potential weapons, fireworks.

3.9.4 Illegal possession or use of hazardous chemicals and controlled substances.

3.9.5 Smoking on the Institute's premises.



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- 3.9.6 Possessing, consuming, distributing, selling, and/or tossing empty bottles on the Institute's campus are all prohibited.
- 3.9.7 Parking a vehicle in an area designated for parking other types of vehicles or in a no parking zone.
- 3.9.8 Improper driving on campus that may cause others to be inconvenienced.
- 3.9.9 Not informing the Chief Medical Officer about a pre-existing health problem, whether physical or psychological, that could impede academic development.
- 3.9.10 Unauthorized access to others' resources or theft.
- 3.9.11 Misconduct during student body elections or any Institute-sponsored activity.
- 3.9.12 Behaving in a disorderly, lewd, or indecent manner at the Institute, including, but not limited to, making excessive noise, pushing, and shoving, inciting or participating in a riot, or causing a group disruption.
- 3.10 Students are not permitted to communicate with media representatives on behalf of the Institute or to invite media persons to the campus without the authorization of the Institute management.
- 3.11 Without prior authorization, students are not permitted to capture audio or video lectures in classes or the behaviors of other students, instructors, or staff.
- 3.12 Students are not permitted to supply media with audio or video clips of any campus activity without prior approval.
- 3.13 Students are required to use social media properly and with caution. They are prohibited from making negative comments about other Institute employees on social media or engaging in any other activity that could harm the Institute's reputation.
- 3.14 Unauthorized entry, use, tampering, etc. of Institute property or facilities, private residences of staff/professors, offices, classrooms, computers networks, and other restricted facilities, as well as interference with others' work, is punishable.
- 3.15 Any damage to or destruction of Institute property or the property of others on Institute grounds.
- 3.16 Without the person's knowledge and explicit agreement, making a video/audio recording, taking pictures, or streaming audio/video of any person in a location where the person has a reasonable expectation of privacy.
- 3.17 Harassment, which is defined as harsh and objective behavior motivated by a person's race, color, national or ethnic origin, citizenship, sex, religion, age, sexual orientation, gender, gender identity, marital status, ancestry, physical or mental disability, or medical condition.



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4 If there is a case against a student for a probable breach of code of conduct, then a committee will be constituted to recommend a suitable disciplinary action who shall enquire into the alleged violation and consequently indicate the action to be taken against the said student.

The committee may meet with the student to determine the extent of the misbehavior and recommend one or more of the disciplinary actions listed below, depending on the severity of the misconduct.

4.1 WARNING- Indicating that the delinquent student's actions were in breach of the Code, and that any future acts of misbehaviour will result in serious disciplinary punishment.

4.2 RESTRICTIONS - Reprimanding and restricting access to certain campus facilities for a period.

4.3 COMMUNITY SERVICE - For a set amount of time, which may be extended if necessary. Any future wrongdoing, as well as failure to comply with any imposed limitations, may result in severe disciplinary action, such as suspension or expulsion.

4.4 EXPULSION - Permanent expulsion of a student from the Institute, indicating that attending the Institute or participating in any student-related activities or living on campus is prohibited.

4.5 FINANCIAL PENALTY- This could include the suspension or forfeiture of a scholarship or fellowship for a set period.

4.6 SUSPENSION- A student may be suspended for a length of time, preventing them from engaging in student-related activities, classes, or programmes. Furthermore, unless permission is acquired from the Competent Authority, the student will be prohibited from using various Institute facilities. Suspension may be followed by dismissal, as well as the other punishments listed below.

4.7 For a period of three years, you will be ineligible to reapply for admission to the Institute, and

4.8 Withholding the grade card or certificate for the courses studied or work \scarred out.

5 APPEALS:

If a delinquent student feels he or she has been wronged by the application of any of the above punishments, he or she may file an appeal with the Principal. The Principal may decide on one of the following:

5.1 Accept the committee's proposal and impose the punishment recommended by the Committee or amend and impose any of the punishments stated in this Code that are appropriate with the degree of the proven wrongdoing. Or

5.2 Recommend the case to the committee for further consideration.



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In all circumstances where there is a potential for student misconduct, the Director's decision is final and binding.

6 ACADEMIC INTEGRITY

The Institute values academic integrity and is devoted to building an intellectual and ethical environment based on academic integrity principles as a top institution for advanced scientific and technology research and education.

Academic integrity includes honesty, accountability, and awareness of ethical standards for study and scholarship. The Institute believes that the ideas and contributions of others should be appropriately acknowledged in all academic work. Academic integrity is critical to the Institute's and its research missions' success, and so academic integrity infractions are a significant offence.

6.1 Purpose and Scope

A. The academic integrity policy, which is an integral aspect of the Code, applies to all students at the Institute, and they are obligated to follow it.

The Policy serves a dual purpose:

- To make the ideals of academic honesty clearer, and
- To give examples of dishonest behavior and academic integrity infractions.

NOTE: These examples are intended to be illuminating rather than exhaustive.

B. Failure to follow these academic integrity principles jeopardizes the Institute's reputation as well as the worth of the degrees issued to its students.

As a result, every member of the Institute community takes responsibility for upholding the highest standards of academic integrity.

C. Academic integrity dictates that a student appropriately acknowledges and references the use of others' ideas, results, materials, or language.

Ensures that all work submitted as his or her own in a course or other academic activity is produced without the use of impermissible materials or impermissible collaboration; properly acknowledges all contributors to a given piece of work; and ensures that all work submitted as his or her own in a course or other academic activity is produced without the use of impermissible materials or impermissible collaboration.

Obtains all data or results ethically and accurately reports them, with no results suppressed that contradict his or her interpretation or conclusions.

Demonstrates ethical behavior toward all other students, respecting their integrity and right to pursue their educational goals without hindrance. This means that a student must not assist others in academic dishonesty or hamper their own academic advancement.



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6.2 Examples of policy violations include, but are not limited to:

(i) Plagiarism Violation:

Plagiarism is defined as the use of someone else's content, ideas, figures, code, or data without properly recognizing the original source. This could include submitting material written by another person or previously published by oneself, directly or paraphrased.

Plagiarism can be defined as:

- (a) reproducing text/sentences from a report, book, thesis, publication, or the internet in whole or in part.
- (b) Reproducing previously published data, illustrations, figures, or images, whether one's own or someone else's.
- (c) Incorporating non-textual material from other sources into one's class reports, presentations, manuscripts, research papers, or thesis without proper attribution, such as graphs, drawings, photographs, diagrams, tables, spreadsheets, computer programmes, or other non-textual material from other sources.
- (d) Self plagiarism which comprises copying verbatim from one's own earlier \published work in a journal or conference proceedings without necessary citations.
- e) Completing a course requirement by submitting a purchased or downloaded term paper or other resources.
- f) Without citation, paraphrasing or modifying an author's words or style.

(ii) Cheating:

Cheating can take many forms, including, but not limited to:

- (a) Exam copying, as well as copying of homework assignments, term papers, theses, or manuscripts.
- (b) Permitting or enabling copying, making a report, or taking an examination on behalf of another person.
- (c) Using unlawful materials, copying, collaborating without permission, and purchasing or borrowing papers or materials from a variety of sources.
- (d) fabricating (falsifying) data and reporting it in theses and publications.
- (e) Inventing new sources or citations when none exist
- (f) Making changes to previously evaluated work and submitting it for re-evaluation
- (g) Signing an assignment, report, research paper, thesis, or attendance sheet in the name of another student.



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(iii) Conflict of Interest:

In a variety of activities such as teaching, research, publication, serving on committees, research funding, and consultancy, a clash of personal or private interests with professional actions can lead to a potential conflict of interest. Actual professional independence, integrity, and commitment must be protected, as well as the appearance of any impropriety resulting from conflicts of interest.

Conflict of interest is not restricted to personal financial gain; it extends to a vast range of professional academic activities including peer reviewing, serving on numerous committees, which may, for example, monitor financing or grant recognition, as well as influencing public policy.

Potential conflicts of interest must be notified in writing to competent authorities for a thoughtful decision to be made on a case-by-case basis, to promote transparency and boost credibility. In the part below dealing with resources, there is also some more information.

4.3 Academic behavior guidelines are presented here to protect against both negligence and purposeful dishonesty:

(a) For experiments and computational tasks, use suitable procedures. Data should be accurately described and compiled.

b) Save primary and secondary data such as original photographs, equipment data readouts, laboratory notebooks, and computer folders with care. Digital alteration of images/photos should be kept to a minimum; the original version should be maintained for subsequent inspection if necessary, and the changes done should be clearly indicated.

c) Ensure that experiments and simulations are robustly reproducible and statistically analysed. It's critical to be honest about the facts and avoid "cherry picking" (omitting some data pieces to produce an outstanding statistic).

d) Laboratory notes should be kept in bound notebooks with printed page numbers so that they can be checked later for publication or patenting purposes. Each page should have a date on it.

e) Use your own language to write clearly. It is vital to resist the temptation to "copy and paste" from the Internet or other sources for class tasks, manuscripts, and thesis.

f) Cite prior reports, methodologies, computer programmes, and other sources appropriately. It's also a good idea to cite material from your own published work; otherwise, it'll be regarded self-plagiarism.

6.3. Individual and Collective Responsibilities: Responsibilities differ depending on the role played.

a) Student responsibilities:



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Before submitting a thesis to the department (B.Tech, M Tech), the student is responsible for reviewing the thesis for plagiarism using proper tools. Furthermore, the student must guarantee that he or she is aware of the Institute's academic norms, that the paper has been examined for plagiarism, and that the thesis is original work. Plagiarism cannot always be detected with a web search. If a student notices or learns of any violations of the academic integrity policy, he or she should report the wrongdoing as soon as possible.

b) Faculty responsibilities:

Faculty members should guarantee that suitable methods for experiments, computations, and theoretical developments are followed, and that data is properly recorded and stored for future reference. They should also thoroughly analyze manuscripts and theses. Faculty members must also ensure personal compliance with the broad principles of academic integrity. Faculty members are expected to inform students in their respective courses about the Institute's academic integrity policy, to ensure minimum academic dishonesty, and to respond appropriately and promptly to academic integrity violations.

c) Institutional responsibilities:

A breach of academic integrity is a serious offence that can result in a variety of sanctions for both the individual and the institute. In the event of a student, the first academic infringement will result in a warning and/or a "F" mark in the course. If a repeat offence is deemed serious enough, it may result in expulsion. Faculty should bring any academic infractions to the attention of the department chairperson. When the Director receives reports of scientific misconduct, he or she may create a committee to review the situation and make recommendations for appropriate action on a case-by-case basis.