MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

Department of Civil Engineering

STUDENT HANDBOOK

R20 – III B.Tech I & II Semester

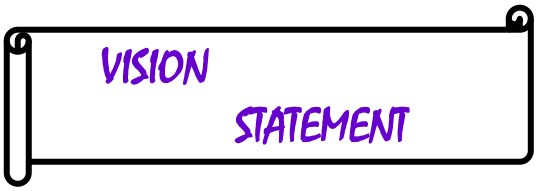
Student Name :……

Register No :……

Class :……..

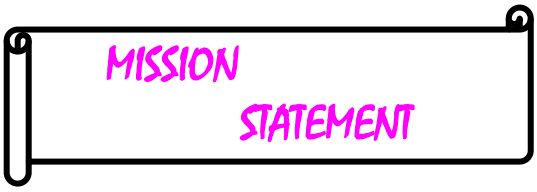
Department :……

Academic Year:……...



VISION STATEMENT OF MLRITM

To establish as an ideal academic institutions in the service of the nation, the world and the humanity by graduating talented engineers to be ethically strong, globally competent by conducting high quality research, developing breakthrough technologies, and disseminating and preserving technical knowledge.



MISSION STATEMENT OF MLRITM

MLR Institute of Technology and Management is committed to providing a positive, professional and conducive learning environment where all students are inspired to achieve their potential and strive for excellence in a global society as dignified professionals with the cooperation of all stakeholders.

GOALS OF MLRITM

Goals of engineering education at undergraduate / graduate level:

- Contemporary and rigorous educational experiences that develop the engineers and managers;
- An atmosphere that facilitates personal commitment to the educational success of students in an environment that values diversity and community;
- Prudent and accountable resource management;
- Undergraduate programs that integrate global awareness, communication skills and team building;
- Leadership and service to meet society's needs;
- Education and research partnerships with colleges, universities, and industries to graduate education and training that prepares students for interdisciplinary engineering research and advanced problem solving abilities;
- Highly successful alumni who contribute to the profession in the global society.

Our Pioneers...

MARRI LAXMAN REDDY – CHAIRMAN

Sri **Marri Laxman Reddy**, the Founder Chairman of MLR Institutions – MLR Institute of Technology, MLR Institute of Pharmacy and Marri Laxman Reddy Institute of Technology and Management.

He is also Founder Chairman of St. Martin's Engineering College and St. Martins Schools at Balanagar, Chintal (HMT) and Malkajgiri who has been in the field of education from last 22 years with the aim spreading quality education among children at the school and college level. He is a veteran Athlete International repute.

MARRI MAMATHA REDDY – TREASURER

Mrs. **Marri Mamatha Reddy**, a person with remarkable abilities and great acumen and a dynamic leader. She is known to be the dynamic mentor of MLR Institute of Technology and Management who is always on the sprit to take the institute to newer levels in every aspect of an "Ideal Institution" and strives hard to make every dream a reality.

The treasurer has a vision of establishing MLR Institute of Technology and Management as a brand. She is striving hard to initiate various industry oriented programs for the benefit of the students and he envisions her student to be present at the top most position in the industry**.**

Dr. K. VENKATESWARA REDDY – PRINCIPAL

Dr.K.Venkateswara Reddy, M.Tech., Ph.D., MISTE, the Principal, Marri Laxman Reddy Institute of Technology& Managemnt, is a young and dynamic Professor of CSE, has 15 years of Teaching, Research and Administrative experience in reputed engineering colleges & industry. In 15 years of experience served various positions from Asst. Professor to Principal. He received "The Great Mind Challenge - 2013, TGMC Mentor Award".

Dr.K.V.Reddy contributed immensely for the growth of institutes by introducing the disciplinary innovative in the life style of under graduate engineering students. He has established Institute-Industry Interaction and Research & Development cells in the institute.

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Dundigal, Quthbullapur Mandal, R.R. Dist.- 500 043.
Ph: 08418 – 204066, 204088, 9866755166

1. GENERAL INFORMATION

ABOUT THE COLLEGE

The college is situated at Dundigal village, which is located at 11km away from Jawaharlal Nehru Technological University Hyderabad, KPHB Colony Hyderabad. The college started functioning during the academic year 2009-2010, after due recognition from AICTE. This college is affiliated to the prestigious JNT University Hyderabad. MLRITM got the Autonomous status in the academic year 2019-20 by the University Grants Commission (UGC). Though started 10 years back, the college is making biggest strides and marching ahead very confidently for excellent outputs in their future endeavors. At present the college is offering 10 UG courses and 4 PG programmes. The total strength of the college is more than 3000.

1.1 BEAUTIFUL CAMPUS:

Set in Sylvan surroundings away from the hustle & bustle of city life yet only 4 km away from Mahindra Satyam Technology Park on Balanagar – Narsapur state highway, the Institute is extremely conducive to academic, co-curricular and extra-curricular activities. It has large and well ventilated buildings with modern equipment in place and "State of the art", sports facilities.

HIGHLIGHTS:

1.2 PERFORMANCE

The college has been AA rated under colleges in AP by Careers360 magazine. Also, the college has been ranked at 126 by the week magazine in the Best colleges Survey-2013.

1.3 FACULTY:

The College is proud to have the best faculty, a blend of experienced and academics with eminent academicians team from IIT's, NIT's and other reputed universities and organizations teaching at the Institute that makes MLRITM as one of the best Autonomous Institute to pursue B.Tech, M.Tech, and MBA courses affiliated to JNTU Hyderabad. The faculty is constantly encouraged to upgrade their skills & qualifications and most of them have enrolled their Ph.D. Most of the faculty

members have been empowered with High Impact teaching under Wipro Mission 10X program.

1.4 INFRASTRUCTURE:

The Institute is housed in a RCC Building with a built up area of Three Lakh Sft in 5.2 Acres and have centralized air conditioning Auditorium, Seminar Halls and a Central Library. A good canteen caters hygienic food and a fleet of buses running from all important points to bring the students to the college. Accessibility of HDFC Bank ATM within the Campus is to enable students and faculty to withdraw cash at anytime.

1.5 LABORATORIES:

The Institute has State of the art laboratories with 1000 plus Branded Systems equipped with latest hardware and software with online testing facility catering to the needs of CSE, IT, DS, CS, CSIT. The Institute also has well equipped Electronic Labs, Civil Engineering Labs and Workshops for ECE, Mechanical and Civil Engineering Students.

1.6 CAT Centre:

The Institute is an Authorized IIM Cat Centre, which will conduct tests all through the year as per the IIM schedule.

1.7 COMMUNICATION SKILLS LABORATORY:

The Institute has established Ultramodern Computerized English language laboratory with 60 plus Computer Systems loaded with latest Software to enhance the Soft skills of Students to make the Students Industry ready.

The Library also have the previous University Exam Question papers and previous project reports from all the departments. The library contains recorded lectures of all IIT professors from NPTEL.

1.8 R&D CELL:

The Institute has an R&D Cell under the guidance of Dr.G.Narsinga Rao. The R&D cell undertakes externally funded R&D projects from agencies like AICTE, DST, UGC and other similar state, private and society/trust bodies. It also undertakes research publications and interactions of faculty members with outside world.

1.9 LIBRARY:

The Institute Library has over 26427 books and 120 National and International journals that are required to all branches of Engineering. The Institute has the unique distinction of becoming Member of DELNET that connects more than 700 libraries in Asia Pacific Region. The Library has 20 Computers with 10 MBPS, Internet Facility that makes our knowledge Savvy Students to be technically competent on par with Industry professionals.

1.10 NATIONAL PROGRAMME ON TECHNOLOGY ENHANCED LEARNING (NPTEL):

The main objective of NPTEL program is to enhance the quality of engineering education in the country by developing curriculum based video and web courses. This is being carried out by seven IITs and IISc Bangalore as a collaborative project. In the first phase of the project, supplementary content for 129 web courses in engineering / science and humanities have been developed. Each course contains materials that can be covered in depth in 60 or more lecture hours. In addition, 110 courses have been developed in video format, with each course comprising of approximately 60 or more one-hour lectures. In the next phase other premier institutions are also likely to participate in content creation.

1.11 CO-CURRICULAR ACTIVITIES:

The Institution organizes Local Industrial Visits to Organizations like DOORDARSHAN, BSNL, and to Student Conferences like Valourous, Student Conference at INFOSYS, Gachibowli Campus, and Government Sponsored Summits like INDO SOFT IT Summit at Hitech City Convention Centre to Interface with the Industry for Career Planning and to make them Industry Ready. The Institute focuses on Techno Management Events like Technonium and Zavtra to enhance the Technical Skills and Soft Skills to make them Employable.

1.12 PROFESSIONAL BODIES:

MLRITM have the unique distinction of becoming Institutional Member in professional bodies such as ACCE, MISTE and ACI.

1.13 EXTRA-CURRICULAR ACTIVITIES:

The Institute helps the B.Tech, M.Tech and MBA Students to imbibe Culture, Knowledge and Sportsman Spirit during their Study Period.

The Institution has a Basketball Court, Volley ball Court, Beach Volley ball Court, Cricket Stadium with 400 meter, Excellent track for Athletic Meet and Indoor Stadium for Shuttle Badminton and Gymnasium. MLRITM has been regularly conducting JNTU Zonal Games Football, Cricket, and State level Volleyball Tournaments. The Institute has been awarded as the best organiser for conducting JNTU Zone A Intercollegiate Tournaments by JNTUH. MLRITM is affiliated to Hyderabad Cricket Association (HCA) to play league Cricket Matches. The college has conducted 5K RUN in 2008-09 and south zone Cricket Tournament in 2009-10.The college has been conducting JNTU-H Cricket Tournament I 2010-11.

The Institute also organizes events like Traditional Day, Annual Day, Fashion Shows, Rockshows and other Cultural Events. MLR Institutions has been conducting Traditional Day every year. The purpose of Celebrating traditional day is basically to imbibe a spirit of Oneness, where the First year Students who have joined the Institute shed their Inhibitions, play and dine together with their seniors and recollect the old traditions & glory of the Past.

Apart from that the traditional day is being celebrated with a purpose of removing fear and as a measure of Anti-Ragging activity.

The college has a National Service Scheme (NSS) unit, which conducts a number of programmes viz blood donation camp, tree plantation, community services in the adjoining villages, flood relief, etc.

1.14 IN HOUSE PROJECTS:

The students are taking part in International Project competitions hosted by major MNCs, like IBM, Microsoft and Infosys. The Great Mind Challenge hosted by IBM, Microsoft Imagine Cup and project work as part of foundation programme conducted under the aegis of Infosys are some of the important projects presently being undertaken by the students of MLRITM. Further, the students are encouraged to do In House Projects under the supervision of expect faculty members. In addition, students are encouraged to give innovative ideas and do projects under the aegis of Microsoft academic innovative alliance.

1.15 MEMORANDOM OF UNDERSTANDING:

The Institute has MOUs for student and faculty enhancement programmes with Multi National Companies like

- **IBM -** IBM has established "Center of Excellence" in MLRITM
- **Sun Microsystem Systems -** Student Development Programmes and Certificates
- **Oracle -** Faculty and Student Development Programmes
- **WIPRO: Mission – 10X Programme -** Faculty impact teaching programme
- **CA Labs -** Student and Faculty enablement Programme
- **Infotech -** To enhance the quality of educational experience for student community
- **Mahindra -** Industry Oriented course ware and Technology
- **Institute of Electronic Governance -** Faculty Enablement Programme on "Soft Skills, Technical Skills, Reasoning and Aptitude and Basic Computer Skills".
- **Indo – US Collaboration for Engineering Education** - Faculty Development Programme sponsored by Infosys
- **Microsoft IT Academy -** Student and Faculty enablement programme
- **Microsoft -** Academic Innovative Alliance
- **Infosys -** Foundation Programme for students
- **IIIT, Gachibowli, Hyderabad -** Certification in Information Technology (CIT) for students
- **SAM Technologies -** In house projects in Robotics and Embedded System

1.16 CONTACT INFORMATION:

S. No.	Name	Designation	Contact Number
1	Dr. K. Venkateswara Reddy	Prinicipal	040-29556182
2	Dr. R. Kotaiah	Dean - Academics	08418-255055
3	Mr.K.Nagabhushan	Controller of Examinations	9985795785
4	Mr. D Pavan Kumar	Admin Officer	9866755144
5	Dr. Srinivas Bachu	HOD (E.C.E)	9912712798
6	Dr. R Issac	HOD (E.E.E)	9951166558
7	Dr C Balarangadurai	HOD (C.S.E)	8374530302
8	Prof. K. Abdul basith	Professor in CSE	9160400041
9	Dr. B. Ravi Prasad	HOD (IT)	9849356732
10	Dr. V. VaraLakshmi	HOD (CIVIL)	9160404645
11	Dr. K.Ashok	HOD (H&S)	9160404647
12	Dr.P Nageswar Rao	HOD (MECH)	9490217919
13	Dr. Veeraiah	HOD (MBA)	9160404643
14	Dr S Pratap Singh	Website	9527366149
15	Mr. M.Srinivas Reddy	Library	9849924036
16	Mr. G.B.N Saroj	Transport	9160401744
17	Mr Sumanth	Training and Placement Officer	9849568827
18	Mr D Pavan Kumar	Public Information Officer	9866755144

2. PLACEMENT & HIGHER STUDIES

Marri Laxman Reddy Institute of Technology and Management has a unique distinction of placing their First Batch of B.Tech Students in their prefinal year of Study and MBA Students in Multi National Companies. The Institute has so far interacted with more than 72 Companies and 746 Selections from B.Tech and MBA Programmes have taken Place.

In this direction Apart from the Placements the Institute has arranged Summer Internship Programmes with Companies like Computer Amociates, Mind Tree, M/s Infotech Enterprises Ltd, Mahindra Finance, Max New York Life Insurance, Nokia Ltd, Mahindra Finance, Bajaj Capital Ltd, Reliance Money and Tata AIG for Engineering and MBA Students to develop Mentor Relationships and to get to know about the Work Culture and gain Competencies to make them Industry Ready during their Study period.

The Institute has arranged Campus Recruitment drives Infosys, Mind Tree Ltd, Oracle, ADP, Mahindra Satyam, Infotech Enterprises Ltd, Keane India Ltd (NTT), IBM Technologies Pvt Ltd, Tata Advanced Systems, IBM, Syntel Inc, Tech-Synergy Pvt Ltd, Adithya Software Solutions, HDFC Bank Ltd, Medha Servo drives. NR Radio & Switches Pvt.Ltd. OsiTechnologies Ltd, Genpact, Reliance Money, Nagarjuna Caments Ltd & Oasis Software Informatics, Shoppers Shop, Trident Micro Systems India, SnapDeal.com, India Mart Ltd, Power Tech, Suchir India, Quartz Infra and Engineering Pvt Ltd, Gobrah Technologies Pvt Ltd, Elbit Diagnostics, Eprism Solutions, Geo Meme Strategic Consulting, India Info Line, Water Shed project of Govt of AP, Ocean Ship Maritime etc.

The CSE students visited Infosys Infosys for the SPARK Programme which is an orientation programme on Information Technology Space.

2.1 Industry Grade Skills required for Employment

Behavioral and Communication Skills are recognized as important elements in professional development of an Engineer including English for specific purposes. Employers give considerable value to these diverse set of skills at the time of interviews.

In addition to course curriculum, every student will gain the following skills during the study period:

- Analytical and Problem solving skills
- Subject – specific knowledge
- Research and improved decision making abilities
- Oral communication skills
- Managerial skills
- Understanding of other cultures
- Confidence and competence to work in International environment

As students are the future leaders, the Responsibility, Accountability and exhibiting the leadership skills should start from the first year of engineering. Every student is advised to read / practice from the following books;

- Verbal and Nonverbal by RS Agarwal
- Baron GRE
- Wren and Martin English Grammer Book

2.2 Important criteria of Employment

In addition to the industry grade skills required for employment, the most important criteria for employment is that the student should get a minimum of 60% in academics with no backlogs to make them eligible for campus recruitments. In the recent past, many companies stipulated a cut of 68% for attending the interview / writing the test. Every student should Endeavour to achieve a minimum of 68% with no backlogs to make them suitable for picking up by good companies.

Job Portals:

1. www.freshersworld.com
2. www.monster.com
3. www.naukri.com

2.3 Higher Studies

M.Tech

The Graduate Aptitude Test in Engineering (GATE) is an all-India examination administered and conducted in eight zones across the country by the GATE Committee comprising faculty from Indian Institute of Science, Bangalore and 23 Indian Institutes of Technology on behalf of the National Coordinating Board - GATE, Department of Education, Ministry of Human Resources Development (MHRD), and Government of India.

Objective

To identify meritorious and motivated candidates for admission to Post Graduate Programmes in Engineering, Technology, Architecture and Pharmacy at the National level. To serve as benchmark for normalization of the Undergraduate Engineering Education in the country.

This provides an opportunity for advanced engineering education in India. An M.E or M.Tech degree is a desirable qualification for our young engineers seeking a rewarding professional career. Engineering students, while in the final year of their degree course, spend considerable time in seeking an opening for studies in foreign universities.

The students are advised to pursue M.Tech in IIT's/NIT's/University Colleges.

MBA

Earning a Master's of Business Administration (MBA) degree can provide you with management skills and business expertise that open new career opportunities to you. An MBA program will also launch you into the much higher pay range that upper level managers and executives enjoy. Furthermore, in the high-level positions, an MBA degree will allow you to hold and your work will often be more interesting and rewarding.

The students are advised to pursue M.BA in IIM's/XLRI/Reputed Business Schools.

Higher Studies Abroad

TOEFL is mandatory for seeking admission in any academic course at any level-undergraduate, graduate or post graduate, in USA and Canada. Similarly UK Universities ask for IELTS for seeking admission to graduate and past graduate courses.

GRE The Graduate Record Examination (GRE) is administered by the Educational Testing Services (ETS) for admission into all graduate academic programs (except management) in universities across USA and Canada and some selected universities across the world including India. The exam is a Computer Adaptive Test and is administered at any of the Sylvan testing centers in the country after prior registration.

The GMAT is a Computer Adaptive Test administered online by Educational Testing Services (ETS) through Sylvan testing centers located in all the major cities in India. Those who wish to enroll for courses in Business Management in American universities have to take the GMAT test and submit their scores to the department.

2.4 Various Scholarships Available In India

Bharat Petroleum Scholarship For Higher Studies | Balarama Digest Scholarship | Central Institute of Indian Languages | Fair & Lovely Foundation - Project Saraswati Scholarships | Government Of India Office of the Director General of Civil Aviation Scholarship | Homi Bhabha Centre For Science Education Tata Institute of Fundamental Research Research Scholarships | HSBC Scholarships | Indian Council Of Agricultural Research Award Of National Talent Scholarship In Agriculture | Indian Institute Of Geomagnetism Research Scholars | Invention Awards For School Children | Indian Oil Corporation Ltd (IOCL) - Scholarships | Jawaharlal Nehru Memorial Fund Jawaharlal Nehru Scholarships For Doctoral Studies | Junior Research Scholarships For Cancer Biology Tata Memorial Centre & Tata Memorial Hospital | Jaigopal Garodia Vivekananda Trust Scholarships | Lalit Kala Akademi - Scholarship | Mahindra All India Talent Scholarships For Diploma courses In Polytechnics | National Brain Research Centre Scholarships | NTPC Scholarships | National Institute Of Science Communication And Information Resources(NISCAIR) | National Board For Higher Mathematics(NBHM) | National Thermal Power Corporation Ltd.Scholarships | National Olympiad Programme | National Level Science Talent Search Examination - 2005 | Narotam Sekhsaria Scholarship Programme | National Brain Research Centre Scholarships, Post Doctoral Fellowships | National Aptitude Test | NIIT National IT Aptitude Test | Oil And Natural Gas Corporation Ltd (ONGC) Scholarships To SC/ST Students | Office Of The Director General of Civil Aviation Scholarships Stipend to the SC/ST Candidates | Rashtriya Sanskrit Sansthan - Scholarships | Scholarships To Young Artistes | Saf-Madanjeet Singh Scholarship | Sports Authority Of India - Sports Scholarships | SAF-Madanjeet Singh Scholarship | Spic Macay Scholarships | The Childrens Foundation - Scholarships | The L&T Build-India Scholarship | The Hindu-Hitachi Scholarships | The Paul Foundation Scholarships | Technology Information Forecsting and Assessment Council(TIFAC) Women Scientist Scholarship Scheme | The Young Talent IT Scholarship The Dr.GB Scholarships Foundation |

2.5 Various International Scholarships Available In India

A * STAR India Youth Scholarship | A.M.M. Arunachalam-Lakshmi Achi Scholarship For Overseas Study | British Chevening Scholarships | Bharat Petroleum - Scholarships for Higher Studies | Cambridge Nehru Scholarships | Commonwealth Scholarship and Fellowship | Czech Government Scholarship | Chevening Technology Enterprise Scholarship Programme | Chinese Government Scholarship | Greek Government Scholarships | Israel Government Scholarship | Iranian Government Scholarship | Offer of Italian Government Scholarship | Japanese Government Scholarships | K.C.Mahindra Scholarships For Post-Graduate Studies Abroad | Lady Meherbai D.Tata Scholarships | Mexican Government Scholarship | Norwegian Government Scholarships | National Overseas Scholarships/Passage Grant for ST Candidates | Portuguese Government Scholarships | Sophia Merit Scholarships Inc | Slovak Government Scholarship | SIA Youth Scholarships | The Rhodes Scholarships India | The Ramakrishna Mission Institute Of Culture Award of Debesh-Kamal Scholarships For Studies Abroad | The Inlaks Foundation - Scholarships |

Website for Higher Studies:

1. www.higherstudyabroad.org
2. www.highereducationinindia.com
3. www.educations.com

3. STUDENT CAREER ORIENTED PROFESSIONAL CERTIFICATION COURSES

As per the career plan for students of MLR Institute of Technology and Management with a view to bridge the gap between Industry and Academia, it has been planned to equip every student with at least three International / National certification by the time he / she completes the course of study. The details of the certification courses are given below:

Branch	Year	Name of the Certification Course
CIVIL Engineering	2nd Year	Certificate in AutoCAD
	3rd Year	Certificate in model bridge
	4th Year	Certificate in STAAD Pro
Computer Science and Engineering / IT / MCA	2nd Year	Certificate Information Technology
	3rd Year	IBM Certified DB2 Database Associate, Infosys Campus Connect
	4th Year	IBM Certified Rational Application Developer
	4th Year	SUN Certified Java Programmer
Electronics and Communication Engineering	2nd Year	Institute of Electronics and Telecommunication Engineering
	3rd Year	Motorola @ CAMPUS
	4th Year	IBM Certified DB2 Database Associate
Mechanical Engineering	2nd Year	Certificate in AutoCAD
	3rd Year	Certificate in HighPerMesh
	4th Year	Certificate in CATIA

3.1 Help Desk

The college has set up a Help Desk for Career Guidance and overseas education. The aim of the Help Desk is to provide a platform for the students to choose the Right Destination. The students can reach the Help Desk in person or through mail at email id helpdesk@mlrinstitutions.ac.in

4. PERFORMANCE MONITORING AND GUIDANCE

4.1 Student Feedback

In case the students find it difficult to cope up / understand a particular subject, they are advised to discuss it with

a. The Concerned Teacher
b. The Class Teacher
c. The Department Head
d. The Principal

Students can use the suggestion boxes for communicating feedback. Students should mention their names so that they can be informed of the progress / more details / clarifications can be obtained.

4.2 Class Teacher

Every class is assigned a Class Teacher (a faculty member). Students can directly discuss their college related or personal problems related to studies with them. The Class Teachers are accessible to the students and they can talk to the Class Teacher or whenever they are free from class / lab work. Class Teacher will meet with the class representative on daily basis to discuss their day-to-day difficulties if any.

4.3 Class Representatives and their roles

Two students from each class are selected as the Class Representatives from the department basing on their academic performance and discipline. Department Head makes the selections.

Responsibilities of the Class Representatives:

- Collection of MIS format from Class Teacher daily.
- Communicating the departmental / college directives & information to the students.
- Collecting the feedback of difficulties faced by the students and communicating Suggestions for improvements.
- Coordinating academic events and co-curricular activities.
- Encourage students to interact for better studies, sharing books and notes.
- Compilation and submission of MIS form to class teacher at the end of the period.

4.4 Performance Counseling

One counselor is assigned to a group of 20students. Students can directly discuss their college related or personal problems related to academics with them. The Counselors are accessible to the students and they can talk to them, whenever they are free from class / lab work. Counselors will interact with the students once in a fortnight and discuss the progress.

Mentors will evaluate the student individually for the following:

- Less marks in internal exams
- Continuous absence (3 days) and shortage of attendance
- Not understanding the subject
- Students from Telugu medium
- Assistance for back log subjects etc.
- Communication with parents
- Provide help to back log students

4.5 Remedial Classes / Tutorial / Revisions

Remedial Classes are conducted for students who are weak and who do not perform well in their internal examinations / class tests or for the students who want extra help. Slots in the time table have been reserved for Tutorial where in the students are helped to solve the question in the class itself.

4.6 Backlog Management

The Mentors maintain a complete record of Examination results of each student and they counsel and guide them in preparing for backlogs. Students are provided with material and important questions are discussed.

4.7 Correspondence with parents

Parents will be informed about the performance of their ward from time to time in the semester. However, parents are requested to be in touch with the Student mentor / Department Head on a regular basis. Further, parents are sent sms on daily bases if their wards do not attend the college.

5. RULES AND REGULATIONS FOR STUDENTS

5.1 Administrative:

1. Students, admitted into this College, are deemed to have agreed to the rules and regulations of the college, as laid down by the College Authorities from time to time, and the rules lay down in this leaflet, issued at the time of admission.
2. Students should inform **any changes in the addresses/Phone No.** of their parents / guardians to the college office.
3. The college shall communicate to the parents \ guardians of the students from time to time regarding the regularity and performance in the examinations of their wards. The case of serious indiscipline on the part of the students (s) may also be communicated to parent (s) \ guardian (s).

5.2. Academic:

1. Students should **attend the classes in - time**. Late- comers shall not be permitted to enter the class room and they are likely to **loose the attendance**.
2. Students are expected to be regular to the classes. The students shall not absent themselves for classes without prior approval. **Prior permission** shall be taken from concerned **counselor** and submitted to the **Head of the Department**.
3. In case of **ill-health**, the student should submit the **medical certificate** along with prescription, etc., from a **registered medical doctor**. The student should get the medical certificate within **two days** from the date of reporting to the college after ill health and also produce a **letter from Father/ Mother** regarding ill-health. Permission on medical grounds shall not be granted for one or two days.
4. The students should come to the laboratories with the **prescribed uniform**.
5. If a student **disturbs the class** or makes mischief, he / she will be marked absent and may be **expelled from the class**.
6. Students shall spend their **leisure time** in the library/computer center.
7. Students are expected to put up the **minimum aggregate percentage of attendance (75%)** as laid down by the JNT University. Students, falling short of 75% of attendance shall not be promoted to the next Semester \ Class.
8. Parents \ guardians of the students can contact the college authorities either in person or by post regarding discipline, regularity in attending classes, performance in the examinations, etc., of their wards.

5.3 Dress Code:

1. Students are expected to attend the college **properly dressed**. They should wear the prescribed uniform while attending laboratory classes.
2. Students are expected to **carry the identity cards**, issued by the college, in the campus. They are required to show the identity cards at the library, computer center, office, etc. Students without Identity Cards are not allowed in to the laboratory classes.

5.4 Discipline & Punctuality:

1. No student shall **enter or leave** the class room **without the permission** of the teacher.
2. **Calling students** out of their class rooms while the lecture is in progress is prohibited.
3. Students are required to help in keeping the rooms, buildings, and premises **clean and tidy**. Writing or sticking up of posters and notices on the walls is strictly prohibited.
4. Smoking, Consumption of alcohol, intoxicating drinks or drugs is **strictly prohibited** in and around the college premises. Those indulging in such activities will be put severely or expelled.
5. Students are expected to behave well with the staff, other students and the general public. Any **misbehavior**, coming to the notice of the college authorities, will be severely dealt with.
6. The conduct of the students should be exemplary not only within the premises of the college but also outside. This will help in maintaining the **image and status** of the college.
7. Students are required to **observe silence** at all times in the college campus. They shall not talk in loud tone or call each other by shouting.
8. Students are **prohibited** from loitering in the verandahs / campus during class hours, and sitting on the steps, stair-cases or parapet walls.
9. Students are **not permitted** to resort to strikes and demonstrations within the campus. Participation in such activity entails their dismissal from the college. Any problem they face may be represented to the Counselor / Head of the Department / Principal.
10. Students are **prohibited carrying Cell Phones** and organizing any meeting or entertainment in the college campus without the permission of the college authorities.
11. The entry of **outsiders without permission** is prohibited. Any student found responsible for bringing outsiders into the campus for settling personal disputes with other students, shall be **expelled** from the college.
12. The college is entitled to take any **disciplinary action**, which is deemed necessary in the case of any indiscipline on the part of the students. The same will be reflected on the **Conduct Certificate** issued at the time of leaving the college.
13. No Student Unions, except **Professional Associations**, are **permitted** in the college.
14. If the students cause any **damage to the college property** knowingly or unknowingly individually or in a group they have to pay **5 times to cost of property** damaged them. All the students are collectively responsible for the proper maintenance college property i.e. building, furniture, lab equipment, garden, playgrounds, etc., recovery, calculated on semester to semester basis, will be collected along with examination fee for the semester.
15. Students should keep their **vehicles** only at the **parking place allotted** for the purpose. Vehicle riding in the campus is strictly prohibited.

16. Sitting on the parapet wall and Riding beyond the **parking limits**, the fine will be imposed to Rs.100.00
17. Breakage or loss of equipment /property as decided by the appropriate authority
18. The Principal/Director may, on the recommendation of the Head of the Department, or otherwise, inflict the **following punishments** in the interests of the student discipline and the Institution: fined, curtailment attendance, denial of promotion to next semester, suspension, expulsion or such other action as deemed necessary for the maintenance of discipline in the campus.

5.5. Lab Classes:

All students must attend lab classes without fail. Those absent shall follow this procedure laid down in the prescribed format explaining valid reasons and obtain permission to attend the future classes.

5.6 Fee:

1. All students admitted into this college, will be required to pay the prescribed tuition fee and other specified fees. Failure of the same will result in the cancellation of admission. No portion of fees will be refunded under any circumstances. If any student wishes to change the college or discontinue the course at any point for any reason, he \ she shall not be permitted to do so unless he \ she pays balance amount of four years fees which he \ she would have to pay, if he \she continued till the completion of the course. His \ Her original certificates including I.e., etc., will be issued only after all the dues as stated above, are cleared by the students. All senior students must pay the college fee every year on or before the 15th of July irrespective of the reopening of the college. If they fail the fine will be imposed as per norms of the management.
2. Miscellaneous fee paid for expenditure related to training programs i.e., technical or soft skills etc., is not refundable.
3. Other than the above, if any fees are levied by the University the student has to be pay the same.

5.7. Transport:

All students who are availing the college bus facility must carry the bus-pass and must produce when demanded, failing which they will not allowed to travel in the bus. All students must travel in the allotted bus and routes. They should not change but occupy only their allotted seats throughout. Unauthorized students caught in the bus for not having the bus pass, should pay even if they traveled for one day also. First and second year are not allowed to bring two-wheelers.

5.8. Library Rules

1. Library Books will be issued for 15 days time and renewal depends upon the demand of the book.
2. Silence should be strictly maintained in the library.

3. Students are responsible for the library borrower card issued to them. Loss of the library card should be reported in writing to the circulation section immediately. Duplicate library borrower card will be issued on payment of Rs.150/- after a week time from the date of application for duplicate cards.
4. The Library borrower card is not transferable.
5. **Library books must be returned on or before the due date. Any student failed to do so, 1st week –Rs.1/-per day/per book, 2nd week – Rs.2/-per day/per book and 3rd week –Rs.3/-per day/per book penalty will be imposed From 4th week-Rs.5/-per day/per book penalty will be imposed.**
6. Students shall not make any sort of conversation in any part of the library, causing inconvenience to others.
7. Students shall not bring their belongings inside the library and should keep them outside the library.
8. Students leaving from the library should be checked at the exit.
9. Tearing of pages/stealing of books will invite suspension from using of the library facilities and further disciplinary action will be taken against such students, as per college norms.
10. The borrower shall replace the **New book within 7 days, otherwise, he/she has to pay 3 times of the book cost, along with fine**. In case of lose of book.

5.9. General:

1. All the students admitted in this college have to give an **undertaking** to abide by the **rules and regulations** of this college in prescribed format given by the college.
2. All the students **should attend** the college after vacations (Dasara / Sankranthi / Christmas / Semester term / summer) on the **re-opening day** without fail.
3. Students must **deposit all the relevant original certificates and documents** at the time of the admission Office and they will not be returned until completion of the course.
4. Admission of any student can be cancelled by the Management at any point during the course for reasons which are not in consonance with the rules and regulations and which are detrin the reputation of the college.
5. All the Students are here by informed that **college authorities will not take any responsibility** for **loss or theft of your valuable items and money** kept in your bags or some where else. Hence I request all the students are not to keep your valuables in class room or anywhere without your presence.
6. **Fee For Issue Of Duplicates**

a) Duplicate Hall ticket	Rs. 100.00
b) Duplicate Identity Card	Rs. 100.00
c) Duplicate College Bus Pass	Rs. 50.00
d) Duplicate Study Certificate for same purpose	Rs. 50.00
e) Xerox copies of OD's	Rs. 50.00

All Breakage etc., penalties will be displayed on the Notice Board, and must be paid by the student and no student will be allowed to write examination or internal test or

laboratory test, if penalties are not paid by the due date specified in the notice or circular.

5.10. Ragging

Ragging in any form inside or outside the college campus is banned/Prohibited vide Ragging Act 26 of AP. legislative Assembly 1997. Those who indulge in this uncivilized activity are liable for severe disciplinary actions besides being liable for prosecution.

SALIENT FEATURES

Ragging means doing an act which causes or is likely to cause insult 'or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student.

S. No	Nature of Ragging	Punishment
1	Teasing, Embarrassing and Humiliating	Imprisonment Upto 6 Month or Fine Upto Rs 1000/- or Both.
2	Assaulting or using criminal Force or criminal intimidation	Imprisonment Upto 1 Year or Fine Upto Rs 2000/- or Both.
3	Wrongfully restraining or Confining or causing hurt	Imprisonment Upto 2 Years or Fine Upto Rs 5000/- or Both.
4	Causing grievous hurt kidnapping Or raping or committing unnatural offence	Imprisonment Upto 5 Years or Fine Upto Rs 10000/- or Both
5	Causing death or abating Suicide	Imprisonment Upto 10 Years or fine Upto Rs. 50000/- or Both

Note:

1. A student convicted of any of the above offences, will be, dismissed from the college
2. A student imprisoned for more than six months for any of the above offences 'will not be admitted in any other College.
3. A student against whom there is prima facie evidence of ragging in any form will be suspended from the college immediately.

Prohibition of Ragging

1. Ragging is prohibited as per act 26 of AP. Legislative assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the college.
4. Outsiders are prohibited from entering the college premises without permission.
5. All students must carry their identity cards and show them when Demanded.
6. The principal and staff will visit and inspect the rooms at any time.
7. Suspended students are debarred from entering the campus except when required to attend enquiry and to submit an explanation .

6. DEPARTMENT SAILENT FEATURES

6.1 General Information:

The department of civil engineering was established in the academic year 2009-2010 with an intake of 60 students and in the year 2017 it has increased to 120. The Department is offering one M.Tech programme in Structural Engineering with the student intake of 24. The department has received NBA accreditation for 3 years in the year 2019. The department has well qualified and experienced faculty and has potential for doing consultancy works like water quality testing, designing of building plans, soil testing and concrete testing etc. to the farmers and industries. The department has in forefront in arranging export lectures faculty drawn from reputed institutions like Jawaharlal Nehru Technological University Hyderabad (JNTUH), Andhra Pradesh State Remote Sensing Application Centre (APSRAC), Osmania University (OU) etc. The department is well known for it's technical excellence and modern infrastructure facilities such as latest version of software and highly sophisticated instruments

6.2 Vision

The Civil Engineering department strives to impart quality education by extracting the innovative skills of students and to face the challenges in latest technological advancements and to serve the society.

6.3 Mission

Civil engineers know that they cannot rest on their laurels. Current trends pose questions about the future of their profession. These questions address the role that the civil engineers have to play and could play in society, towards the integrity of the world's infrastructure. Hence the mission of the Department of Civil Engineering is

- M-I Provide quality education and to motivate students towards professionalism.
- M-II Address the advanced technologies in research and industrial issues.

6.4 Programme Educational Objectives

The Programme Educational Objectives (PEOs) that are formulated for the civil engineering programme are listed below:

PEO-I solving civil engineering problems in different circumstances

PEO-II Pursue higher education and research for professional development.

PEO-III Inculcate qualities of leadership for technology innovation and entrepreneurship

6.5 Programme out comes

The Civil Engineering Department Faculty, students, and industry advisory board have adopted the Engineering Criteria outcomes and have defined specific outcomes to be achieved by the civil engineering students. Those outcomes are:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

6.6 Highlights

- Focus on industry oriented teaching to bridge the gap between industry demands and course curriculum.
- Department Started the student hapters and professional bodies memberships with ICE(Institute of civil Engineering) Association of consulting Civil Engineers (ACCE) and Indian Association of Structural Engineers (IASE),
- The department has the faculty from NITs, and Professors who have done their PhD from other universities, among all two are pursuing their Ph.D.
- Department has got strong research oriented team and focuses on publishing research based papers in international journals/Conferences.
- Department stresses on academic growth of student/faculty by conducting conferences/workshops/seminars in collaboration with IIT Delhi.

6.7 Laboratories

Department of civil engineering is fully equipped with modern laboratories to cater the needs of civil engineering programme. The Department contain the following laboratories

1. Surveying Laboratory
2. Strength of Material Laboratory
3. Engineering Geology Laboratory
4. Fluid Mechanics and Hydraulic Machinery Laboratory
5. Computer Aided Drawing and Design Laboratory
6. Geotechnical Engineering Laboratory
7. Concrete Technology Laboratory
8. Advanced Concrete Technology Laboratory (M.Tech Structures)
9. Structural Design Laboratory
10. R&D Laboratory

Rules for Laboratory:

a. Equipment in the lab for the use of student community. Students must use the equipment with care. Any damage caused is punishable.
b. Students should carry their observation book along with the record book with completed exercises/ calculations while attending the lab.
c. Students are supposed to occupy the experiment setup allotted to them and maintain discipline in the lab.
d. Labs can be used in free time / lunch hours by the students with prior permission from the lab in-charge.
e. **30 marks are awarded for continuous evaluation in the laboratory.**
Lab records need to be submitted on or before date of submission

6.8 CONSULTANCY SERVICES

The Department has potential to take up the consultancy in the areas such as Water quality monitoring, concrete technology, Surveying, Strength of material, Geo technology etc.

7. ACADEMIC REGULATIONS OF R20 FOR B.TECH. (REGULAR)

(Effective for the students admitted into I year from the Academic Year 2020-21 onwards)

7.1. Award of B. Tech. Degree

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

i) The student shall register for 123 credits and secure 123 credits with CGPA ≥ 5 from II year to IV year B.Tech. Programme (LES) for the award of B.Tech degree.

ii) The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

iii) The attendance requirements of B.Tech. (Regular) shall be applicable to B.Tech. (LES).

7.1.1 A student who registers for all the specified subjects / courses as listed in the course structure and secures the required number of 160 credits (with CGPA > 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have **"QUALIFIED"** for the award of B.Tech. Degree in the chosen branch of Engineering selected at the time of admission**.**

7.1.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes**.**

7.1.3 A student with final CGPA (at the end of the under graduate Programme) > 7.50, and fulfilling the following conditions - shall be placed in "**FIRST CLASS WITH DISTINCTION"**. However, he / she

(i) Should have passed all the subjects/courses within four academic years or 8 sequential semesters (i.e., whatever the back log subjects have to clear in or before IV- II Regular examinations) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA > 7.50, at the end of each of the 8 sequential semesters, starting from I year I semester on wards.

(iii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA > 7.5 shall be placed in **"FIRST CLASS".**

7.1.4 Students with final CGPA (at the end of the under graduate Programme) > 6.50 but < 7.50 shall be placed in **"FIRST CLASS"**.

7.1.5 Students with final CGPA (at the end of the under graduate Programme) > 5.50 but < 6.50, shall be placed in **"SECOND CLASS"**.

7.1.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the under graduate Programme) > 5.00 but < 5.50, shall be placed in **"PASS CLASS".**

7.1.7 A student with final CGPA (at the end of the under graduate Programme) < 5.00 will not be eligible for the award of the degree.

7.1.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of **"GOLD MEDAL".**

7.2. Credits

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03+1/03	06	04	04
	02	04	--	--
Practical	03	04	03	02
Drawing	02+03	06	03 06	02 04
Mini Project	--	--	--	02
Comprehensive Viva Voce	--	--	--	02
Seminar	--	--	6	02
Project	--	--	15	10

7.3 Distribution and Weightage of Marks

7.3.1 The performance of a student in every subject / course (including practical"s and Project Stage – I &II) will be evaluated for 100 marks each, with 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End-Examination).

For all Theory Courses as mentioned above, the distribution shall be 30 marks for CIE, and 70 marks for the SEE.

7.3.2 For Theory Subjects:

Continuous Internal Evaluation (CIE):

1. During the Semester, there will be two mid-terms examinations for 30 marks each. Each mid-term examination consists of one subjective paper for 25 marks and assignment/ Technical Presentation/ Micro Projects for 5 marks for each subject.
2. Question paper contains two Parts (Part-A and Part-B.) The distribution of marks for PART- A and PART-B will be 10 marks & 15 marks respectively for UG Programmes.
3. Pattern of the question paper is as follows:

PART–A:

Consists of Ten ***Short answer Questions*** each carrying one mark. The I-Mid-term examination shall be conducted for the 50 % of the syllabus and II-Mid-term examination shall be conducted for remaining 50 % of the syllabus.

PART-B:

Consists of Three questions (out of which students have to answer three questions) carrying five marks each. Each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question). The questions may consist of sub questions also.

• The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

• First Assignment should be submitted before the commencement of the first mid-term examinations, and the Second Assignment should be submitted before the commencement of

the second mid-term examinations. The assignments shall be specified/given by the concerned subject teacher.

• The total marks secured by the student in each mid-term examination are evaluated for 30 marks, and the average of the two mid - term examinations shall be taken as the final marks secured by each student in Continuous Internal Evaluation.

• If any student is absent for any subject of Mid-term examination, an online test (CBT - Computer Based Test) will be conducted for student by the institute.

Semester End Examination (SEE): The Semester End Examination (SEE) will be conducted for 70 marks consisting of Two parts i).**Part - A** for 20 marks ii). Part - B for 50 marks.

Part - A is compulsory question consisting of ten sub questions. Two sub questions from each unit and carry 2 marks each.

Part - B consist of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit may contain sub questions. For each question there will be "either" or choice, which means that there will be two questions from each unit and the student, should answer either of the two questions.

7.3.3 For Practical Courses:

Continuous Internal Evaluation (CIE):

There shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 marks with a distribution of 20 marks for day-to-day evaluation and10 marks for internal lab exam. Two internal practical tests (each of 10 marks) shall be conducted by the concerned laboratory teacher and the average of the two tests is considered.

Semester End Examination (SEE):

SEE shall be conducted for 70 marks with an external examiner and the laboratory teacher concerned. The external examiner shall be appointed by the Chief Controller of Examinations of the college. The external examiner should be selected from the outside college among the autonomous / reputed institutions from a panel of three examiners submitted by the concerned BoS chairman of the Department.

7.4 Attendance Requirements:

7.4.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab) for that semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. **This attendance should also be included in the fortnightly upload of attendance to the University. The attendance of Mandatory Non-Credit courses should be uploaded separately to the University.**

7.4.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the students representation with supporting evidence**.**

7.4.3 A stipulated fee shall be payable for condoning of shortage of attendance.

7.4.4 Shortage of attendance below 65% in aggregate shall in **no** case be condoned.

7.4.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and / or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category. 12

7.4.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class**.**

7.5 Minimum Academic Requirements:

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.7.4.

7.5.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (24 marks out of 70 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing „**C**" grade or above in that subject/course**.**

7.5.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industrial Oriented Mini Project / Summer Internship and seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industrial Oriented Mini Project / Summer Internship, or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar as required in the IV year I Semester, or (iii) secures less than 40% marks in Industrial Oriented Mini Project / Summer Internship and seminar evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such „one reappearance" evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.5.3 Promotion Rules:

S. No.	Promotion Stage	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	1. Regular course of study of first year second semester. 2. Must have secured 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	1. Regular course of study of second year second semester. 2. Must have secured 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	1. Regular course of study of third year second semester. 2. Must have secured 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

8. III YEAR – CIVIL ENGINEERING - COURSE STRUCTURE

III YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2050119	Hydraulics and Hydraulic Machinery	PC	3	0	0	3	30	70	100
2	2050120	Structural Analysis - II	PC	3	1	0	4	30	70	100
3	2050121	Structural Engineering - I (RCC)	PC	3	1	0	4	30	70	100
4	-	Professional Elective - I	PE	3	0	0	3	30	70	100
5	2050010	Business Economics and Financial Analysis	HSMC	2	0	0	2	30	70	100
6	2050174	Fluid Mechanics and Hydraulic Machinery Laboratory	PC	0	0	3	1.5	30	70	100
7	2050175	Concrete Technology Laboratory	PC	0	0	3	1.5	30	70	100
8	2050176	Engineering Geology Laboratory	PC	0	0	2	1	30	70	100
9	2050177	Introduction to Artificial Intelligence	MC	0	2	0	0	-	-	-
Total Credits				**14**	**4**	**8**	**20**	**240**	**560**	**800**

III YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2060122	Hydrology & Water Resources Engineering	PC	3	0	0	3	30	70	100
2	2060123	Transportation Engineering	PC	3	0	0	3	30	70	100
3	2060124	Structural Engineering - II (Steel)	PC	3	0	0	3	30	70	100
4	2060125	Geotechnical Engineering	PC	3	0	0	3	30	70	100
5	-	Professional Elective - II	PE	3	0	0	3	30	70	100
6	-	Open Elective - I	OE	3	0	0	3	30	70	100
7	2060178	Geotechnical Engineering Laboratory	PC	0	0	3	1.5	30	70	100
8	2060179	Transportation Engineering Laboratory	PC	0	0	3	1.5	30	70	100
9	2060075	Advanced English Language Communication Skills Laboratory	HSMC	0	0	2	1	30	70	100
10	2060180	Introduction to Machine Learning	MC	0	2	0	0	-	-	-
Total Credits				**18**	**2**	**8**	**22**	**270**	**630**	**900**

Note: All End Examinations (Theory and Practical) are of three hours duration.

T – Tutorial L-Theory P- Practical C – Credits

COURSE OUTCOMES

III YEAR I SEM

COURSE TITLE	COURSE CODE	COURSE OUTCOME
HYDRAULICS AND HYDRAULIC MACHINERY 2050119	CE311.1	Understand the fundamental principles of water conveyance in open channels.
	CE311.2	Analyse the problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
	CE311.3	Apply dimensional analysis and differentiate the model, prototype and similitude conditions for practical problems.
	CE311.4	Understand classification of turbine and assess the efficiency of different turbines
	CE311.5	Understand classification of pumps and identify its efficiency
STRUCTURAL ANALYSIS - II 2050120	CE312.1	Analyse the indeterminate frames with and without sway by slope deflection and moment distribution method.
	CE312.2	Analyse the different types of indeterminate arches.
	CE312.3	Understand the concepts of Muller Breslau principle and draw the influence lines for statically indeterminate beams.
	CE312.4	apply the knowledge of flexibility method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
	CE312.5	apply the knowledge of stiffness method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
	CE312.6	Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames
STRUCTURAL ENGINEERING – I (RCC) 2050121	CE313.1	Understand the fundamentals of reinforced concrete structural properties and behaviors.
	CE313.2	Analyse and Design RCC beams for different loading conditions.
	CE313.4	Analyse and Design one way and two-way slabs with different end conditions for different loading conditions.
	CE313.5	Apply RCC concepts to analyse and design foundations
CONCRETE TECHNOLOGY 2050141	CE314.1	Understand the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different
	CE314.2	Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
	CE314.3	Apply the use of various chemical admixtures and mineral additives to design cement-based materials with tailor-made properties

	CE314.4	Apply advanced laboratory techniques to characterize cement-based materials.
	CE314.5	Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.
BUSINESS ECONOMICS AND FINANCIAL ANALYSIS 2050010	CE315.1	Recognize financial statements, their importance and
	CE315.2	Analyse the elasticity and Demand
	CE315.3	Analyse demand, supply, production, cost, market structure, pricing aspects are learnt.
	CE315.4	Make optimal engineering investment decisions.
	CE315.5	Understand major principles of financial accounting, cost accounting and financial management.
FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY 2050174	CE316.1	Describe the basic measurement techniques of fluid mechanics and its appropriate application
	CE316.2	Interpret the results obtained in the laboratory for various experiments
	CE316.3	Discover the practical working of Hydraulic machines-different types of Turbines, Pumps, and other miscellaneous hydraulics machines
	CE316.4	Compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions
	CE316.5	Identify characteristics of different turbines
	CE316.6	Write a technical laboratory report
CONCRETE TECHNOLOGY LABORATORY 2050175	CE317.1	Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests
	CE317.2	Recognize the effects of the rheology and early age properties of concrete on its long-term behaviour
	CE317.3	Recognize the effects of the rheology and early age properties of concrete on its long-term behaviour
	CE317.4	Use advanced laboratory techniques to characterize cement-based materials
	CE317.5	Perform mix design for a given set of conditions
	CE317.6	Understand engineering properties of special concretes such as high performance concrete, self-compacting concrete, and fibre reinforced concrete
ENGINEERING GEOLOGY LABORATORY 2050176	CE318.1	Understand the method and ways of investigations required for Civil Engineering projects
	CE318.2	Understand different classification of rocks
	CE318.3	Identify the various rocks, minerals depending on geological classifications
	CE318.4	Know the physical properties of minerals
	CE318.5	Know the topographical features from geological maps

	CE318.6	Understand folds, faults and unconformities
INTRODUCTION TO ARTIFICIAL INTELLIGENCE 2050177	CE319.1	Understand artificial intelligence concepts/algorithm in construction
	CE319.2	Apply various Algorithms involved in artificial intelligence for Civil applications
	CE319.3	Appy of algorithms in design of structural elements

III YEAR – II SEM

COURSE TITLE	COURSE CODE	COURSE OUTCOME
HYDROLOGY & WATER RESOURCES ENGINEERING 2060122	CE321.1	Understand various components of hydrologic cycle
	CE321.2	Evaluate various runoff measurements technique
	CE321.3	Apply the concepts of movement of groundwater beneath the earth
	CE321.4	Apply the knowledge of various irrigation techniques
	CE321.5	Use components of designing unlined and lined irrigation canals
TRANSPORTATION ENGINEERING 2060123	CE322.1	Understand highway planning, development and geometric design
	CE322.2	Determine the traffic volume and design of traffic signals
	CE322.3	Design intersections and prepare traffic management plans
	CE322.4	characterization of Highway material and maintenance
	CE322..5	develop Intelligent Transport System Planning and
STRUCTURAL ENGINEERING – II (STEEL) 2060124	CE323.1	Design bolted and welded connections
	CE323.2	design laterally supported and unsupported beams
	CE323.3	Design tension and compression member.
	CE323.4	Design lacings and battens
	CE323.5	Design roof trusses and purlin
GEOTECHNICAL ENGINEERING 2060125	CE324.1	Classify the soil and assess the engineering properties, based on index properties
	CE324.2	Understand the stress concepts in soils
	CE324.3	Analyze stress distribution, consolidation in soil and identify the settlement in soils
	CE324.4	Determine the shear strength of soil
	CE324.5	Design of both finite and infinite slopes.

PRESTRESSED CONCRETE 2060148	CE325.1	Understand principles of prestressing
	CE325.2	Understand the method and system of prestressing and evaluate losses of prestressing
	CE325.3	Analysis of section for flexure and shear
	CE325.4	Understand the **Transfer of Prestress in Pretensioned Members**
	CE325.5	Analysis of composite beam and deflection
AIR AND NOISE POLLUTION CONTROL 2060101	CE326.1	Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality
	CE326.2	identify meteorological aspects of air pollution dispersion
	CE326.3	evaluate the ambient air quality samples with standards
	CE216.4	understand the reasons and process for gaseous contaminants
	CE326.5	understand the reasons and process for noise pollution
GEOTECHNICAL ENGINEERING LABORATORY 2060178	CE327.1	Classify and evaluate the behavior of the soils subjected to various loads
	CE327.2	Determine the atterberg limits
	CE327.3	Determine specific gravity of soil
	CE217.4	Evaluate permeability of soil
	CE327.5	Determine coefficient of consolidation
	CE327.6	Apply direct and vane shear test
TRANSPOTATION ENGINEERING LABORATORY 2060179	CE328.1	Determine crushing, abrasion and impact value of Highway materials
	CE328.2	Determine specific gravity and water absorption of Highway materials
	CE328.3	Determine Flakiness and elongation Indices of coarse Aggregates
	CE328.4	Identify ductility value of bitumen
	CE328.5	Identify Softening Point value of bitumen
	CE328.6	Determination of Traffic Volume and parking studies
ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY 2060075	CE329.1	Self-instructional, learner friendly modes of language
	CE329.2	Learn better pronunciation through stress on word accent, intonation, and rhythm.
	CE329.3	Train them to use language effectively to face interviews, group discussions, public speaking.
	CE3294	Initiate them into greater use of the computer in resume preparation, report writing, format making etc
	CE329.5	Team building and Leadership qualities through their communicative competence

2050119 - HYDRAULICS AND HYDRAULIC MACHINERY

B. Tech. III Year I Sem **L T P C**
Prerequisites: Fluid Mechanics **3 0 0 3**

Course Objectives: The objective of the course is

1. To define the fundamental principles of water conveyance in open channels.
2. To discuss and analyze the open channels in uniform and Non-uniform flow conditions.
3. To study the characteristics of hydroelectric power plant and its components.
4. To analyze and design of hydraulic machinery and its modeling

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

1. Apply knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
2. Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
3. Apply dimensional analysis and differentiate the model, prototype and similitude conditions for practical problems.
4. Assess different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages
5. Understand classification of turbine and determine the efficiency of different turbines
6. Understand classification of pumps and identify its efficiency

UNIT – I

OPEN CHANNEL FLOW – I

Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient "n". Most economical sections. Computation of Uniform flow, Normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the uniform flow, turbulent flow in open channel and how to measure it
- Measure energy, critical depth

UNIT – II

OPEN CHANNEL FLOW – II

Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the turbulent flow in open channel and how to measure it
- How the flow changed in to rapidly varied flow, and its character

UNIT - III

DIMENSIONAL ANALYSIS AND HYDRAULIC SIMILITUDE: Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – Dimensionless groups. Similitude, Model studies, Types of models.

Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular

Learning Outcomes:

At the end of the unit, students should able to,

- Do dimensional analysis
- Measure the work done and efficiency of vanes

UNIT - IV

HYDRAULIC TURBINES – I: Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

HYDRAULIC TURBINES – II: Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the heads, efficiency of turbines
- Classification and working principles of turbines

UNIT - V

CENTRIFUGAL PUMPS: Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

HYDROPOWER ENGINEERING: Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the concepts and working principles of pumps.
- Classification of hydropower plants and its operations

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai &Co

REFERENCES:

1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.).
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).
4. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
5. Hydraulic Machines by Banga & Sharma (Khanna Publishers).

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Introduction to Open channel flow			
2	1	2	Comparison between open channel flow and pipe flow			
3	1	3	Classification of open channels, Classification of open channel flows			
4	1	4	Velocity distribution. Uniform flow – Characteristics of uniform flow			
5	1	5	Uniform flow – Chezy's, Manning's and Bazin formulae for uniform flow			
6	1	6	Factors affecting Manning's Roughness Coefficient "n".			
7	1	7	Most economical sections. Computation of Uniform flow, Normal depth.			
8	1	8	Critical Flow: Specific energy – critical depth			

9	1	9	Computation of critical depth – Critical, sub critical			
10	1	10	Computation of critical depth – Super critical flows			
11	1	11	Channel transitions.			
12	1	12	PPT			
13	1	13	Active Learning			
14	1	14	Unit Test - 1			
15	2	15	Nonuniform flow - Gradually Varied Flow			
16	2	16	Dynamic equation for G.V.F; Classification of channel bottom slopes			
17	2	17	Classification and characteristics of Surface profiles			
18	2	18	Computation of water surface profiles by Numerical method.			
19	2	19	Computation of water surface profiles by Analytical approaches			
20	2	20	Computation of water surface profiles by Direct step method.			
21	2	21	Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel			
22	2	22	Types, applications of hydraulic jump			
23	2	23	Location of hydraulic jump, Energy dissipation			
24	2	24	Other uses – Positive and Negative Surges (Theory only).			
25	2	25	PPT			
26	2	26	Active Learning			
27	2	27	Unit Test - 2			
28	3	28	Dimensional homogeneity - Introduction			
29	3	29	Dimensional homogeneity - Rayleigh’s method			
30	3	30	Dimensional homogeneity - Buckingham’s pi methods			
31	3	31	Dimensionless groups. Similitude, Model studies, Types of models.			
32	3	32	Application of dimensional analysis			

33	3	33	Model studies to fluid flow problems			
34	3	34	Distorted models.			
35	3	35	BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat vane.			
36	3	36	Hydrodynamic force of jets on inclined and curved vanes			
37	3	37	Jet striking centrally and at tip			
38	3	38	Velocity triangles at inlet and outlet			
39	3	39	Expressions for work done and efficiency – Angular			
40	3	40	PPT			
41	3	41	Active Learning			
42	3	42	Unit Test - 3			
43	4	43	HYDRAULIC TURBINES – I: Elements of a typical Hydropower installation			
44	4	44	Heads and efficiencies – Classification of turbines			
45	4	45	Pelton wheel – working, working proportions, velocity diagram, work done and efficiency, hydraulic design.			
46	4	46	Francis turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design.			
47	4	47	Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design.			
48	4	48	Draft tube – Classification, functions and efficiency.			
49	4	49	HYDRAULIC TURBINES – II: Governing of turbines – Surge tanks			
50	4	50	Unit and specific turbines			
51	4	51	Unit speed – Unit quantity			
52	4	52	Unit power – Specific speed			
53	4	53	Performance characteristics – Geometric similarity			

54	4	54	Cavitation. Selection of turbines.			
55	4	55	PPT			
56	4	56	Active Learning			
57	4	57	Unit Test - 4			
58	5	58	CENTRIFUGAL PUMPS: Pump installation details – classification			
59	5	59	Work done - Manometric head - minimum starting speed			
60	5	60	Losses and efficiencies – specific speed.			
61	5	61	Multistage pumps – pumps in parallel			
62	5	62	Performance of pumps – characteristic curves			
63	5	63	NPSH – Cavitation.			
64	5	64	HYDROPOWER ENGINEERING: Classification of Hydropower plants			
65	5	65	Definition of terms – load factor, utilization factor, capacity factor			
66	5	66	Estimation of hydropower potential.			
67	5	67	PPT			
68	5	68	Active Learning			
69	5	69	Unit Test - 5			

Important Questions:

Unit – 1

Part – A

1. Differentiate between subcritical flow and supercritical flow.
2. What is hydraulic jump?
3. What is Bazin's formula and how is it used ?
4. Classify the hydropower plants and write an explanatory note on different components of the hydropower plants.

Part – B

1. Derive expression for kinetic energy correction factor.
2. Velocity distribution in an open rectangular channel is given by V=3y½ . If the width of the channel is 10 m and the depth of flow is 1m, find the average velocity of the cross section, energy correction factor and momentum correction factor.
3. State and prove the conditions under which the trapezoidal section of an open channel will be most economical.
4. Define hydraulic jump. Explain various types of hydraulic jump. Derive the head loss in hydraulic jump.

5. A triangular channel has an apex angle of 600 and carries aflow with a velocity of 2.0 m/s and depth of 1.25 m. (i) Is the flow sub--critical or supercritical? (ii) What is the specific energy at critical depth?
6. Explain the terms: (i) Hydraulic mean depth. (ii) Wetted perimeter

Unit – 2

Part – A

1. State Rayleigh's method of dimension analysis.
2. What are geometric, kinematic and dynamic similarities?
3. Define the term 'dynamic similarity'.
4. What are the different dimensionless numbers?
5. What is Utilisation factor?

Part – B

1. A gate is to be suddenly dropped into a place closing a rectangular channel 2 m deep and 3 m wide in which 6 cumec of water is flowing at a depth of 1.2 m. Will the water spill over the sides? What will be the velocity and height of surge produced?
2. Explain about different types of forces acting in moving fluid. b) The pressure difference Δp in a pipe of diameter D and length due to turbulent flow depends on the velocity V, viscosity μ, density ρ and roughness k. Using Buckingham's π-theorem, obtain expression for Δp.
3. What do you mean by similitude and what are the different types of similarities that must exist between a model and a prototype
4. Explain Reynold's number, Froude's number and Mach number. Derive expressions for any above two numbers
5. What are different types of dimensionless numbers and explain them?
6. A ship model of scale 1/50 is towed through sea water at a speed of 1 m/s. A force of 2 N is required to tow the model. Determine the speed of ship and propulsive force on the ship, if the prototype is subjected to wave resistance only.
7. Explain the applications to radial flow turbines.
8. Explain about Geometric and kinematic similarities.

Unit – 3

Part – A

1. State the principle of Angular momentum.
2. Explain Hydraulic efficiency, mechanical efficiency and overall efficiency.
3. Explain the following terms: (i) Volumetric efficiency (ii) Overall efficiency
4. Classify different types of turbines according to discharge.

Part – B

1. Show that the force exerted by a jet of water on an inclined fixed plate in the direction of the jet is given by $Fx=\rho\, aV2\, Sin2\, \theta$, where a = Area of the jet, V = velocity of the jet and θ = inclination of the plate with the jet.

2. A jet of water having a velocity of 20 m/sec strikes a curved vane which is moving with a velocity of 9 m/sec. The vane is symmetrical and is so shaped that the jet is deflected through 120 degrees. Find the angle of the jet at inlet of the vane if there is no shock. What is the absolute velocity of the jet at outlet in magnitude and direction and the work done per second per unit weight of water strikings. Assume the vane to be smooth.
3. Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of the jet when the jet strikes at the centre of the semi-circular plate is two times the force exerted by the jet on an fixed vertical plane.
4. A jet of water of 10 cm diameter is discharging under a constant head of 80 m. Find the force exerted by the jet on a fixed plate. Take coefficient of velocity as 0.9.
5. Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.
6. A jet of water of 60 mm diameter strikes a curved vane at its centre with a velocity of 18 m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate to be smooth find: (i) Thrust on the plate in the direction of jet, (ii) Power of the jet, and (iii) Efficiency of the jet.
7. A pelton wheel operates at 630 rpm taking 3 m3/s of water under a head of 256 m with a speed ratio of 0.4g. What is the diameter of the impeller?
8. Differentiate between the impulse turbine and reaction turbine with example.
9. Determine the number of turbines and diameter of runner for a power plant having 40 cumecs inflow, 20 m head. The efficiency of turbine is 85% with the speed of 225 rpm. Assume the specific speed as 250 and speed ratio as 0.8.
10. Write short notes on i) Governing of turbines ii) Water hammer in turbines.

Unit – 4

Part – A

1. Explain about surge tank in turbines.
2. Define specific speed of turbine.
3. Discuss the phenomenon of cavitation? Where and how it occurs in water power plant?
4. Draw different types of draft tube.

Part – B

1. What are the uses of a draft tube? Describe with neat sketches different types of draft tubes. A turbine develops 7355 kW under a head of 24.7 m at 210 rpm. What is its specific speed? Indicate the type of turbine suitable for this purpose. If this turbine is tested in the laboratory where the head of water available is only 7.5 m, what power will it develop at what speed?
2. A pelton wheel has to be designed for the following data. Power to be developed = 6,000 kW. Net head available=300 m; Speed= 550 r.p.m.; Ratio of jet diameter to wheel diameter = 1/10; and overall efficiency = 85 %. Find the number of jets; diameter of the jet; diameter of the wheel ; and the quantity of water required

3. Define the term unit power, unit speed and unit discharge with reference to a hydraulic turbine. And also derive the expression for these terms.
4. A turbine develops 9000 kW when running at a speed of 140 rpm and under a head of 30 m. Determine the specific speed of the turbine.
5. What is draft tube? Derive an expression for the efficiency of a draft tube
6. Define cavitation. What are the effects of cavitation? Give the necessary precaution against the cavitation.

Unit – 5

Part – A

1. Differentiate between single stage and multi stage pump.
2. Define utilization factor and capacity factor.
3. Write a short note on performance curves of a centrifugal pumps.
4. Distinguish between a base load power plant and a peak load power plant.
5. What is NPSH?

PART-B

1. The diameter of an impeller of a centrifugal pump at inlet and outlet are 300 mm and 600 mm respectively. The velocity of flow at outlet is 2.5 m/sec and vanes are set back at an angle of 45 degrees at outlet. Determine the minimum starting speed of the pump if the manometer efficiency is 75%.
2. What are the various applications of Hydroelectric power plant.
3. A centrifugal pump rotating at 1000 rpm delivers 160 liters/s of water against a head of 30 m. The pump is installed at a place where atmospheric pressure is 1×105 Pa(abs.) and vapour pressure of water is 2 kPa (abs.). The head loss in suction pipe is equivalent to 0.2 m of water. Calculate minimum NPSH.
4. Define the static and manometric heads of a centrifugal pump. State the different types of head losses which may occur in a pump installation.
5. A double-acting reciprocating pump, running at 45 rpm, is discharging 0.009 m3 /s of water. The pump has a stroke of 40 cm. The diameter of the piston is 20 cm. The suction and delivery heads are 3 m and 14m, respectively. Find the slip of the pump and power required to drive the pump. Neglect the effect of piston rod area.
6. Classify the hydropower plants and write an explanatory note on different components of the hydropower plants.
7. What is the difference between single stage and multistage pumps?
8. Explain the working of centrifugal pump.
9. A pump storage power plant has a gross head of 300m. The head loss in head race tunnel is 3m. The discharge passing is 4 cumec. The plant efficiency is 90 %. Determine the plant capacity of power generation.

2050120 - STRUCTURAL ANALYSIS - II

B. Tech. III Year I Sem **L T P C**

Pre-requisites: Structural Analysis - I **3 1 0 4**

Course Objectives: The objective of the course is

1. To understand the concepts and principles of analysis, calculate and draw the variation of shear force and bending moment of the structure
2. To analyse the indeterminate arches.
3. To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses.
4. To apply the concepts of matrix analysis for different beams, frames and truss
5. To learn and apply the knowledge of Plastic analysis on beams and rigid frames.

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

1. Analyse the indeterminate frames with and without sway by slope deflection and moment distribution method.
2. Analyse the different types of indeterminate arches.
3. Understand the concepts of Muller Breslau principle and draw the influence lines for statically indeterminate beams.
4. Understand and apply the knowledge of flexibility method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
5. Understand and apply the knowledge of stiffness method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
6. Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames

UNIT - I

SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD

Slope Deflection Method: Analysis of Single Bay – single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams. Elastic curve, Analysis of inclined frames

Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames including side Sway. Analysis of inclined frames.

Learning Outcomes:

At the end of the unit, students should able to

- Understand the concepts behind the analysis of rigid using slope deflection and moment distribution method.
- Analyse the indeterminate frame for different loading condition and draw the SFD and BMD using slope deflection method.
- Analyse the indeterminate frame for different loading condition and draw the SFD and

BMD using moment distribution method.

UNIT - II

ARCHES AND INFLUENCE LINES FOR INDETERMINATE BEAMS

Analysis of two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

Learning Outcomes:

At the end of the unit, students should able to

- Perform the calculation to analyse the two hinged and fixed arches for various loading conditions and find the maximum bending moment, radial shear and horizontal thrust.
- Know the concepts on influence lines and its application
- Understand the Muller Breslau's principle
- Analyse the beams with the redundancy is one for different end conditions

UNIT - III

FLEXIBILITY MATRIX METHOD

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

Learning Outcomes:

At the end of the unit, students should able to

- Understand the redundancy of the beams, concepts and applications of flexibility matrix method.
- Perform the analysis on the continuous beam using flexibility matrix method
- Analyse the pin jointed and rigid jointed frames using flexibility matrix method

UNIT - IV

STIFFNESS MATRIX METHOD

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two)

Learning Outcomes:

At the end of the unit, students should able to

- Understand the redundancy of the beams, concepts, equilibrium conditions and applications of stiffness matrix method.

- Perform the analysis on the continuous beam using stiffness matrix method
- Analyse the pin jointed and rigid jointed frames using stiffness matrix method

UNIT - V

CABLES, SUSPENSION BRIDGES AND PLASTIC ANALYSIS

Cables and suspension bridges: Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

Learning Outcomes:

At the end of the unit, students should able to

- Perform the calculation to analyse the suspension cables and bridges to find out the BM and thrust.
- Know the concepts of elastic and plastic analysis and where the plastic analysis has used.
- Understand the terms of collapse load, shape factor, plastic hinges, upper and lower bound theorem, etc.
- Analyse the structure using plastic theory.

TEXT BOOKS:

1. Basic Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
2. Indeterminate Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
3. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.
4. Vazirani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.
5. R. Vaidyanathan & P. Perumal, Structural Analysis Vol I & II, (Fourth Edition), Laxmi Publications, New Delhi, 2016.
6. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.

REFERENCES:

1. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
2. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004
3. Reddy.C.S, “Basic Structural Analysis”,Tata McGraw Hill Publishing Company,2005.
4. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd.,2011.

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Slope Deflection Method: Analysis of Single Bay			
2	1	2	Single storey Portal Frames by Slope Deflection Method			
3	1	3	Single storey Portal Frames by Slope Deflection Method - Shear force and bending moment diagrams.			
4	1	4	Single storey Portal Frames by Slope Deflection Method - Shear force and bending moment diagrams.			
5	1	5	Single storey Portal Frames by Slope Deflection Method - Shear force and bending moment diagrams.			
6	1	6	Single storey Portal Frames by Slope Deflection Method Including Side Sway.			
7	1	7	Single storey Portal Frames by Slope Deflection Method Including Side Sway.			
8	1	8	Elastic curve, Analysis of inclined frames			
9	1	9	Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames			
10	1	10	Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames			
11	1	11	Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames			
12	1	12	Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames			

13	1	13	Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames including side Sway.			
14	1	14	Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames including side Sway.			
15	1	15	Analysis of inclined frames			
16	1	16	PPT			
17	1	17	Active Learning			
18	1	18	Unit Test - 1			
19	2	19	Analysis of two hinged - parabolic and circular arches			
20	2	20	Analysis of two hinged - parabolic and circular arches			
21	2	21	Analysis of two hinged - parabolic and circular arches - Settlement and temperature effects.			
22	2	22	Analysis of fixed arches - parabolic and circular arches			
23	2	23	Analysis of fixed arches - parabolic and circular arches			
24	2	24	Analysis of fixed arches - parabolic and circular arches			
25	2	25	Analysis of fixed arches - parabolic and circular arches - Settlement and temperature effects.			
26	2	26	Introduction – influence line diagram for SF and BM for two span continuous beam with constant moments of inertia			
27	2	27	Introduction – influence line diagram for SF and BM for two span continuous beam with constant moments of inertia			
28	2	28	Introduction – influence line diagram for SF and BM for two span continuous beam with different moments of inertia			

29	2	29	Introduction – influence line diagram for SF and BM for two span continuous beam with different moments of inertia			
30	2	30	Influence line diagram for SF and BM for propped cantilever beams.			
31	2	31	PPT			
32	2	32	Active Learning			
33	2	33	Unit Test - 2			
34	3	34	Equilibrium and compatibility – Determinate vs Indeterminate structures			
35	3	35	Indeterminacy - Primary structure – Compatibility conditions			
36	3	36	Analysis of indeterminate pin-jointed plane frames			
37	3	37	Analysis of indeterminate pin-jointed plane frames			
38	3	38	Analysis of indeterminate continuous beams			
39	3	39	Analysis of indeterminate continuous beams			
40	3	40	Analysis of rigid jointed plane frames (with redundancy restricted to two).			
41	3	41	Analysis of rigid jointed plane frames (with redundancy restricted to two).			
42	3	42	PPT			
43	3	43	Active Learning			
44	3	44	Unit Test - 3			
45	4	45	Element and global stiffness matrices – Analysis of continuous beams			
46	4	46	Co-ordinate transformations – Rotation matrix			
47	4	47	Transformations of stiffness matrices, load vectors and displacements vectors			
48	4	48	Analysis of pin-jointed plane frames (with redundancy limited to two)			

49	4	49	Analysis of pin-jointed plane frames (with redundancy limited to two)			
50	4	50	Analysis of pin-jointed plane frames (with redundancy limited to two)			
51	4	51	Analysis of rigid plane frames (with redundancy limited to two)			
52	4	52	Analysis of rigid plane frames (with redundancy limited to two)			
53	4	53	Analysis of rigid plane frames (with redundancy limited to two)			
54	4	54	PPT			
55	4	55	Active Learning			
56	4	56	Unit Test - 4			
57	5	57	Cables and suspension bridges: Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads			
58	5	58	Length of a cable - Cable with different support levels			
59	5	59	Suspension cable supports - Suspension Bridges			
60	5	60	Analysis of Three Hinged Stiffening Girder Suspension Bridges.			
61	5	61	Analysis of Three Hinged Stiffening Girder Suspension Bridges.			
62	5	62	Analysis of Three Hinged Stiffening Girder Suspension Bridges.			
63	5	63	Plastic theory - Statically indeterminate structures			
64	5	64	Plastic moment of resistance – Plastic modulus – Shape factor – Load factor			
65	5	65	Plastic hinge and mechanism – collapse load			
66	5	66	Static and kinematic methods – Upper and lower bound theorems			
67	5	67	Plastic analysis of indeterminate beams and frames			

68	5	68	Plastic analysis of indeterminate beams and frames.			
69	5	69	Plastic analysis of indeterminate beams and frames.			
70	5	70	PPT			
71	5	71	Active Learning			
72	5	72	Unit Test - 5			

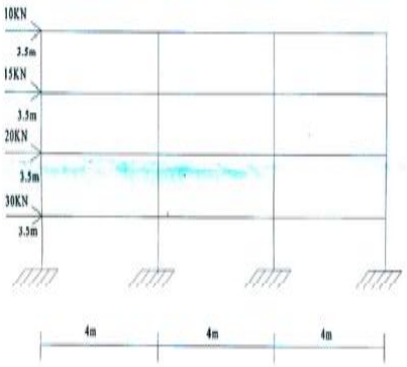
Important Questions:

Unit – 1
Part – A

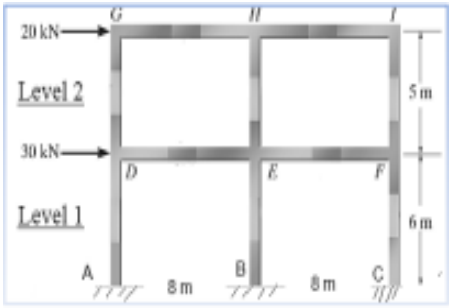
1. Show that a three hinged parabolic arch carrying an udl of 'w' per unit length over the whole span is not subjected to any bending moment at any section.
2. What are the advantages of arch action over the beam?
3. How does the approximate methods useful in preliminary design and analysis?
4. Contrast between the moment distribution and Kani"s methods of analysis.
5. Define Static and Kinematic Indeterminacy with an example.

PART – B

1. A two hinged semicircular arch ABC of radius 20 m carries a load of 100 KN at crown and 80 KN on right hand side and left hand side of arch at an angle 300 from the hinges A and C. Determine the horizontal thrust at each support. Assume uniform flexural rigidity.
2. In a parabolic arch with two hinges how will you calculate the slope of the arch at any point?
3. Analyze the given multi storied structure using portal frame method and draw BMD:



4. Analyze the frame shown in figure, for forces in Top storey by Portal method. Assume that all the columns have equal area of cross-section for the purpose of analysis.



Unit – 2

Part – A

1. What are the various approximate methods used for analysis of Multistoried frames subjected to vertical loads and horizontal loads.
2. Contrast between portal and cantilever methods of approximate analysis
3. When does the stiffness method is more suitable than flexibility method?
4. Mention the process of analyzing the fixed arches
5. What is the effect of Temperature on two hinged arches? Write an expression to find the effect of (rise or fall) temperature in two hinged arch.

Part – B

1. Describe the analysis of a cable subjected to UDL.
2. A light cable of length 20 m is supported at two ends at the same level. The supports are at 16 m apart. The cable supports three loads of 10, 12 1nd 16 KN dividing the 16 m distance in four equal parts. Find the shape of the string and tension in various portions.
3. Classify the arches based on end conditions also discuss the effect of temperature on three hinged arches.
4. A two hinged parabolic arch of span 36 m and central rise 8 m carries a uniformly distributed load of 32 kN/m over the left half of the span. Determine the position and value of maximum bending moment. Also find the normal thrust and radial shear at the section. Assume that the moment of inertia at a section varies as secant of the slope at the section.
5. A suspension cable has a span of 160 m and a central dip of 16 m. It carries a load of 5 kN/m of horizontal length. Calculate the maximum and minimum tension in the cable. Find the horizontal and vertical forces in each pier under the following conditions. i) If the cable passes over frictionless rollers, which are stayed by wires inclined at 300 to the horizontal. ii) If the same cable is firmly clamped to saddles on friction rollers on the towers.

Unit – 3

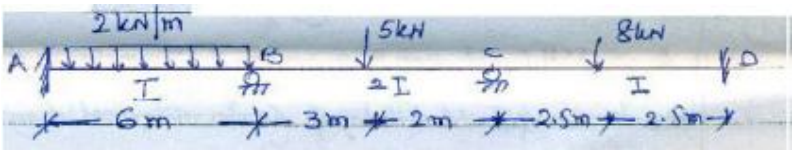
Part – A

1. A cable carrying a load of 15kN per meter run of horizontal span is stretched between supports 100 m apart. The supports are at same level and the central dip is 10 m. Find the greatest and the least tensions in the cable.
2. Does the moment distribution method can be used to analyze the determinate structures?

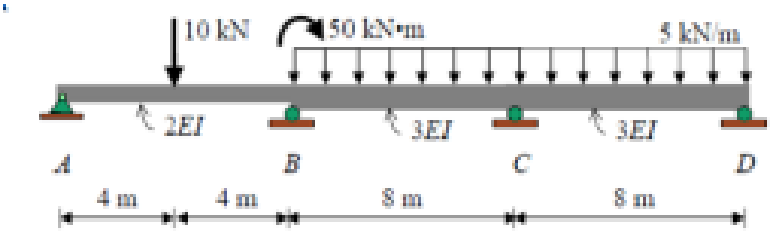
3. Sketch the cable stayed bridge and mark the various components of it.
4. Differentiate between Portal method and Cantilever method in the analysis of lateral loads acting on the structure.

Part – B

1. A continuous beam ABCD consists of three spans, and is loaded as shown in fig. Determine the bending moments at the supports and plot the bending moment diagram. Use moment distribution method.



2. Analyze the portal frame ABCD of span AB=CD=6 m and span BC=4 m. Span BC carries an eccentric load at a distance of 1 m from B. Analyze the frame using moment distribution method. Assume uniform 'EI'.
3. a) Derive the stiffness factor for a beam whose far end is supported.
4. b) For the beam shown use the moment distribution method to determine all the moments at the supports.



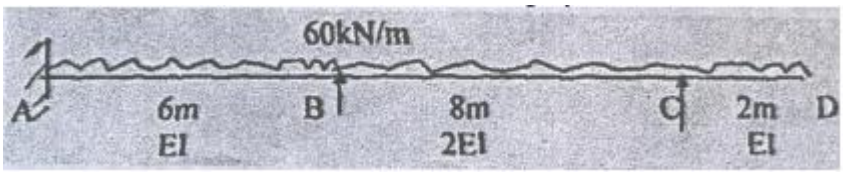
Unit – 4

Part – A

6. How is the moment induced at a fixed end calculated when a moment M is applied at the end of prismatic beam without translation?
7. Summarize the effect of temperature on the horizontal reaction and the dip in the cable.
8. List any three methods of force and displacement methods of analysis.
9. Give an expression to find the effect of Temperature in two hinged stiffened girder of cable stayed suspension bridge.

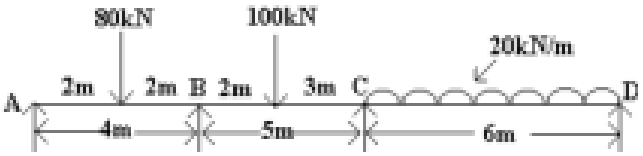
Part – B

1. Draw the SFD and BMD for the beam shown in fig. by kani's method:



2. Analyze the portal frame ABCD of span AB= 5m, CD=4m and span BC=5m. Span BC carries an eccentric load of 5 KN at a distance of 1 m from B. Analyze the frame using Kani's method. Assume uniform 'EI'.

3. Analyse the three-span continuous beam loaded as shown in Figure by the moment distribution method, if the moments of inertias of spans AB,BC and CD are I, 1.5 I and 2 I respectively.



4. Explain the rotation contribution method for the frames with columns of equal height and subjected to vertical loads only with fixed ends and also hinged ends

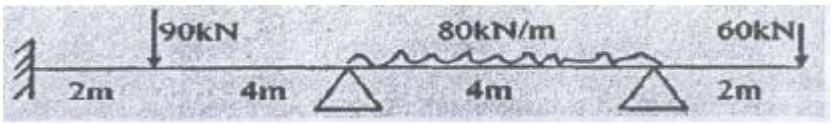
Unit – 5

Part – A

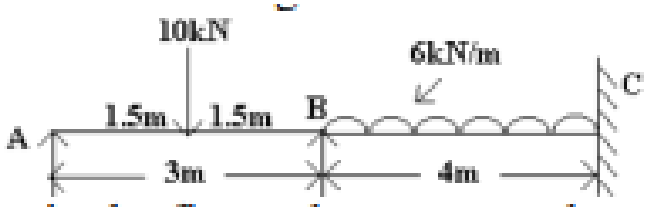
1. Who introduced kani's methods? and write its applications.
2. Write the reasons for preferring to Kani's 'Rotation Contribution' method over Moment distribution method
3. Define degree of static indeterminacy and find DSI of a propped cantilever beam.
4. When does flexibility method is more suitable than stiffness method.
5. Give any Two Differences between Sway and Non-sway analysis of portal frames. Under what circumstances the above methods are used.

Part – B

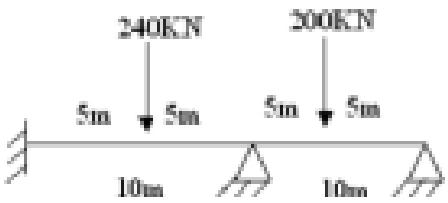
1. Analyze the beam shown in figure by stiffness matrix method. EI is constant.



2. Compare stiffness and flexibility matrix methods
3. Using Flexibility method of analysis find the support moments for the two-span continuous beam loaded as shown in Figure. Sketch the BMD.(EI = constant).



4. A continuous beam shown in the figure has two equal spans of 10m each with the A as fixed and support C as hinged. Spans AB and BC carry central point loads of 240 kN and 200 kN respectively. Supports B and C settle by 2000/EI & 1000/EI respectively. Calculate the slopes at B and C in terms of EI and hence find the end moment at B using displacement method.



2050121 – STRUCTURAL ENGINEERING – I (RCC)

B. Tech. III Year I Sem **L T P C**

Pre-requisites: Building Materials, Strength of Materials I & II **3 1 0 4**

Course Objectives: The objective of the course is

1. To discuss the fundamentals of reinforced concrete structural properties and behaviors.
2. To state the optimum design criteria and procedures.
3. To explain the basic principles and design methods of reinforced concrete members.
4. To clarify code requirements and specifications and explain the background of code.
5. To outline professional and contemporary issues in the design and fabrication of reinforced concrete members.
6. To sketch reinforcement details of reinforced concrete members.

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

1. Describe the general mechanical behavior of reinforced concrete.
2. Understand basic principles and design methods of reinforced concrete members
3. Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members.
4. Analyze and design reinforced concrete flexural and compression members.
5. Examine and design for deflection and crack control of reinforced concrete members.
6. Design simple connections of reinforced concrete members.

UNIT - I

INTRODUCTION: CONCEPT OF REINFORCED CEMENT CONCRETE

Introduction IS: 456-2000, Materials & other properties, compressive strength, tensile strength, creep, shrinkage, Elastic Deformation, Suitability of steel in concrete, stress-strain relation of steel, Methods of design, Design of slab and beam by Working stress method.

Learning Outcomes:

At the end of the unit, student should able to,

- To get familiar with IS:456-2000 code
- Understand the properties of concrete and steel
- Understand the concept of RCC
- To know the methods of RCC design

UNIT - II

DESIGN OF BEAMS

Loads and Load Combinations, safety factors- Limit State method, Limit State of Collapse **Singly Reinforced Concrete Beams** - Stress Block Parameters, limiting depth of neutral axis, Ultimate moment of resistance. Under reinforced, Balanced & Over reinforced sections.

Doubly Reinforced Concrete Beams: Doubly reinforced concrete beam and its necessity, Design of a doubly reinforced concrete beam, Design of L and T-beams, Economical depth

Learning Outcomes:
At the end of the unit, student should able to,

- Understand and implement the load calculations for different conditions.
- Analyse and Design RCC beams for different loading conditions.
- Calculate the bearing capacity of slab beam combo in flanged beams.

UNIT - III
BOND, SHEAR AND TORSION
Concept of bond, Permissible bond stresses for plain and deformed bars as per BIS code of practice, minimum length, and standard hook
Design of shear using IS:456-2000, Design of stirrups
Design of shear using IS:456-2000, Design of Torsional Reinforcement

Learning Outcomes:
At the end of the unit, student should able to,

- Analyse the importance and bond between concrete and steel in RCC
- Implement the codal provisions for bond, shear and torsion in design
- Design beams for all loading conditions

UNIT - IV
DESIGN OF SLABS
Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using IS Method, Limit state design for serviceability for deflection, cracking and codal provisions

Learning Outcomes:
At the end of the unit, student should able to,

- Understand the concept of slab
- To be able to distinguish between different varieties of slab and loading conditions
- Introduce to limit state of serviceability

UNIT - V
DESIGN OF COLUMNS AND FOOTINGS
Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - IS Code provisions

Different types of footings –Design of flat isolated square, rectangular, circular footings and combined footings for two columns.

Learning Outcomes:
At the end of the unit, student should able to

- Design of Columns
- Understand the codal provisions and load combinations on members
- Implement RCC concepts to analyse and design foundations

TEXT BOOKS:

1. Dr. B.C. Punmia and A.K.Jain, "Limit State Design of Reinforced Concrete", Lakshmi Publication, 2007.
2. Dr. H.J. Shah, "Reinforced Concrete (Elementary Reinforced Concrete), Charotar Publishing House Pvt. Ltd., 11th Edition.

REFERENCES:

1. S. Unnikrishna Pillai and Devdas Menon, "Reinforced Concrete Design", McGraw HillEducation, 3rd Edition.
2. M.L. Gambhir, "Fundamentals of Reinforced Concrete Design" PHI Learning Edition, 2012.
3. Arthus H. Nilson, David Darwin and Chorles W. Dolar, "Design of Concrete Structures",Tata McGraw Hill, 2011.
4. S.S.Bhavikatti, "Design of RCC Structural Elements" :Vol-1, New Age Publishers, 2008.

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Introduction IS: 456-2000			
2	1	2	Materials & other properties			
3	1	3	Compressive strength, tensile strength			
4	1	4	Creep, shrinkage, Elastic Deformation			
5	1	5	Suitability of steel in concrete, stress-strain relation of steel			
6	1	6	Methods of design			
7	1	7	Design of slab by Working stress method.			
8	1	8	Design of slab by Working stress method.			
9	1	9	Design of slab by Working stress method.			
10	1	10	Design of beam by Working stress method			
11	1	11	Design of beam by Working stress method			

12	1	12	Design of beam by Working stress method			
13	1	13	PPT			
14	1	14	Active Learning			
15	1	15	Unit Test - 1			
16	2	16	DESIGN OF BEAMS Loads and Load Combinations			
17	2	17	Safety factors- Limit State method, Limit State of Collapse			
18	2	18	Singly Reinforced Concrete Beams - Stress Block Parameter			
19	2	19	Limiting depth of neutral axis, Ultimate moment of resistance			
20	2	20	Under reinforced, Balanced & Over reinforced sections.			
21	2	21	Doubly Reinforced Concrete Beams: Doubly reinforced concrete beam and its necessity			
22	2	22	Design of a doubly reinforced concrete beam			
23	2	23	Design of a doubly reinforced concrete beam			
24	2	24	Design of L beams, Economical depth			
25	2	25	Design of L beams, Economical depth			
26	2	26	Design of T-beams, Economical depth			
27	2	27	Design of T-beams, Economical depth			
28	2	28	PPT			
29	2	29	Active Learning			
30	2	30	Unit Test - 2			
31	3	31	Concept of bond			
32	3	32	Permissible bond stresses for plain and deformed bars as per BIS code of practice			
33	3	33	Minimum length, and standard hook			
34	3	34	Design of shear using IS:456-2000, Design of stirrups			
35	3	35	Design of shear using IS:456-2000, Design of stirrups			

36	3	36	Design of shear using IS:456-2000, Design of stirrups			
37	3	37	Design of shear using IS:456-2000, Design of Torsional Reinforcement			
38	3	38	Design of shear using IS:456-2000, Design of Torsional Reinforcement			
39	3	39	Design of shear using IS:456-2000, Design of Torsional Reinforcement			
40	3	40	PPT			
41	3	41	Active Learning			
42	3	42	Unit Test - 3			
43	4	43	Design of Two-way slabs with different end conditions			
44	4	44	Design of Two-way slabs with different end conditions			
45	4	45	Design of Two-way slabs with different end conditions			
46	4	46	Design of one way slab			
47	4	47	Design of one way slab			
48	4	48	Design of one way slab			
49	4	49	Design of continuous slab			
50	4	50	Design of continuous slab			
51	4	51	Design of continuous slab			
52	4	52	Limit state design for serviceability for deflection and cracking			
53	4	53	Limit state design for serviceability - codal provisions			
54	4	54	PPT			
55	4	55	Active Learning			
56	4	56	Unit Test - 4			
57	5	57	Short Column - Columns with axial loads			
58	5	58	Short Column - Columns with axial loads			
59	5	59	Short Column - Uni-axial bending			
60	5	60	Short Column - Uni-axial bending			
61	5	61	Short Column - Bi-axial bending			

62	5	62	Short Column - Bi-axial bending			
63	5	63	Use of design charts- Long column – Design of long columns - IS Code provisions			
64	5	64	Use of design charts- Long column – Design of long columns - IS Code provisions			
65	5	65	Different types of footings - Design of flat isolated square			
66	5	66	Different types of footings - Design of flat isolated square			
67	5	67	Design of rectangular footings			
68	5	68	Design of rectangular footings			
69	5	69	Design of circular footings			
70	5	70	Design of circular footings			
70	5	70	Design of combined footings for two columns.			
71	5	71	Design of combined footings for two columns.			
72	5	72	PPT			
73	5	73	Active Learning			
74	5	74	Unit Test - 5			

Important Questions:

Unit – 1

Part – A

1. What is Ultimate Limit State (ULS)
2. What is characteristic load?
3. State the 3 types of load.
4. State four objectives of the design of reinforced concrete structure.
5. How to fulfill the three objectives of the design of reinforced concrete structures?
6. What are the three methods of design of reinforced concrete structural elements?
7. How to estimate the design loads in (i) limit state method, and (ii) working stress method?

Part – B

1. Explain the limit state philosophy as detailed in the current IS code.
2. Design a R.C beam to carry a load of 6 kN/m inclusive of its own weight on an effect span of 6m keep the breath to be 2/3 rd of the effective depth .The permissible stressed in the concrete and steel are not to exceed 5N/mm2 and 140 N/mm2 .take m=18.
3. Design a doubly reinforced beam of section 240X500mm to carry a bending moment of 80kNm.Assume clear cover at top a bottom as 30mm and take m=18.adopt working stress method.

4. Determine the moment of resistance of a singly reinforced beam 160X300mm effective section, if the stress in steel and concrete are not to exceed 140N/mm2 and 5N/mm².effectve span of the beam is 5m and the beam carries 4 nos of 16mm dia bars. Take m=18.find also the minimum load the bam can carry. Use WSD method.
5. Differentiate between working stress method and limit state method.
6. Explain the following terms: a. Characteristic strength and characteristic loads. b. Partial safety factors. c. Balanced section and under reinforced section.
7. Design an interior panel of RC slab 3mX6m size, supported by wall of 300mm thick. Live load on the slab is 2.5kN/m².the slab carries 100mm thick lime concrete (density 19kN/m²).Use M15 concrete and Fe 415 steel.

Unit – 2

Part – A

1. Write a short notes on (i) Characteristics strength of materials (ii) Characteristics of loads
2. What are the assumptions made in limit state of collapse in flexure?
3. Write a short on doubly reinforced sections.
4. What do you understand by limit state of collapse?
5. Write short note on balanced sections.
6. Write short note on under reinforced sections.
7. Write short note on over reinforced sections.
8. What are the conditions to be followed in design of slab?
9. What is the necessity of doubly reinforced sections?
10. How to select cross sectional dimensions for beams?
11. Briefly explain about one way slab
12. Briefly explain about limit state of serviceability
13. Briefly explain about partial safety factor
14. Define singly reinforced section
15. Write about limiting neutral axis

Part – B

1. Design a one way slab with a clear span of 5m, simply supported on 230mm thick masonry walls and subjected to a live load of 4kN/m² and a surface finish of 1kN/mm².Assume Fe 415 steel. Assume that the slab is subjected to moderate exposure conditions.
2. Design a simply supported RC beam having an effective span of 5m.the beam has to carry a load of 25 kN/m. sketch the reinforcement details.
3. Design a RC beam 350X700mm effective section, subjected to a bending moment of 300kNm.Adopt M20concrete and Fe415 steel.
4. Design a one way slab for a clear span 4m simply supported on 230mm thick wall. Subjected to a live load of 4kN/m² and floor finish of 1kN/m².use M20 concrete and F415 steel.
5. Deign a rectangular beam of cross section 230 x 600 mm and of effective span 6m.imposed load on the beam is 40 kN/m. Use M20 concrete and Fe415 steel.

Unit – 3

Part – A

1. What are the types of shear failure in reinforced concrete beams?
2. How do you prevent minimum shear reinforcements?
3. How do you develop bond mechanisms between concrete?
4. Define bond stress.
5. List out the various types of reinforcement.
6. Write the formula for developing length
7. What are the criteria recommended by IS 456-2000 for anchorage value of bend?
8. What is the necessity of bending reinforcement?
9. What are the points to be considered in anchoring shear reinforcement?
10. What are the criteria recommended by IS 450-2000 for cover to reinforcement?
11. Give the property of good a bond between concrete reinforcement.
12. Define shear strength.
13. What are the important factors affecting the shear resistance of a Reinforced concrete member without shear reinforcement?
14. What are the types of reinforcement used to resist shear?
15. Define Torsion.
16. Explain Equilibrium Torsion.
17. Define bond.
18. List out the different types of bond.
19. Define flexure bon
20. What is meant by Anchorage bond?

Part – B

1. A rectangular beam with b=350mm and d=550mm has a factored shear of 400kN at the critical section near the support. The steel at the tension side of the section consists of four 32mm dia bars which are continued to support. Assume f_{ck}=25N/mm^2 and f_y=415N/mm^2, design the vertical stirrups for the section. Use limit state method.
2. Examine the development length at support of a doubly reinforced beam 400mm x 750mm (effective) the clear span of the beam is 5.25m. The beam carries UDL of 46kN/m (including self-weight). The beam is reinforced with 8 bars of 20mm diameter (4 are bent up near support) on tension side and 4 bars of 16mm diameter on compression side. Adopt M20 grade concrete and Fe415 HYSD bars.
3. A simply supported beam is 6m in span and carries a characteristic load of 60kN/m. If six numbers of 20 mm diameter bars are provided at the mid span and four numbers of these bars are continuous into the supports, check the development length at the supports. Adopt M 20 grade concrete and Fe 415 grade steel.
4. Design a shear of rectangular concrete beam section tocarry a factored bending moment of 200 kNm, factored shear force of 120 kN, and a factored torsional moment of 75 kNm. Use M20 grade concrete and Fe415 steel.
5. A beam of rectangular section 300 mm width and 500 mm effective depth is subjected to

factored moment of 175 kN- m, factored shear force of 25 kN and factored twisting moment of 10kN-m. Determine the area of reinforcement to resist the above forces. Use M20 grade concrete and Fe 415 grade steel.

6. Design the transverse reinforcement using 2-legged stirrups of 10 mm diameter for the following data: Size of the beam : 300 mm x 600 mm Factored torsion : 40 kN-m. Factored shear : 95 kN. Torsion reinforcement: 4 numbers of 20 mm diameter; Reinforcement on compression face: 2 number of 12 mm diameter; Clear cover on all four sides (beyond the stirrups): 15 mm; Material used: M20 grade of concrete and Fe 415 steel bars.
7. A RC beam of rectangular section 300 mm x 550 mm is reinforced with 6 bars of 20 mm diameter place at an effective cover of 50mm. Out of 6 bars 3 bars have been bent up 45°. Design the shear reinforcement if the beam is subjected to a UDL of 100 kN/m over simply supported clear span of 7 m.
8. A beam of rectangular section is reinforced with 6 nos of 18mm diameter bars in tension and is supported on an effective span of 5m, the beam being 300mm wide and 700mm deep. The beam carries a udl of 42kN/m. Design the shear reinforcement considering no bars are bent up for shear. Assume σ_{sv}=230N/mm^2. τ_c=0.30N/mm^2 and fy=415 N/mm^2.
9. Design a shear of rectangular concrete beam section to carry a factored bending moment of 220 kNm, factored shear force of 140 kN, and a factored torsional moment of80 kNm. Use M20 grade concrete and Fe415 steel.
10. A simply supported RC beam of size 300 x 500 mm effective is reinforced with 4 bars of 16 mm diameter HYSD steel of grade Fe415. Determine the anchorage length of the bars at the simply supported end, if it is subjected to a factored force of 50 KN at the centre of 300 mm wide masonry support. The concrete mix of grade M20 is to be used. Draw the reinforcement details.
11. Design the reinforcements required for a rectangular beam section with the following data. Use M20 concrete and Fe415 steel. Adopt limit state design method. Size of the beam = 400 mm x 800 mm. factored shear force = 100 kN, Factored torsion = 50 kN, Factored bending moment = 120 kN-m.
12. Design a rectangular beam section of 250 mm width and 500 mm overall depth subjected to ultimate values of ending moment of 40 kN-m, shear force of 40 kN, torsion moment of 30 kN-m. Adopt effective cover of 50 mm on top and bottom. Use M20 concrete and Fe415 steel.

A beam of rectangular section of 350 mm width and 550 mm effective depth is reinforced with 6 numbers of 20 mm diameter bars out which three bars have been bent up at 45°. Determine shear resistance of the bent-up bars and the additional shear reinforcement required if it is subjected to an ultimate shear force of 300 kN. M20 concrete and Fe-415 steel are used. **(Anna Univ. Nov/Dec. 2007)**

A RC beam 250 mm wide and 450 mm deep is reinforced with 3 numbers of 20 mm diameter bars on tension side with an effective cover of 50 mm. If the shear reinforcement of two-legged 8 mm diameter stirrups at a spacing of 160 mm centre to centre is provided at a section, determine the shear strength of the section. Assume M20 concrete and Fe-415 steel have been used. If one of the tension bars is bent up at the section at 45°, what is the design strength of the section in shear. Adopt limit state design method.

A simply supported beam with clear span 600 mm, $b = 400$ mm, $d = 500$ mm carries a limit state load of 175 kN/m (including self weight, dead load and live load). It is reinforced with 4 bars of 28 mm diameter tension steel ($A_{st} = 2464\ mm^2$) which continue right into the support. Take $f_{ck} = 20\ N/mm^2$ and $f_y = 250\ N/mm^2$. Design shear reinforcement

A reinforced beam 350 mm wide and 550 mm effective depth is reinforced with 4 numbers of 25 mm bars as main tension steel. Two of its four main bars are symmetrically bent at the ends of the beam at 45°. Find the stirrups required for resistance against shear failure at the ends, if the factored shear force at the critical section is 250 kN. Assume M25 grade of concrete and Fe-415 steel bars. **(Anna Univ. May/June 2012)**

Design the reinforcements required for a rectangular beam section with the following data:
Size of the beam section = 300 mm × 600 mm
Factored shear force = 95 kN
Factored torsion = 45 kN.m
Factored bending moment = 115 kN.m
Materials = M20 concrete and Fe-415 steel. Adopt Limit state design method.

(Anna Univ. Nov/Dec. 2010)

A R.C.C section 200 mm × 400 mm is subjected to the following: Factored Torsional mome of 25 kN.m and a transverse shear of 60 kN. Assume M25 grade concrete and Fe-415 ba determine the reinforcement required according to IS 456 code provisions, using the followi data: Over all depth: 400 mm, Effective depth = 350 mm, $b_1 = 150$ mm and $d_1 = 300$ mm.

Unit – 4
Part – A

1. Enumerate the advantages of flanged beams.
2. Differentiate under reinforced and over reinforced sections.
3. Write any two assumptions of limit state method.
4. Differentiate between design mix and nominal mix.
5. What is the importance of two way slabs over one way slab?
6. Discuss any two advantages of introducing compression steel in R.C beams.
7. What are the minimum and maximum reinforcement for a beam in LSD?
8. Distinguish between the behavior of one way slab and two wayslab.
9. State the approximate value of total shrinkage strain of concrete tobe taken for the design purpose and mention the relevant clause no. of IS code.

10. Why is secondary /distribution reinforcement provided in one wayRC slab?
11. Why corner reinforcement are provided in a two way slab? And sketch the edge and middle strips of a two way slab.
12. Determine the maximum depth of neutral axis for a balanced rectangular section of overall depth 550 mm. assume an effective

1. Calculate ultimate moment of resistance of the beam of size 300 mm x 500 mm provided with tensile reinforcement of 9000 mm^2 and compression reinforcement of 3000 mm^2. Take the effective cover at top and bottom is 40 mm.

2. Design a slab over a room 5 m x 7 m as per I.S. code. The slab is supported on masonry walls all round with adequate restraint and the corners are held down. The live load on the slab is 330 N/m^2. The slab has a bearing of 150 mm on the supporting walls.
3. Recommend the Design value of reinforcement for a T-beam forthe following data:
   Effective span : 8m, Spacing of beam = 3m, Thickness of slab = 130 mm, Total depth = 450 mm, Live load 10 kN/m^2.
4. Design a one way reinforced concrete slab - simply supported at the edges for a public building with a clear span of 4 m supported on 200 mm solid concrete masonry walls. Live load on slab is 5kN/m^2. Adopt M20 grade concrete and Fe 415 HYSD bars.
5. Analyze and Design a T- beam section with a flange width of 1200mm, a flange depth of 100 mm, a web width of 250 mm andan effective depth of 500 mm, which is subjected to a factored moment of 550 kNm. The concrete mix is to be used is of grade M20 and steel is of grade Fe415. Use LSM.
6. Outline the design of a reinfored concrete beam of rectangular section to support a dead load of 10kN/m and a service load of 15 kN/m over simply supported spans of 8m. Adopt M20 concrete and Fe415 steel bars.

7. Sketch the reinforcement details of a rectangular beam are to besimply supported on supports of 230 mm width. The clear span of the beam is 6 m. The beam is to have a width of 300 mm, the characteristic superimposed load is 12 kN/m. Design the beam and
   sketch the reinforcement details.

8. Interpret the following details and design the one way slab: size=3m x 9m, width of the support =230mm, live load= 3kN/m^2,floor finish as 1kN/m^2 use M20 concrete and Fe415 steel bars.

9. Calculate the reinforcement details of a one way slab for an office floor which is continuous over tee beam spaced 3.5m intervals. Assuming a live load of 4 kN/m^2. Adopt limit state design. Use M20 grade concrete and Fe415 steel bars.

10. A simply supported one way slab of 4 m span carries a live load of3 N/m2 and the load of floor finish as 1.25 kN/m2.the slab having a total depth of 150mm is reinforced with 8 mm dia bars @100 mm c/c at a nominal cover of 20 mm.assuming a permanent load equal to dead load plus 20% of live load, compute the total maximum deflection and check it as per code requirements. Use M20 concrete and Fe415 steel.
11 Design a two way slab for an office floor size 3.5m x 4.5m with discontinuous and simply supported edges on all the sides with the corners prevented from lifting and supporting a service live load of 4.4kN/m^2. Adopt M20 grade and Fe 415HYSD bars.
12 A T beam slab floor of an office comprises of a slab 150 mm thick spanning between ribs spaced at 3 m centres. The effective span of the beam is 8 m. Live load on floor is 4 KN/m^2. Use M20 grade concrete and Fe 415 HYSD bars; select one of the intermediate T beams.
13 Design and draw the reinforcement details of a two way slab for thefollowing data:
Size = 7 m x 5 m
Width of the support = 300 mm
Edge condition = two edges are discontinuous, live load =5 kN/m^2Floor finish as 1 kN/m^2
Use M20 concrete and Fe 415 steel.
14 Design a R.C. slab for a room measuring 5m x 6m size. The slab is simply supported on all the four edges, with corners held down and carries a superimposed load of 30 N/m2. Inclusive of floor finishes etc. Use M20 mix, Fe415 steel and IS code method. Draw the reinforcement details.

Unit – 5
Part – A

1. Briefly explain the classification of columns.
2. How columns are classified according to transverse reinforcement?
3. Sketch the salient points on a typical axial – moment interaction curve of a column.
4. Differentiate between long and short column.
5. Enumerate compression members with helical reinforcement.
6. Differentiate between uniaxial and biaxial column.
7. Using design charts, calculate the area oflongitudinal reinforcement for a short R.C. Column for square section of size 400mm to carry a factored axial load of 2000kN.
8. State the methods recommend by IS 456 to estimate the effective length of columns.
9. Write down the expression for minimum eccentricity?
10. On what condition long column is more suitable?
11. According to IS code all the columns shall be designed for minimum eccentricity. Justify the reasons for this statement.
12. How the compression failures occur in columns?
13. What are the types of reinforcements used to resist shear force in columns
14. Briefly explain uniaxial and biaxial eccentricity.

15. What is the importance of slenderness ratio in columns?
16. What is the minimum eccentricity to be adopted while designing columns?
17. What are the assumptions made in the design of short columns?
18. Write the expression for the ultimate loade bearing capacity of a compression
19. What are the points to be considered while designing longitudinal reinforcement for columns?
20. What are the factors to be considered while selecting pitch and diameter of lateral ties for columns?
21. What are the factors to be considered while selecting pitch and diameter of helical reinforcement for columns?
22. What are braced and unbraced columns?
23. How is the main steel distributed in wall footings and two way rectangular footings?
24. What are the factors that influence the selection of number of lifting and hoisting locations of a long beam during its erection process?
25. Define punching shear.
26. What is the main advantage of combined footing?
27. When you need a combined footing?
28. Why check for transfer of load at the base of the column over footing is done?
29. Write any two situations in which combined footings are preferred to isolated footings.
30. Explain about eccentric loading on a footing?
31. What is slenderness ratio for a masonry wall? State the maximum values?
32. Compare the behaviour of tied and spirally reinforced column.
33. Under what circumstances a trapezoidal footing become necessary?
34. How do you classify one-way footing and two-way footing in foundation?

Part – B

1 Design the longitudinal reinforcement in a short column 400mm x 600mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kN-m and 90kN-m about the major and minor axis respectively. The reinforcements are distributed equally on all four sides. Adopt M_{20} grade concrete and Fe415 steel bars.

2 A circular column, 3m high is effectively held in position and restrained against rotation at both ends. Design the column, to carry an axial load of 750 kN, if its dia is restricted to 350mm. Use M_{25} and Fe 500 grade.

3 Determine the ultimate load carrying capacity of rectangular column section 400x600mm reinforced with 10nos. Of 25mmdia. Use M_{25} concrete and Fe415 steel.

4 Design a rectangular column, 5m long restrained in position and direction at both ends, to carry an axial load of 120 kN.usesM_{20} and Fe415 grades.

5 Design of short column subjected to biaxial bending. Determinethe reinforcement for a short column for the following data. Column size: 400mmx600mm, Pu=2000kN Mux= 160kN, Muy=120kN.Use M_{20} grade concrete and Fe415 grade steel.

6 Discuss various assumptions used in the limit state methods of design of compression members.

7 Determine the ultimate load carrying capacity of circularcolumnof section500mm diameter reinforced with 8 no.s of 25mm diameter bars adequately tied with lateral ties. Use M_{25} and Fe415 steel.

8 Design the reinforcement in short column 400x600mm subjected to an ultimate axial load of 1600kN together with ultimate moments of 120kNm and 90kNm about the major and minor axis respectively. Use M20 grade concrete and Fe415 grade steel.

9 Design a biaxial eccentric loaded braced circular column deforming in single curvature for the following data: Ultimate load=200kNUltimate moment in longer direction at bottom Mux1=178 kNm and at top Mux1= 128kNm.Ultimate moment in shorter direction at bottom Muy1= 108 kNm and at top Muy2= 88kNm. Unsupported length of column = 9m.Effective length in long direction lex=8m.Effective length in shorter direction ley= 5.8m.Diameter of column = 550mm.Use M25&Fe415.

10 Design the reinforcement in a circular column of diameter 350mm with helical reinforcement of 8mm diameter to support a factored load of 1400kN. The column has an unsupported length of 3.5 m and is braced against side sway. Adopt M20 grade concrete and Fe415 steel bars.

11 A circular column, 4.6m high is effectively held in position at both ends and restrained against rotation at one end onlyto carry an axial load of 1200kN, if its dia is restricted to 450mm. Use M20 and Fe415 grades.

12 Design a short column subjected to biaxial bending. Determine the reinforcement fora short column for the following data. Column size: 400mmx600mm, Pu=200kN Mux: 160kN, Muy=120kN.Use M20 grade concrete and Fe415 grade steel.

13 Design the reinforcement required for a column which is restrained against sway using the following data. Size of column=530x450mm, leff=6.6m, unsupported length=7.70m. Factored load =1600kN. Factored moment about major axis =45kNm at top and 30kNm at bottom. Factored moment about minor axis=35kNm at top and 20kNm at bottom. Use M25 grade concrete and Fe 500 grade HYSD bars. Column is bent in double curvature and reinforcement is distributed equally on all the four sides of the section.

2050141 - CONCRETE TECHNOLOGY
(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**
Pre-Requisites: Building Materials, Construction and Planning **3 0 0 3**

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.

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

1. Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests.
2. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
3. Apply the use of various chemical admixtures and mineral additives to design cement-based materials with tailor-made properties
4. Know the different workability and strength tests.
5. Use advanced laboratory techniques to characterize cement-based materials.
6. Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

UNIT - I

Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT - II

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

UNIT - III

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT - IV

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing. Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT

Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT - V

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design. Special Concretes: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

REFERENCES:

1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers

Session Planner

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Cement: Portland cement – chemical composition			
2	1	2	Hydration, Setting of cement			
3	1	3	Structure of hydrated cement			
4	1	4	Tests on physical properties			
5	1	5	Different grades of cement			
6	1	6	Admixtures: Types of admixtures			
7	1	7	Mineral admixtures.			
8	1	8	Chemical admixtures.			

9	1	9	PPT			
10	1	10	Active Learning			
11	1	11	Unit Test - 1			
12	2	12	Aggregates: Classification of aggregate – Particle shape & texture			
13	2	13	Bond, strength & other mechanical properties of aggregate			
14	2	14	Specific gravity, Bulk density, porosity			
15	2	15	Adsorption & moisture content of aggregate			
16	2	16	Bulking of sand – Deleterious substance in aggregate			
17	2	17	Soundness of aggregate – Alkali aggregate reaction			
18	2	18	Thermal properties – Sieve analysis			
19	2	19	Fineness modulus – Grading curves			
20	2	20	Grading of fine, Manufactured sand and coarse Aggregates			
21	2	21	Gap graded aggregate			
22	2	22	Maximum aggregate size			
23	2	23	Properties Recycled aggregate.			
24	2	24	PPT			
25	2	25	Active Learning			
26	2	26	Unit Test - 2			
27	3	27	Fresh Concrete: Workability			
28	3	28	Factors affecting workability			
29	3	29	Measurement of workability by different tests			
30	3	30	Setting times of concrete			
31	3	31	Effect of time and temperature on workability			
32	3	32	Segregation & bleeding			
33	3	33	Mixing, vibration and revibration of concrete			
34	3	34	Steps in manufacture of concrete			
35	3	35	Quality of mixing water.			
36	3	36	PPT			
37	3	37	Active Learning			
38	3	38	Unit Test - 3			

39	4	39	Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio			
40	4	40	Gain of strength of concrete – Maturity concept – Strength in tension and compression			
41	4	41	Factors affecting strength – Relation between compression and tensile strength			
42	4	42	Curing. Testing of Hardened Concrete: Compression tests			
43	4	43	Tension tests – Factors affecting strength			
44	4	44	Flexure tests – Splitting tests			
45	4	45	Pull-out test, Non-destructive testing methods			
46	4	46	Codal provisions for NDT			
47	4	47	Elasticity, Creep & Shrinkage			
48	4	48	Modulus of elasticity – Dynamic modulus of elasticity			
49	4	49	Posisson's ratio – Creep of concrete			
50	4	50	Factors influencing creep – Relation between creep & time			
51	4	51	Nature of creep – Effects of creep			
52	4	52	Shrinkage – types of shrinkage			
53	4	53	PPT			
54	4	54	Active Learning			
55	4	55	Unit Test - 4			
56	5	56	Mix Design: Factors in the choice of mix proportions			
57	5	57	Durability of concrete – Quality Control of concrete			
58	5	58	Statistical methods – Acceptance criteria			
59	5	59	Proportioning of concrete mixes by various methods			
60	5	60	BIS method of mix design.			
61	5	61	Special Concretes: Introduction to Light weight concrete			
62	5	62	Cellular concrete – No-fines concrete			
63	5	63	High density concrete – Fibre reinforced concrete			

64	5	64	Polymer concrete – High performance concrete			
65	5	65	Self compacting concrete.			
66	5	66	PPT			
67	5	67	Active Learning			
68	5	68	Unit Test - 5			

Important Questions:

Unit – 1
Part – A

1 What is the chemical composition of cement?
2 List various types of cement.
3 What is grade of cement? List any three grades of cement with their strengths.
4 Give step by step method of manufacture of cement by wet process.
5 What is the common classification of aggregates?
6 What are the properties of Aggregate?
7 What are the Physical Quality requirements of aggregates?
8 Distinguish between plasticizers and super plasticizers.
9 Distinguish between natural and chemical admixtures.
10 What is meant by hydration of cement?

Part – B

1 Explain the different types of cement in detail.
2 Describe the setting time and soundness test of cement.
3 Explain the bulking phenomenon of aggregates.
4 Explain the procedure of determining '10 per cent fines value'. What is gap graded aggregate?
5 Describe the hydration reaction of Bogue compounds indicating the products of hydration.
6 How is compressive strength of cement determined?
7 Describe the test done to determine aggregate abrasion value.
8 Write short notes on:
   a. Accelerators
   b. Retarders
9 Write short notes on:
   a. Air entraining agents
   b. Damp proofing agents
10 Write short notes on:
   a. Wet process of cement manufacturing
   b. Dry process of cement manufacturing

Unit – 2

Part – A

1 What is meant by proportioning of concrete?
2 Can sea water be used for making concrete? Explain.
3 What is meant by curing of concrete?
4 What is meant by controlled concrete?
5 Define Workability.
6 Mention the Properties of concrete at Early Ages.
7 What are the Causes of bleeding and segregation?
8 What are the Methods for Control of Bleeding?
9 Define segregation of concrete.
10 Define bleeding of concrete.

Part – B

1 What is meant by workability? What are the factors affecting workability of concrete?
2 Explain the following tests:
   a. Flow test
   b. Compaction factor test
3 What are the methods available for measuring air content in fresh concrete? Explain one of the methods in detail.
4 What are the various steps involved in concrete manufacturing?
5 What is segregation and how can it be prevented?
6 What is bleeding and how can it be prevented?
7 How does freeze-thaw damage occur?
8 What is alkali-aggregate reaction? Explain.
9 Define re-vibration. What are the various vibration techniques used for concrete vibration?
10 Describe the importance of the quality of water used for concreting.

Unit – 3
Part – A

1 Define Water/cement ratio**.**
2 What is meant by gel-space ratio?
3 Why is Elastic Modulii Important for Concrete?
4 Define Shrinkage cracking
5 Define Tension cracking
6 Define Creep.
7 Write short notes on the following: Acid attack
8 Write short notes on the following: Sulphate attack
9 Write short notes on the following: Alkali attack
10 Write short notes on the following: non destructive testing of concrete

Part – B

1. What is Abram's law? How does it affect concrete?
2. What are the various factors affecting strength of hardened concrete?
3. What is curing? What are the different methods of curing?
4. Write a short note on:
   a. Compression test
   b. Tension test
5. Write a short note on:
   a. Flexural test
   b. Split tensile test
6. Explain nondestructive tests. What are the codal provisions for NDT
7. Write a short note on:
   a. Elasticity of concrete
   b. Shrinkage
8. Write a short note on:
   a. Creep
   b. Durability of concrete
9. What is creep of concrete? What are the factors influencing creep? What is the relation between creep & time? What are effects of creep?
10. What is shrinkage? What are the types of shrinkage?

Unit – 4
Part – A

1. Define Concrete Durability.
2. Define concrete mix design.
3. What are the factors influencing the selection of materials?
4. What are the factors Influencing Consistency?
5. What are the Factors affecting Strength of Hardened concrete?
6. What is the sequence of steps should be followed in ACI method?
7. Mention the Maximum aggregate size to be used in Mix Design as per ACI.
8. What are the Requirements of concrete mix design as per BIS?
9. What are the types of concrete mixes? Explain.
10. What are the Factors affecting the choice of mix proportions?

Part – B

1. Describe ACI method of mix design in detail.
2. Describe Indian standard method of mix design in detail.
3. Describe about the Sampling and Acceptance criteria
4. Design the concrete mix for grade M20 with suitable conditions. Find the quantities of constituents of the mix for a bag of cement.
5. Explain the factors that influence the choice of mix design.

6 Explain in detail about the statistical quality control and acceptance criteria of concrete.
7 Design the concrete mix for grade M30 with suitable conditions. Find the quantities of constituents of the mix for a bag of cement.
8 Explain the procedure of selection of constituent materials of concrete.
9 Define Nominal Mixes and Standard mixes. What are Designed Mixes?
10 Describe the recent trends in concrete mix design.

Unit – 5
Part – A

1 Define Aerated Concrete
2 What is the general use of Shotcrete?
3 What is meant by No fine concrete?
4 What do you mean by Fibre Reinforced Concrete?
5 Define ferro-cement.
6 What is self-compacting concrete?
7 What are the uses of polymer concrete?
8 What are the advantages of using high-strength concrete?
9 List the differences between polymer – impregnated concrete, polymer – modified concrete
10 What is SIFCON?

Part – B

1 How can high-strength concrete be classified? Explain.
2 List the differences between polymer – impregnated concrete, polymer – modified concrete, and polymer concrete.
3 What are the various quality control tests done to ensure good performance of polymer concrete?
4 What are the basic properties of fibre – reinforced concrete which can be advantageously made use of in the design of structural elements?
5 In what way the behavior of FRC can be used for seismic – resistant design?
6 Explain in detail the method of design of light weight concreting.
7 Describe the procedure of Shotcrete& Grouting.
8 Explain the properties of polymer Impregnated Concrete.
9 Explain the design aspects of aerated concrete.
10 Explain the various methods of polymer concrete.

2050142 – ELEMENTS OF EARTHQUAKE ENGINEERING
(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**
Pre-Requisites: Structural Engineering-I (RCC) **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand Engineering Seismology
2. To explain and discuss single degree of freedom systems subjected to free and forced vibrations
3. To acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
4. To understand importance of ductile detailing of RC structures

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

1. Explain and derive fundamental equations in structural dynamics
2. Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes
3. Evaluate base shear using IS methods
4. Analyze masonry structures subjected to earthquake forces
5. Design and Detail the reinforcement for earthquake forces
6. Know about ductility design of concrete structures

UNIT - I

Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonics Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales Energy Released-Earthquake measuring instruments seismogram - Seismoscope, Seismograph, - strong ground motions- Seismic zones of India. Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

UNIT - II

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings - Seismic methods of analysis- IS code based methods for seismic design - Vertical irregularities - Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT - IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - V

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of nonstructures- Effects of non-structural elements on structural system- Analysis of non-structural elements Prevention of non-structural damage Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 - Behaviour of beams, columns and joints in RC buildings during earthquakes.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCES:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Buidling structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design – Anand S.Arya, Nem chand & Bros.
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy
6. BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:200

2050143 - PREFABRICATED STRUCTURES
(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**
Pre-Requisites: Structural Engineering (I&II) **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

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

1. Know the principle & procedure of prefabrication
2. Design the structural prefabricated elements.
3. Familiarize with joining techniques used for prefabrication
4. Know the manufacturing technology adopted
5. Identify the different techniques for hoisting
6. Know abnormal loads which are hazardous to the prefabricated structures.

UNIT - I

GENERAL PRINCIPLES OF FABRICATION

Types of prefabrication – site and plant prefabrication -Economy of prefabrication – Modular coordination – Standardization- Disuniting of Prefabricates, production, transportation, erection, stages of loading – Applications of Prefabrication.

UNIT - II

PREFABRICATED COMPONENTS

Behavior of structural components - Roof and floor panels- wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing- Columns – Shear walls

UNIT - III

MANUFACTURING TECHNOLOGY

Manufacturing methods – Stationary and mobile production- Storage of precast elements - Dimensional tolerances

UNIT - IV

HOISTING TECHNOLOGY

Equipments for hoisting and erection – Techniques for erection of different types of members like Slabs, Beams, Wall panels and Columns – Advanced techniques - Vacuum lifting pads.

UNIT - V

DESIGN FOR ABNORMAL LOADS

Progressive collapse-Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., Importance of avoidance of progressive collapse.

TEXT BOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES:

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

2050144 - INTRODUCTION TO OFFSHORE STRUCTURES
(Professional Elective – I)

B. Tech. III Year I Sem	**L**	**T**	**P**	**C**
Pre-Requisites:-	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

6. To understand the importance and functions of Offshore structure
7. To know the materials used in marine environment
8. To Know the Installation Methods of Offshore Structures

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

1. understand the functions of Offshore Structures
2. know the materials used for marine structures
3. know the different loads on Offshore Structures
4. understand the basic design of Offshore structures
5. know mooring system, industry standards and rules
6. understand installation method of Offshore Structures

UNIT - I

Introduction to Offshore Structures - Functions of Offshore Structures - Offshore Structure Configurations - Bottom Supported Fixed Structures - Compliant Structures - Floating Structures.

UNIT - II

Materials for Marine Environment - Structural Steel Topside Materials - Advanced Composite materials - Corrosion Control Material - Reliability and Monitoring - Fracture Control.

UNIT - III

Loads on offshore Structures - Gravity Loads, Hydrostatic Loads - Resistance Loads, Current loads on Structures - Current Drag and Lift Force, Steady, Dynamic and Wind Loads on Structures - Wave Loads on Structures - Varying Wind Load - Impulse loads - Introduction to design.

UNIT - IV

Mooring - General layout Areas and Equipment - Helideck Platform Crane Mooring systems : Mooring Hardware components

UNIT - V

Installation Methods of Offshore Structures - Platform Installation Methods: Fixed Platform Substructures - Floating Structures Foundations Subsea Templates.

TEXT BOOKS:

1. Reddy, D.V & Arockiasamy, M., Offshore Structures Vol.1 & 2, Kreiger Publ. Co.1991.

2. Graff, W.J., Introduction to Offshore Structures, Gulf Publ.Co.1981.

REFERENCES:

1. Morgan, N., Marine Technology, Butter worths, 1990.

2. Dawson, T.H., Offshore Structural Engineering, Prentice Hall, 1983.

3. B.C Gerwick, Jr. Construction of Marine and Offshore Structures, CRC Press, Florida, 2000.

2050010 - BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B. Tech. III Year I Sem **L T P C**
Prerequisites:- **3 0 0 3**

Course Objectives: To learn the basic business types, impact of the economy on business and firms specifically. To analyze the business from the financial perspective.

Course Outcomes: After completion of syllabus the students will understand the

1. Various forms of business and the impact of economic variables on the business.
2. The demand, supply, production, cost, market structure, pricing aspects are learnt.
3. The students can study the firm's financial position by analyzing the financial statements of a company.

UNIT - I Introduction to Business and Economics

Introduction to Business and Economics: Business: Structure of Business Firm, Types of Business Entities, Limited Liability Companies, Economics: Significance of Economics, Micro and Macro Economic Concepts, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist.

Learning Outcomes:

By going through this unit, technical students can have the scope of learning about different economic concepts, business cycles and nature of business economists.

UNIT - II Demand Analysis: Elasticity of Demand

Demand Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

Learning Outcomes:

By going through this content, student can learn about different types of demand, its determinants and elasticity of demand concepts thoroughly and how to forecast the demand of different things by using different agreed upon techniques.

UNIT - III Production, Cost, Market Structures & Pricing

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

Learning Outcomes :

By reading this chapter, student can learn different pricing techniques in different market structures and different cost functions that determine products life cycle in a long term basis.

UNIT - IV Capital Budgeting

Capital Budgeting: Importance of Capital Budgeting, methods of Capital Budgeting: Traditional Methods: Pay Back Period, Accounting Rate of Return, and Discounting Methods: Net Present Value, Profitability Index, Internal Rate of Return; Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Learning Outcomes:

By going thoroughly through this unit, students can have the scope of learning about different techniques by which a project can be evaluated from financials perspective and utilization of ratios at different times to assess the business position for decision making.

UNIT - V Financial Accounting

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

Learning Outcomes:

Students can learn the methodology of accounting cycle which is valid from stakeholders' point of view and they can learn the comparison of the different firms at a time, so that they can take appropriate decision of either investment or to become an entrepreneur.

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book
House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill
Education Pvt. Ltd. 2012.
4. I.M. Pandey, Financial Management, 11th Edition, Kindle Edition, 2015.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

Unit – 1
Part – A

1	Define Managerial Economics.
2	Write a short note on Macro Economics
3	Write a short note on Micro Economics.
4	Explain Investment Decision.

5	State the Normative Statement.
6	Define demand.
7	List the determinants of demand
8	Discuss about the Giffen‘s Paradox.
9	Describe a short note on consumer surplus.
10	Describe the autonomous demand.
11	How managerial economics is used in price-output decision? Discuss.
12	How economics is linked with psychology? Explain
13	Define Elasticity of Demand.
14	What is Test Marketing?
15	What is perfectly elastic?
16	What is cross elasticity of demand?
17	State How to estimate Demand.
18	Express Income Elasticity.
19	Write a note on elasticity as a tool for the finance minister.
20	Discuss the need for estimation of demand? Discuss.
21	Describe Demand forecasting for established products.
22	What is barometric technique?
23	Briefly explain about judgmental approach.
24	Illustrate censes method.
25	Discuss sample method.
26	Explain about survey of sales force method.
18	Express Income Elasticity.
19	Write a note on elasticity as a tool for the finance minister.
20	Discuss the need for estimation of demand? Discuss.
21	Describe Demand forecasting for established products.
22	What is barometric technique?
23	Briefly explain about judgmental approach.
24	Illustrate censes method.

25 Discuss sample method.

26 Explain about survey of sales force method.

Part – B

1 Define Managerial Economics. Explain its nature.

2 Define Managerial Economics. Write its scope.

3 Define Law of Demand. State the assumptions of Law of Demand.

4 Briefly explain the exceptions of Law of Demand.

5 Describe the determinants of Demand.

6 Explain the significance/Importance of Elasticity of Demand.

7 Illustrate different types of Price Elasticity of Demand.

8 Write different types of Income Elasticity of Demand.

9 Identify the factors which are influencing/governing Elasticity of demand.

10 Consider different methods of Cross Elasticity of Demand.

11 How to measure Price Elasticity of Demand? Explain.(Methods of Price Elasticity of Demand)

12 Define Demand Forecasting. Illustrate different methods of Demand Forecasting.

13 Discuss the factors governing Demand Forecasting.

14 Express Survey based Demand Forecasting methods with appropriate examples

15 Write the significance/Importance of Elasticity of Demand.

Unit – 2

Part – A

1. Explain the Break Even Point.

2. Discuss about Iso- Cost.

3. Discuss about Iso- Quant.

5. What is least cost combination of input?

6. Express law of returns to scale.

10. Write a note on opportunity cost

11 Write Differences between explicit and implicit costs.

12 What is optimum size?

13 What is angle of incidence

14 Write the assumptions of BEA?

15 What is CVP analysis?

15 Explain about law of Equi-Marginal Utility.

16 Write differences between Marginal Utility and Total Utility

17 State the exceptions of law of diminishing marginal utility.

18. What are the external economies of scale?

19 State about expansion path.

20. Illustrate Cobb-Douglas production function

Part – B

1 Describe different types of Internal Economies.

2 Briefly explain different types of External Economies.

3 Consider the significance of Break-Even Analysis.

4 State the limitations of Break-Even Analysis.

5 Write the Law of Returns with appropriate examples.

6 Discuss the economies of scale that accrue to a firm.

7 Define Production function. How can a producer find it usefulness? Illustrate.

8 State the features of Iso- Quants and Iso-Costs.

9 Briefly Explain about the Cobb-Douglas Production Function.

Unit – 3

Part – A

1. Illustrate perfect competition.

2. Explain about product differentiation

3. Discuss about oligopoly.

4. Identify the market skimming.

5. Describe the Block Pricing.

6. Sketch the market structure.

7. State the equilibrium price.

8. Discuss the penetration pricing.
9. List out the pricing objectives.
10. Discuss the cross subsidization.
11 Illustrate the Sealed Bid.
12 Describe monopolistic competition.
13 Write about marginal revenue curve.
14 What is promotional pricing?
15 Define market.
16 Discuss the privatization.
17 State the liberalization.
18 What is anti dumping duties?
19 Write a note on world trade organization.
20 Write the economic reforms.
21 What is globalization?
22 Write about Asian economic crisis.
23 Write the objectives of new industrial policy, 1991.
24 What is removal of compulsory convertibility clause?
25 What is franchising?
26 What is the real strength of economic reforms?
27 Write the amendments to MRTP Act.
28 What are the factors that led to globalization?
29 Discuss few features of industrial policy 1991.
30 Write a note on removal of compulsory convertibility.
31 Define Business.
32 List out the features of business.
33 Define sole trading.
34 Define Partnership
35 Define Company.
36 List out the features of company.
37 Define Public Enterprise.

38	State Public Corporation.
39	What is unlimited Liability?
40	List out different types of Partners.
41	Write any two differences between Public Company and Private company.

Part – B

1	Define Perfect Competition. List out the features of Perfect Competition?
2	Define Monopoly. Discuss the features of Monopoly?
3	How to determine price under Perfect Competition? Illustrate.
4	Discuss price-output determination in case of Monopoly.
5	Write differences between Perfect competition and Monopoly.
6	Write differences between perfect and imperfect market. Explain different types of Pricing.
7	Define Monopolistic Competition. Explain the features of Monopolistic Competition.
8	How to determine price- output in case of Monopolistic Competition?
9	Define Business. Explain its characteristics.
10	Define Sole Trading. Describe the features, merits and demerits of Sole Trading?
11	Define Partnership. State the features, merits and demerits of Partnership?
12	Define Joint Stock Company. Illustrate the features, merits and demerits of Joint Stock Company.
13	Distinguish between public company and private company.
14	State the merits & demerits of different types of Public Enterprises.
15	Explain different types of Partners.
16	List out different types of companies.

Unit – 4

Part – A

1	List out the features of fixed capital.
2	Sketch the requirements of capital.
3	Discuss the components of working capital.
4	Sketch working capital cycle.

5	Explain Debt Factoring.
6	Write different types of shares.
7	Write differences between hire purchase and leasing.
8	Observe a note on commercial paper.
9	Write a note on venture capital.
10	Discuss the characteristics of common methods of finance.
11	Observe a note on rights issue
12	Discuss the nature of capital budgeting proposals.
13	Illustrate capital rationing.
14	Explain the meaning of payback period.
15	Write a note on profitability index.

Part – B

1	Define Capital. Explain its significance.
2	Determine different types of capital.
3	Consider the factors which are influenced on working capital requirement.
4	Describe the advantages and Disadvantages of Pay-back Period.
5	State the advantages and Disadvantages of ARR Method.
6	Illustrate the advantages and Disadvantages of NPV Method.
7	Write the advantages and Disadvantages of IRR Method.
8	Explain the advantages and Disadvantages of Profitability Index Method.
9	Define Capital Budgeting. Illustrate the significance and limitations of Capital budgeting

Unit – 5

Part – A

1	Define Financial Accounting.
2	Discuss the meaning of Journal Proper.
3	List out different types of Accounting Concepts.
4	Explain the meaning of Double Entry System.
5	State the meaning of purchase book
6	Define subsidiary books

7	Identify the meaning of trial balance.
8	State the errors of principle
9	Describe the Meaning of Errors of Omission
10	Write a note on provisions for doubtful debts.
11	State the Meaning of Revenue Receipt
12	Express the meaning of Contra Entry.
13	Illustrate the meaning of ledger account.
14	Explain the meaning of Capital Expenditure.
15	List out different types of Accounting Conventions.
16	Explain a note on current ratio
17	Identify the formula for Operating ratio.
18	Determine the formula for Debt Equity Ratio
19	List out the limitations of ratio analysis.
20	Discuss the Return on Capital Employed
21	What is the formula for debt collection period?
22	Define Ratio Analysis.
23	State the meaning of Price-Earnings Ratio.
24	Write the meaning of Earnings per share.
25	Describe two types of capital structure ratios.
26	Identify different types of Activity Ratios.
27	State the meaning of Interest Coverage Ratio.
28	Explain the meaning and computing procedure of Return on Capital
29	Identify the formulas for liquidity ratios.
30	What is the formula for Interest Coverage Ratio?

Part – B

1.	Define Financial Accounting. Explain the importance and Limitations of Financial Accounting.
2.	Define Account. Illustrate different types and principles of Accounts(Rules of Debit and Credit).
3.	What is Double Entry System? Describe the advantages and Disadvantages of Double Entry System.
4.	Explain different types of Accounting Concepts.
5.	Discuss different types of Accounting Conventions.

6. State the advantages of the Journal.
7. Illustrate the importance of the Ledger.
8. Write the significance of Trial Balance.
9. Sketch different methods of preparing Trial Balance.
10. Explain the importance of Trading Account.
11. Illustrate the significance of Profit & Loss Account.
12. Consider the importance of Balance Sheet.
13. Define Ratio Analysis. Describe the advantages/ significance and limitations of Ratio Analysis.
14. Discuss different types of Liquidity Ratios.
15. State different types of Activity Ratios.
16. Explain different types of Capital Structure Ratios.
17. Express different types of Profitability Ratios.
18. Write formulas for of Liquidity Ratios.
19. State the formulas for Activity Ratios.
20. Explain the formulas for Capital Structure Ratios.
21. Write the formulas for Profitability Ratios.

2050174 – FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY

B. Tech. III Year I Sem **L T P C**
Prerequisites: Fluid Mechanics **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
2. To explain the standard measurement techniques of fluid mechanics and their applications.
3. To illustrate the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. To analyze the laboratory measurements and to document the results in an appropriate format.

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

1. Describe the basic measurement techniques of fluid mechanics and its appropriate application.
2. Interpret the results obtained in the laboratory for various experiments.
3. Discover the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. Compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
5. Identify characteristics of different turbines
6. Write a technical laboratory report

List of Experiments:

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Keplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

2050175 - CONCRETE TECHNOLOGY LABORATORY

B. Tech. III Year I Sem **L T P C**

Prerequisites: Building Materials, Construction and Planning **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.
4. To understand the different properties of materials and different types of procedures adopted for mix design
5. To apply the learning for research work.
6. To summarize the concept of workability and testing of hardened concrete.

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

1. Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests.
2. Recognize the effects of the rheology and early age properties of concrete on its long-term behaviour.
3. Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
4. Use advanced laboratory techniques to characterize cement-based materials.
5. Perform mix design for a given set of conditions.
6. Understand engineering properties of special concretes such as high performance concrete, self-compacting concrete, and fibre reinforced concrete.

I. TEST ON CEMENT

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement.
5. Compressive strength of cement.

II. TEST ON AGGREGATE

1. Sieve Analysis and gradation zone
2. Bulking of sand.
3. Bulk and compact densities of fine and coarse aggregates

III. TEST ON FRESH CONCRETE

1. Slump test
2. Compaction factor test
3. Vee-bee Test

4. Flow table Test.

Self-Compacting Concrete

1. Slump cone
2. V funnel
3. L Box

IV. TEST ON HARDENED CONCRETE

1. Compression test on cubes & cylinders
2. Flexure test
3. Splitting Tensile Test
4. Modulus of Elasticity

V. NON DESTRUCTIVE TEST OF CONCRETE

1. Rebound hammer
2. Ultrasound pulse Velocity (UPV).

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty – S. Chand & Co.
2. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons.

2050176 - ENGINEERING GEOLOGY LABORATORY

B. Tech. III Year I Sem **L T P C**
Pre-requisites: Engineering Geology **0 0 2 1**

Course Objectives: The objective of the course is to give

1. Practical knowledge about physical properties of minerals,
2. Practical knowledge about physical properties of rocks,
3. Drawing of geological maps,
4. Showing faults,
5. Knowledge on uniformities

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

1. Understand the method and ways of investigations required for Civil Engineering projects
2. Understand different classification of rocks
3. Identify the various rocks, minerals depending on geological classifications
4. Know the physical properties of minerals
5. Know the topographical features from geological maps.
6. Understand folds, faults and unconformities

List of Experiments

1. Study of minerals under theory.
2. Study of physical properties of minerals.
3. Study of Rocks referred under theory
4. Study of Rocks properties
5. Study of topographical features from Geological maps. Identification of symbols in maps.
6. Simple structural Geology Problems (Folds, Faults & Unconformities)

LAB EXAMINATION PATTERN:

1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.
5. Microscopic identification of rock

2050177 – INTRODUCTION TO ARTIFICIAL INTELLIGENCE

B. Tech. III Year I Sem **L T P C**
Pre-requisites:- **0 2 0 0**

List of Experiments:

Module 1 Overview of artificial intelligence concepts/algorithm in construction
Module 2 Review of various Algorithms
Module 3 Application of algorithms in design of structural elements

2060122 – HYDROLOGY & WATER RESOURCES ENGINEERING

B. Tech. III Year II Sem **L T P C**

Pre-requisites: Fluid Mechanics & Hydraulics and Hydraulic Machinery **3 0 0 3**

Course objectives: The objective of the course is

1. To study occurrence movement and distribution of water
2. To know the estimation of hydrologic parameters like evaporation, infiltration
3. To understand the concept of unit hydrograph
4. To know the basic principles and movement of groundwater
5. To impart the knowledge of various irrigation techniques , requirements of the crops,
6. To learn about design of irrigation canals which are associated with sediment problem

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

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

1. Understand various components of hydrologic cycle
2. Evaluate various runoff measurements technique
3. Apply the concepts of movement of groundwater beneath the earth
4. Apply the knowledge of various irrigation techniques
5. Analyse the requirements of the crops
6. Use components of designing unlined and lined irrigation canals.

UNIT - I

HYDROLOGY

Hydrologic cycle, types and forms of precipitation, rainfall measurement, computation of average rainfall over a basin, Adjustment of record, Rainfall Double Mass Curve. Evaporation, factors affecting evaporation, measurement of evaporation- Evapotranspiration estimation Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understanding of hydrology and its application in varied areas of civil engineering
- Illustrate the methods measuring rainfall
- Interpret the rainfall over a drainage basin
- Explain the need of measuring the abstractions
- Assess the losses from rainfall

UNIT - II

HYDROGRAPHS

Distribution of Runoff - Factors affecting Runoff - Rational Formulae.

Hydrograph Analysis Flood Hydrography - Effective Rainfall - Base Flow - Base Flow Separation - Direct Runoff Hydrograph - Unit Hydrograph, definition, and limitations of

applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the runoff cycle
- Interpret the discharge over a basin using hydrographs
- Explain the concept of s-hydrograph
- Assess the runoff from ungauged basin using synthetic unit hydrograph
- Apply the unit hydrograph theory in flood estimation

UNIT - III
GROUNDWATER

Groundwater Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivitty and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of well's, Well Construction - Well Development.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the movement of groundwater
- Explain the groundwater properties that cause flow
- Assess the groundwater properties
- Interpret the flow of water through different subsurface layers
- Understand the well construction and development techniques

UNIT - IV
IRRIGATION

Necessity and Importance of Irrigation, ill effects of irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility - Crop Roation, preparation of land for Irrigation, standards of quality for Irrigation water.
Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, Duty and delta, factors affecting duty- Depth and frequency of Irrigation, irrigation requirements and efficiencies-Water Logging.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need of irrigation in India
- Illustrate different methods of irrigation
- Establish the relation between soil-water-plant
- Assess the duty and delta for crop
- Design the required discharge for crop

UNIT - V CANALS

Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standard for a canal design, canal lining.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify the irrigation canals
- Understand the importance of silt in canal design
- Design the irrigation canals using silt concept
- Illustrate the lining materials
- Apply the silt theories in canal design

TEXT BOOKS:

1. Engineering hydrology by Jayram Reddy, Laxmi publications pvt. Ltd., New Delhi.
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi.

REFERENCES:

1. Elementary hydrology by V. P. Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House.
3. Water Resources Engineering - I by Dr. G. Venkata Ramana, Acadamic Publishing Company.
4. Irrigation Water Management by D. K. Manjundar, Printice Hall of India.
5. Irrigation and Hydraulic structures by S. K. Grag.
6. Applied hydrology by Ven Te Chow, David R. Maidment larry W. Mays Tata Mc. Graw Hill.
7. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI.

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Hydrologic cycle, types and forms of precipitation			
2	1	2	Rainfall measurement			
3	1	3	Computation of average rainfall over a basin			
4	1	4	Adjustment of record			
5	1	5	Rainfall Double Mass Curve			
6	1	6	Evaporation, factors affecting evaporation			
7	1	7	Measurement of evaporation			
8	1	8	Evapotranspiration estimation Infiltration			

9	1	9	Factors affecting infiltration			
10	1	10	Measurement of infiltration			
11	1	11	Infiltration indices			
12	1	12	PPT			
13	1	13	Active Learning			
14	1	14	Unit Test - 1			
15	2	15	Distribution of Runoff			
16	2	16	Factors affecting Runoff - Rational Formulae.			
17	2	17	Hydrograph Analysis Flood Hydrography			
18	2	18	Effective Rainfall - Base Flow			
19	2	19	Base Flow Separation			
20	2	20	Direct Runoff Hydrograph			
21	2	21	Unit Hydrograph, definition, and limitations of applications of Unit hydrograph			
22	2	22	Derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa			
23	2	23	S-hydrograph			
24	2	24	Synthetic Unit Hydrograph.			
25	2	25	PPT			
26	2	26	Active Learning			
27	2	27	Unit Test - 2			
28	3	28	Groundwater Occurrence			
29	3	29	Types of aquifers, aquifer parameters			
30	3	30	Porosity, specific yield, permeability			
31	3	31	Transmissivitty and storage coefficient			
32	3	32	Darcy's law, radial flow to wells			
33	3	33	Confined and unconfined aquifers			
34	3	34	Types of well's, Well Construction			
35	3	35	Well Development.			
36	3	36	PPT			
37	3	37	Active Learning			
38	3	38	Unit Test - 3			
39	4	39	Necessity and Importance of Irrigation			
40	4	40	Ill effects of irrigation, types of Irrigation			
41	4	41	Methods of application of Irrigation water, Indian			

			agricultural soils			
42	4	42	Methods of improving soil fertility			
43	4	43	Crop Roation, preparation of land for Irrigation			
44	4	44	Standards of quality for Irrigation water			
45	4	45	Soil-water-plant relationship			
46	4	46	Vertical distribution of soil moisture			
47	4	47	Soil moisture constants, Duty and delta			
48	4	48	Factors affecting duty- Depth and frequency of Irrigation			
49	4	49	Irrigation requirements and efficiencies			
50	4	50	Water Logging			
51	4	51	PPT			
52	4	52	Active Learning			
53	4	53	Unit Test - 4			
54	5	54	Classification of canals			
55	5	55	Design of Irrigation canals by Kennedy's theory			
56	5	56	Design of Irrigation canals by Kennedy's theory			
57	5	57	Design of Irrigation canals by Lacey's theory			
58	5	58	Design of Irrigation canals by Lacey's theory			
59	5	59	Balancing depth of cutting			
60	5	60	IS standard for a canal design			
61	5	61	Canal lining			
62	5	62	PPT			
63	5	63	Active Learning			
64	5	64	Unit Test - 5			

Important Questions:

Unit – 1
Part – A

1 Explain hydrograph analysis?
2 What do you mean by base flow?
3 What do you understand about flood hydrograph?
4 Define return period and exceedence probability?

5 Define Unit hydrograph?
6 Define S- hydrograph?
7 Define Maximum probable flood?
8 Define Design flood?
9 Define Annual series?
10 Define Partial series?

Part - B

1 Define raingange density. Discuss the ISI norms for the raingangedensity.

2 Describe different methods of determining the average depth of rainfall over an area. Bring out merits and demerits of each method.

3 Explain how runoff is estimated using Khosla‟s method.
4 Hydrology is a highly inter-disciplinary science, Justify. List outvarious practical applications of Hydrology.
5 What are the basic data required for Hydrological studies. Name theagencies from which the data can be obtained.
6 What are the precautions to be taken in selecting a site for the locationof a raingauge.

7 What is the hydrological cycle ? Give a brief description of differentcomponents the hydrologic cycle.

8 What are different forms of precipitation? Distinguish between theprecipitation and the rainfall.

9 Describe various types of recording type rain gauges. What are theadvantages and disadvantages of these gauges?

10 How would you determine the optimum number of rain gauges for abasin?

11 Explain the rational method of computing the peak discharge of a small catchment. Where is this method commonly used and what are its merits and demerits?
12 What are the basic conditions for the occurrence of precipitation ? Explain how these conditions are satisfied?
13 Explain the following terms: Rain gauge density (b) Isohyets (c) Mean annual rainfall
14 Explain the method for testing the consistency of rainfall records at a station and necessary adjustment with a neat sketch.
15 Explain the following in brief.
a. Isohyet b. Average Annual Rainfall
c. Probable maximum precipitation d. Raingauge density.

16 Explain the method for testing the consistency of rainfall records at a station and necessary adjustment with a neat sketch.
17 Describe with a neat sketch the principle of working of symons non recording raingauge. How does the Indian standard raingauge differe from Symons.
18 Describe the ISI standard evaporation pan with a neat sketch. In what way it is different from USWB class A land pan.
19 How is evapotranspiration estimated using Penman's equation. How can evap-otranspiration be reduced.
20 Evaporation is indirectly a cooling process. Justify the statement. Discuss the factors affecting evaporation.
21 Discuss various methods of reducing evaporation from a water body.
22 write short notes on (i)blaney criddle equation (ii)penman eaquation
23 Explain the balanced equation for precipitation and describe the terms.
   i. Interception and
   ii. Depression storage.
24 How would you estimate the runoff from the infiltration capacity curve? What are its limitations? What is the advantage of ϕ- index method?
25 Present the Blaney-Criddle formula and its modification as suggested by Doorenbos and Pruitt. Outline the criticism about the method.

Unit – 2
Part – A

1 Define aquifer?
2 What are the different types of aquifers?
3 Define porosity?
4 Define Specific yield?
5 Define specific retention?
6 Define Permeability?
7 Define transmissibility?
8 Define Storage coefficient?
9 What are the types of wells?
10 Ground water and surface water, Which water is more pure?

Part - B

1 Why is base flow separated from total runoff. Describe any twomethods of separating the base flow from the total runoff.
2 Sketch and explain a typical hydrograph resulting from an isolatedstorm.
3 Explain how runoff is computed from infiltration indices.
4 What do you mean by basin yield and dependable yield. How basin yield is estimated from water balance equation.

5 What is a unit hydrograph? What are the basic propositions of the unithydrograph theory? What are the limitations of the unit hydrograph theory?

6 Differentiate between the followings:
- (i) Positive base flow and negative base flow
- (ii) Effluent and influent streams
- (iii) Rainfall excess and effective rainfall
- (iv) Surface run-off and direct run-off
- (v) Interflow and base flow

7 Distinguish between:
- i) Valley storage and Bank storage. (ii) Overland flow and Interflow.
- ii) Influent and effluent streams. (iv) Detention Storage andDepression Storage.

8 Explain the procedure for the derivation of a unit hydrograph from an isolated storm hydrograph.

9 Explain the superposition method for the development of the unit hydrograph of a longer duration from that of a smaller duration. What are the limitations of this method?

10 How would you derive a unit hydrograph from a hydrograph of acomplex storm?

11 What is S-hydrograph? How would you derive a S-hydrograph? Discuss the procedure of derivation of the unit hydrograph from a S- hydrograph

12 Discuss the Snyder method for the derivation of a unit hydrograph of an ungauged basin.

13 Explain how a 2D h unit hydrograph is derived from a D h unithydrograph.

14 What is an instantaneous unit hydrograph? What is its use?

Unit – 3

Part – A

1 Define aquifer?
2 What are the different types of aquifers?
3 Define porosity?
4 Define Specific yield?
5 Define specific retention?
6 Define Permeability?
7 Define transmissibility?
8 Define Storage coefficient?
9 What are the types of wells?
10 Ground water and surface water, Which water is more pure?

Part - B

1 Explain the Ground water movement. What are the assumptions madein the theory of groundwater movement.
2 Distinguish between
- i. Confined aquifer and unconfined aquifer

ii. Artesian well and flowing well
iii. Aquifer and Aquifuge.

3 Define specific yield, specific Retention and storage coefficient.
4 Explain the occurance of Ground water in confined and unconfinedaquifers with the help of a neat sketch.
5 Distinguish clearly between a shallow well and a deep well. How doesa deep well differ from a tube well in con_ned aquifer?
6 Briefly explain role of ground water in water resources development inthe country.

a) Define the terms (i) Aquifer; (ii) Aquiclude; (iii) Aquifuge; and (iv) Aquitard.
b) Explain Darcy‟s law. What are its assumptions? Discuss itsvalidity

7 Define porosity, specific yield and specific retention and obtain a relation between them.
8 Describe with neat sketches confined, semi-confined (or leaky), unconfined and perched aquifers.
9 Distinguish between:
i) Valley storage and Bank storage. ii) Overland flow and Interflow.
iii) Influent and effluent streams. iv) Detention Storage andDepression Storage.
10 What do you mean by yield of an open well. Explain the different tests of finding yield of open wells.
11 Briefly explain role of ground water in water resources development inthe country.
(Explain the terms " storage coefficient", and „coefficient oftransmissibility".
12 Write notes on the following:
i. well losses, ii. specific capacity of a well, iii. spherical flow in a well, iv. interference among wells
13 Describe the method of construction of open wells
i) in a soil where a clayey stratum is encountered ii) in a rocky sub- strata
14 Derive an expression for a discharge from a well fully penetrating a confined aquifer.
15 Explain the terms well losses, specific capacity, specific drawdown, well efficiency
16 Derive Dupuit-Thiem‟s equation for the yield of a well penetrating an unconfined aquifer. What are the basic assumptions of the Theory?
17 Derive an expression for the steady state discharge of a well in an on confined aquifer. Also list out the assumptions made.

Unit – 4
Part – A

1 Define Irrigation?
2 What are the different types of soils?
3 What do you understand about full supply coefficient?
4 What are the ill effects of irrigation?
5 What standards required for Irrigation water?
6 Define Duty and Delta?

7 What do you know about the water conveyance efficiency?
8 What do you understand about vertical distribution of soil moisture?
9 Define water logging?
10 Define field capacity?

Part - B

1 (a) Explain the different functions of irrigation water.
(b) List out different Indian soils and their suitability for irrigation.
2 (a) Give a bird‟s eye view of irrigation engineering, tracing the history of adrop of water from the cloud to field.
(b) List out the ill effects of irrigation. How would you reduce the ill effects.
3 (a) Write a note on sub-surface irrigation, stating clearly the conditions under which this method is suitable.
(b) Describe Border strip method of irrigation with the help of a neat sketch.
4 (a) Write a note on scope of irrigation. What is meant by a multipurpose river valley project.
(b) Explain the benefits of irrigation.
5 (a) Enumerate direct scheme of irrigation and combined system of irrigationalong with neat sketches.
(b) Explain the following:

i. Salt concentration of irrigation water and their utility in irrigation
ii. Sodium hazards of irrigation water

6 (a) Write a brief note on „History of development of irrigation in India‟
(b) Describe in detail the border strip method of irrigation with a neat sketch.
7 (a) What are the different types of irrigation systems? Discuss each of these systems briefly?
(b) Write a note on furrow method of irrigation. Indicate the advantages of s method of irrigation
8 Distinguish between:
i. Crop rotation and Mixed croppingii.Base period and kor period
ii. Field capacity and available moisture.

9 Define base period, crop period, Intensity of irrigation and cash crops.
10 Write short notes on the following:
(a) Net irrigation requirement (b) Field irrigation requirement(c)Gross irrigation requirement

Unit – 5

Part – A

1 What is the difference between the lake and a canal?
2 Name the two different types of silt theories?
3 What do you meant by initial and final regime of channels?
4 What are the merits of Lacey's theory?
5 Why do we need to provide side slopes for canals?

6 What do you understand about SCS curve?
7 What is meant by detention storage and depression storage?
8 What do you know about Gumbels method of flood frequency anaylasis?
9 What is the difference between the silt and scour?
10 Which rational formula gives the best results for flood frequency analysis?

Part - B

1 Explain what is meant by unlimited incoherent alluvium in the context of Lacey‟s theory. Discuss the limitations of Kennedy‟s and Lacey‟s theory in their applicability.
2 Explain the different steps and equations involved in the design of an alluvial channel by Kennedy‟s theory.
3 (a) What are the various investigations required for a canal project (Distribution System). Explain in brief.
(b)Explain the limitations of Kennedies theory.
4 Write detailed notes on the following:
(a) Importance of sediment transport in designing earthen irrigation canals.
(b) Kennedy's and Lacey's silt theories for designing irrigation canals inIndia.
5 (a) How irrigation canals are classified?
(b) Describe Kennedy‟s theory for the design of irrigation channel inalluvial soil.
6 Differentiate between
(i) permanent canal and an inundation canal. (ii) Control canal and Ridge
7 Explain the procedure for designing an irrigation channel using Kennedy‟s theory.
8 Derive an expression for the silt transporting capacity of a channel according to Kennedy‟s theory
9 What is meant by `regime'? Differentiate between regime in natural rivers and in artificial channels.
10 . Discuss the salient features of Kennedy's theory for the design of earth channels based on the critical velocity concept and mention its limitations.

2060123 – TRANSPORTATION ENGINEERING

B. Tech. III Year II Sem **L T P C**
Pre-requisites:- **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the highway planning process and carry out surveys involved in planning and highway alignment.
2. To remember various geometric elements involved in design of highways and expressway.
3. To understand the various traffic studies and to implement traffic regulation and control measures
4. To understand the engineering properties of pavement materials used in highway construction.

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

1. Understand highway planning, development and geometric design
2. Determine the traffic volume and design of traffic signals
3. Design highway geometrics.
4. Design intersections and prepare traffic management plans
5. characterization of Highway material and maintenance
6. develop Intelligent Transport System Planning and evaluation

UNIT – I

HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRIC DESIGN

Highway Development in India; Necessity for Highway Planning; Different Road Development Plans; Classification of Roads; Road Network Patterns; Highway Alignment-Factors affecting Alignment; Engineering Surveys; Drawings and Reports; Highway Project. Importance of Geometric Design; Design controls and Criteria; Highway Cross Section Elements; Sight Distance Elements; Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Design of Horizontal Alignment; Design of Super elevation and Extra widening; Design of Transition Curves- Design of Vertical Alignment; Gradients; Vertical curves.

Learning Outcomes:

- The road development plans that initiated for the development of transportation conveniences.
- The design concepts of horizontal alignments.
- The design concepts of vertical alignments.
- Various factors affecting the road network pattern design concepts.

UNIT – II

TRAFFIC ENGINEERING & REGULATIONS

Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data

Collection and Presentation - Speed studies - Data Collection and Presentation - Origin & Destination studies, Parking Studies – On street & Off street Parking - Road Accidents - Causes and Preventive Measures - Accident Data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals – Webster Method.

Learning Outcomes:

- The concept of traffic parameters and characteristics
- The concept of parking studies and accident studies
- Design concepts of traffic signals.
- The knowledge of traffic rules and regulations, signs, markings.

UNIT – III

INTERSECTION DESIGN

Types of Intersections; Conflicts at Intersections; Requirements of At-Grade Intersections; Types of At-Grade Intersections: Channelized and Channelized Intersections; Traffic Islands; Types of Grade Separated Intersections - Rotary Intersection; Concept of Rotary; Design Factors of Rotary; Advantages and Limitations of Rotary Intersections.

Learning Outcomes:

- The classification of intersections.
- Differentiation of Channelized Intersections and Unchannelized Intersections
- Design concepts of rotary intersections.

UNIT – IV

HIGHWAY MATERIALS, CONSTRUCTION AND MAINTENANCE

Highway material characterization; Subgrade; stone aggregates; bitumen materials; Construction of gravel roads; Construction water Bound macadam roads; Construction of bituminous pavements; Construction of cement concrete roads; Construction of joints in cement concrete pavements; Joint filler and seals; Pavement failures; Highway maintenance.

Learning Outcomes:

- The quality requirements of highway materials like coarse and fine aggregates
- The quality analysis of bitumen.
- The construction methods of different kinds of roads and their constructional requirements.
- The reasons of pavement failures and
- Methods of highway maintenance and drainage systems.

UNIT-V INTELLIGENT TRANSPORT SYSTEMS

ITS user services; Public transportation operations; ITS architecture; ITS planning and evaluation- Standards and their needs; Vehicle to vehicle communications; Vehicle to infrastructure communication.

Learning Outcomes:

- The concepts of ITS.
- The planning concept of ITS
- Communications systems of ITS.

TEXT BOOKS:

1. Highway Engineering – S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Nemchand & Bros., 10th edition, 2018.
2. Traffic Engineering & Transportation Planning – Dr. L. Kadyali, Khanna Publications – 6th Edition, 1997.

REFERENCES:

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali and Dr. N. B Lal - Khanna Publications.
3. Highway Engineering – S. P. Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)
4. IRC 37-2012 : Tentative guidelines for design of flexible pavement
5. IRC 58-2011: Guidelines for design of plain jointed rigid pavements.
6. IRC 81-1997 : Guidelines for design of overlay using Benkalman Beam Deflection Technique

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Highway Development in India; Necessity for Highway Planning			
2	1	2	Different Road Development Plans; Classification of Roads			
3	1	3	Road Network Patterns; Highway Alignment- Factors affecting Alignment			
4	1	4	Engineering Surveys; Drawings and Reports; Highway Project.			
5	1	5	Importance of Geometric Design; Design controls and Criteria;			
6	1	6	Highway Cross Section Elements; Sight Distance Elements; Stopping Sight Distance			
7	1	7	Overtaking Sight Distance and Intermediate Sight Distance			

8	1	8	Design of Horizontal Alignment; Design of Super elevation and Extra widening			
9	1	9	Design of Transition Curves - Design of Vertical Alignment; Gradients			
10	1	10	Design of Transition Curves - Design of Vertical Alignment; Gradients			
11	1	11	Vertical curves			
12	1	12	PPT			
13	1	13	Active Learning			
14	1	14	Unit Test - 1			
15	2	15	Basic Parameters of Traffic-Volume, Speed and Density			
16	2	16	Traffic Volume Studies - Data Collection and Presentation			
17	2	17	Speed studies - Data Collection and Presentation			
18	2	18	Origin & Destination studies			
19	2	19	Parking Studies – On street & Off street Parking			
20	2	20	Road Accidents - Causes and Preventive Measures			
21	2	21	Accident Data Recording – Condition Diagram and Collision Diagrams			
22	2	22	Traffic Signs – Types and Specifications			
23	2	23	Road Markings - Need for Road Marking			
24	2	24	Types of Road Markings			
25	2	25	Design of Traffic Signals – Webster Method.			
26	2	26	PPT			
27	2	27	Active Learning			
28	2	28	Unit Test - 2			
29	3	29	Types of Intersections; Conflicts at Intersections			
30	3	30	Requirements of At-Grade Intersections			
31	3	31	Types of At-Grade Intersections:			
32	3	32	Channelized and Channelized Intersections			

33	3	33	Traffic Islands; Types of Grade Separated Intersections			
34	3	34	Rotary Intersection; Concept of Rotary			
35	3	35	Design Factors of Rotary			
36	3	36	Advantages and Limitations of Rotary Intersections.			
37	3	37	PPT			
38	3	38	Active Learning			
39	3	39	Unit Test - 3			
40	4	40	Highway material characterization;			
41	4	41	Subgrade; stone aggregates; bitumen materials			
42	4	42	Construction of gravel roads; Construction water Bound macadam roads			
43	4	43	Construction of bituminous pavements			
44	4	44	Construction of cement concrete roads			
45	4	45	Construction of joints in cement concrete pavements			
46	4	46	Joint filler and seals			
47	4	47	Pavement failures			
48	4	48	Highway maintenance.			
49	4	49	PPT			
50	4	50	Active Learning			
51	4	51	Unit Test - 4			
52	5	52	ITS user services			
53	5	53	Public transportation operations			
54	5	54	ITS architecture			
55	5	55	ITS planning and evaluation - Standards and their needs			
56	5	56	Vehicle to vehicle communications			
57	5	57	Vehicle to infrastructure communication.			
58	5	58	PPT			
59	5	59	Active Learning			
60	5	60	Unit Test - 5			

Important Questions:

Unit – 1

Part – A

1 What is the Necessity for highway planning in our country?
2 Write about Jayakar Committee and its Recommendations?
3 What are the salient features of Second Twenty year road development plan?
4 What are the salient features of First Twenty year road development plan?
5 What are the salient features of Third Twenty year road development plan?
6 Explain the classification of Roads?
7 List various factors controlling alignment?
8 List out advantages of good road?
9 Write short notes on Highway project report?
10 Draw neat sketches of various road patterns.

Part – B

1 What is the Necessity for highway planning in our country? Write about Jayakar committee and its Recommendations?
2 Write short notes on the following
a) Nagpur road plan and its salient features along with two plan formulas b) Central Road Fund
3 Write about Jayakar Committee and its Recommendations and write about I.R.C in detail?
4 Explain the classification of Roads and also list five advantages of Roads?
5 What are the different plans to be prepared after planning surveys are carried out?
6 Write a short notes on Highway project report and Explain the steps for a new Highway project?
7 a) Discuss the Third twenty year road plan and its objectives
b) Compare First & Second Twenty year Road Development plans?
8 What are the characteristics of good road and the need for a good road?
9 Explain in detail about Road development plans in India?
10 What is an Highway alignment and various factors controlling alignment?

Unit – 2

Part – A

1. What is Camber?
2. What is the need of camber on pavement and its recommendations?
3. What is skid resistance?
4. What are the factors on which skid resistance depends?
5. What is Stopping sight distance?
6. What is over taking sight distance?

7. Write about over taking zones?
8 Write about Intermediate sight distance and head light sight distance?
9. Write about Transition curve?
10. Write about Vertical curves?

Part – B

1 What is Camber and explain its need on highway?
2 What is over taking sight distance? Also derive an expression for OSD
3 Write about Intermediate sight distance and head light sight distance and explain them in detail?
4 Write about Design of Transition curves in detail? Explain the concept of shift?
5 What are the factors controlling the geometric elements?
6 Write about the design of Vertical curves and Explain with an example?
7 Write about over taking zones? Explain them with neat sketches.
8 What is skid resistance and what are the factors on which it depends?
9 What are the factors controlling the geometric elements?
10 What are the various types of cambers and explain the need of camber on pavement and its recommendations?

Unit – 3
Part – A

1. Define Traffic Density.
2. How the traffic volume data is collected and presented in traffic engineering?
3. Write about spot speed studies?
4. What is the need for road markings?
5. Show various types of traffic signs with neat sketches.
6. Define On street and off street parking?
7. Describe various causes for road accidents?
8. What are the different types of traffic signal systems?
9. What is origin and destination data?
10. List out various measures that may be taken to prevent accidents?

Part – B

1. Explain the procedure for conducting spot speed studies. How do you analyze the Spot speed data?
2. Describe in detail about parking studies?
3 Describe various causes for road accidents and write about measures that are to be taken to reduce the road accidents?
4. Distinguish between On street and Off street parking?.
5. Explain various measures that may be taken to prevent accidents?

6. What is Road Marking? What is the need for road markings and What are the types of road markings?
7 Describe various types of traffic signs used in traffic control andregulation giving at least two examples for each type. Support your answer with suitable sketches and specifications for the signs
8 Write about traffic volume studies and explain how the data is collected and presented in traffic engineering?
9. Show various types of traffic signs with neat sketches. Explain each in detail
10. Explain the design procedure of Traffic signals according to Webster method.

Unit – 4
Part – A

1 Define intersection? What are the types of Intersections?
2 What are the basic forms of Intersection?
3 What are the various types of at grade Intersections?
4 What are various types of Grade separated Intersections?
5 What is Channelization?
6 Write about Rotary Intersection?
7 What are the advantages of Rotary Intersection?
8 What are the Limitations of Rotary Intersection?
9 What are the requirements of at grade Intersection?

Part – B

1 Define intersection? What are the types of Intersections and explain the necessity of Intersections?
2 What are the basic forms of Intersection and explain each with two types?
3 What are the various types of at grade Intersections and explain them with neat sketches?
4 What are various types of Grade separated Intersections and explain them with neat sketches?
5 What is Channelization and explain the importance with its advantages and disadvantages?
6 Write about Rotary Intersection and explain with a neat sketch?
7 What are the advantages and limitations of Rotary Intersection?
8 What are the design factors that control the design of rotary intersection and explain them in detail?
9 Explain various safety measures to be taken to prevent accidents at Rotary?
10 What are the requirements of at grade Intersection and explain them?

Unit – 5
Part – A

1 Define the characterization of highway material?
2 Write about sub grade soil and stone aggregates
3 Write short notes on surface dressing?
4 Give the difference between wbm and gravel roads.
5 Write notes on cement concrete roads.
6 How will you consider the drainage considerations in highway?
7 Write the steps involved in construction of roads?
8 What are stone aggregates?
9 How will you consider the maintenance of highway?
10 What is bituminous concrete?

Part – B

1 Explain the construction of water bound macadam?
2 Explain the construction of cement concrete roads?
3 Explain the construction of gravel roads?
4 Explain the construction of bituminous pavements?
5 How will construct the joints in cc pavements?
6 What is joint filler and seal?
7 What are the different factors for failure of pavements?
8 What do you mean by surface dressing and what is the role of surface dressing in the construction of highway?
9 Give the difference between water bound macadam roads and bitumen bound macadam.
10 How will do the maintenance of roads?

2060124 – STRUCTURAL ENGINEERING – II (STEEL)

B. Tech. III Year II Sem **L T P C**
Prerequisites: Structural Engineering -1 (RCC) **3 0 0 3**

Course Objectives: The objective of the course is

1. To learn about the basics of steel sections and their prominence in constructions.
2. To impart knowledge on different types of connections
3. To learn about the design of beams.
4. To learn about design of tension and compression member.
5. To learn about design of lacings and battens.
6. To learn about design of roof truss and purlin.

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

1. To design bolted and welded connections
2. To design laterally supported and unsupported beams.
3. To design tension member.
4. To design compression member
5. To design lacings and battens.
6. To design roof trusses and purlin.

UNIT - I

Introduction: Introduction to steel structures, merits and demerits

Bolted and Riveted Connections: Introduction, advantages and disadvantages of bolting and riveting, General terminology, Strength of bolts and rivets, bearing stress and shear stress, Permissible limits, IS Code requirements.

Welded Connections: Introduction, advantages and disadvantages of welding, Strength of welds, Butt and fillet weld; Permissible stresses, IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

Learning Outcomes:

At the end of the unit, students will be able to understand,

- Basics of steel, its properties, merits and demerits.
- Design of bolted and welded connections.

UNIT - II

Laterally Supported Beams: Design of simple and compound beams, Curtailment of flange plates.

Laterally Unsupported Beams: Design of laterally unsupported beams.

Plate Girder: Design of plate girder

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of laterally supported beams.
- Design of laterally unsupported beams.

UNIT - III

Tension Members: General Design of members subjected to direct tension and bending, effective length of columns; Slenderness ratio, permissible stresses.

Compression Members: Design of axially loaded compression members, struts; eccentrically loaded columns; Splicing of members using bolting.

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of tension member.
- Design of compression member.

UNIT - IV

Design of Lacings: Design principles as per IS Code. Design of single and double lacing system using bolting for channel and angle sections.

Design of Battens: Design principles and specifications as per IS Code. Design of batten systems using bolting for channel and angle sections.

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of Lacing.
- Design of Battens.

UNIT - V

Roof Truss: Types of Trusses, Loads on trusses, Design of roof trusses

Purlin: Design of purlin

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of roof trusses.
- Design of purlins.

TEXT BOOKS:

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
2. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.

4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800,2007 Structures Publications, 2009.
5. IS 800:2007, General Construction In Steel, Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

CODES/TABLES:

IS: CODES-STEEL TABLES:

1. IS -800, 2007
2. IS - 875, Part III
3. Steel Tables.
4. IS 1367 (PART 3)

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	**INTRODUCTION TO STEEL STRUCTURES**			
2	1	2	Materials - Types of Structural Steel			
3	1	3	Mechanical Properties of Steel - Concepts of Plasticity			
4	1	4	Loads and Stresses - Concept of Limit State Design			
5	1	5	Connection – Types - Bolted Connections – Design strength – Efficiency			
6	1	6	Problems			
7	1	7	Welded Connections			
8	1	8	Problems			
9	1	9	Design of Beam Column Connection			
10	1	10	Framed Connection			
11	1	11	**PPT for UNIT – 1**			
12	1	12	**ACTIVE LEARNING**			
13	1	13	**UNIT TEST – 1**			
14	2	14	**TENSION MEMBER**			
15	2	15	Design Strength – problem			
16	2	16	Design of Tension Member			
17	2	17	Design of Splice			
18	2	18	Design of Lug Angle			
19	2	19	**COMPRESSION MEMBER**			

20	2	20	Buckling Class – design of simple compression member			
21	2	21	Laced Column			
22	2	22	Battened column			
23	2	23	Splice			
24	2	24	Column base - Slab base			
25	2	25	**PPT for UNIT – 2**			
26	2	26	**ACTIVE LEARNING**			
30	2	30	**UNIT TEST – 2**			
31	3	31	**Plastic analysis**, plastic moment – section modulus			
32	3	32	Plastic analysis of continuous beam			
33	3	33	Design of Laterally Supported Beam			
34	3	34	Problems			
35	3	35	Design of Built-up Section			
36	3	36	Problems			
37	3	37	Beam splice			
38	3	38	**PPT for UNIT – 3**			
39	3	39	**ACTIVE LEARNING**			
40	3	40	**UNIT TEST – 3**			
41	4	41	**PLATE GIRDER**			
42	4	42	Design Procedure			
43	4	43	Problems			
44	4	44	Problems			
45	4	45	Design of Stiffener			
46	4	46	Problems			
47	4	47	Design of web splice and flange splice			
48	4	48	**PPT for UNIT – 4**			
49	4	49	**ACTIVE LEARNING**			
50	4	50	**UNIT TEST – 4**			
51	5	51	**DESIGN OF INDUSTRIAL STRUCTURES**			
52	5	52	Types of Roof Trusses			
53	5	53	Loads on Trusses			
54	5	54	Purlin Design			
55	5	55	Problems			
56	5	56	Problem			
57	5	57	Design of truss			

58	5	58	Problem			
59	5	59	Problem			
60	5	60	Design of welded gantry girder			
61	5	61	Problem			
62	5	62	**PPT for UNIT – 5**			
63	5	63	**ACTIVE LEARNING**			
64	5	64	**UNIT TEST – 5**			

Important Questions:

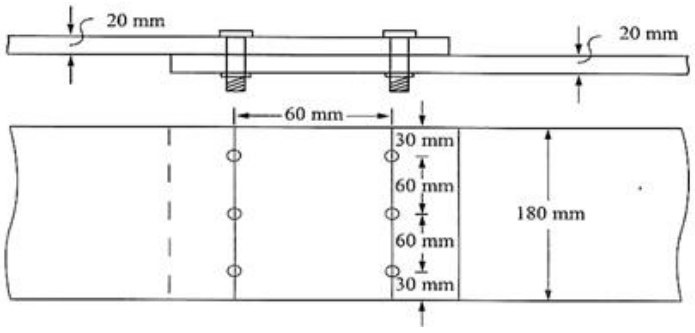
Unit – 1

Part – A

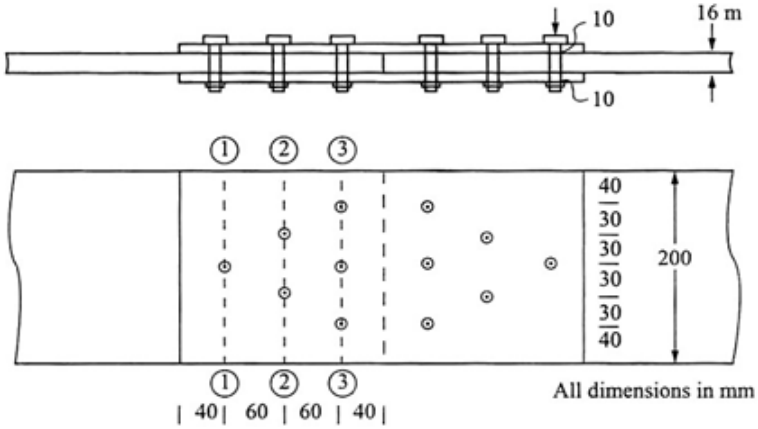
1. Distinguish between gauge distance and pitch of the bolt
2. What are the merits and demerits of welded connection?
3. What is bolt value?
4. List out the disadvantages of welded connections.
5. Define pitch of the rivet.
6. What do you mean by splitting of plates?
7. Define bolt.
8. List out the various types of welded joints.
9. Define modulus of elasticity.
10. What are the various types of connections used for connecting the structuralmembers?
11. Define nominal diameter of rivet.
12. Define gross diameter of rivet.
13. What is meant by gauge distance and edge distance?
14. Define staggered pitch.
15. What is meant by tensile stress?
16. What is meant by compressive stress?
17. Define bearing stress.
18. What is working stress?
19. What are the assumptions made in simple design?
20. What are the types of riveted joints?
21. What are the types of failures occur in riveted joint?
22. What are the assumptions made for designing riveted joint?
23. Write about minimum pitch and maximum pitch.
24. What are the assumptions made for designing riveted joint?
25. What is edge distance?
26. What are the advantages of bolted connections?
27. What are the various types of bolts used for structural purposes?

Part – B

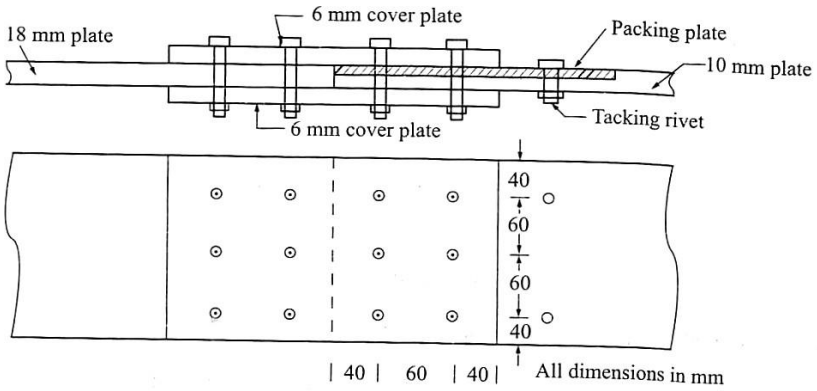
1. Find the efficiency of the lap joint shown in fig.1.with the following data: M20 bolts of grade 4.6 and Fe410 plates are used.



2. Find the maximum force which can be transferred through the double covered butt joint shown in fig. Find the efficiency of the joint also. Given M20 bolts of grade 4.6 and Fe410 steel plates are used.



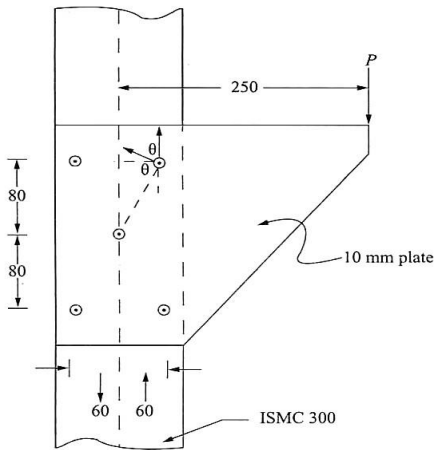
3. Two cover plates, 10mm and 18mm thick are connected by a double cover butt joint using 6mm cover plates as shown in fig. Find the strength of the joint. Given M20 bolts of grade 4.6 and Fe410 plates are used.



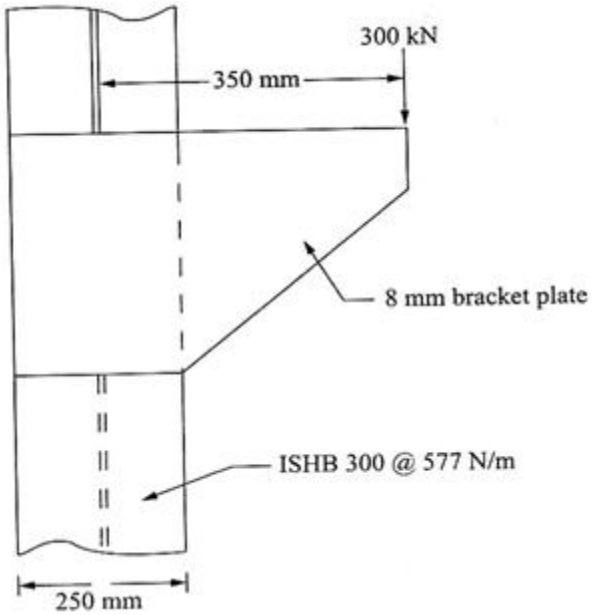
4. Design a lap joint between the two plates each of width 120mm,if the thickness of one plate is 16mm and the other is 12mm.the joint has to transfer a design load of 160Kn.the plates are of Fe410grade.use bearing type bolts.

5. Design a single bolted double cover butt joint to connect boiler plates of thickness 12mm for maximum efficiency. Use M16 bolts of grade 4.6.boiler plates are of Fe 410 grade. Find the efficiency of the joint.

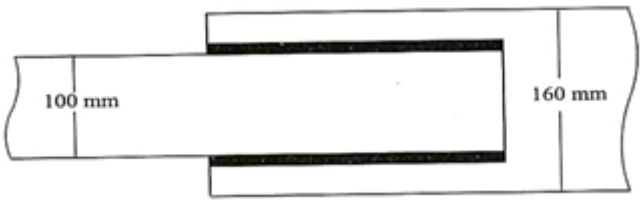
6. A bracket bolted to a vertical column is loaded as shown in fig. If M20 bolts of grade 4.6 are used, determine the maximum value of factored load P which can be carried safely.



7. A bracket is bolted to the flange of a column as shown in fig. Using 8mm thick bracket plate. Using M20 bolts of grade 4.6 design the connection.



8. Design a suitable longitudinal fillet welds to connect the plates as shown in fig. To transmit a pull equal to the full strength of small plate. Given: plates are 12mm thick, grade of plates Fe410 and welding to be made in workshop.

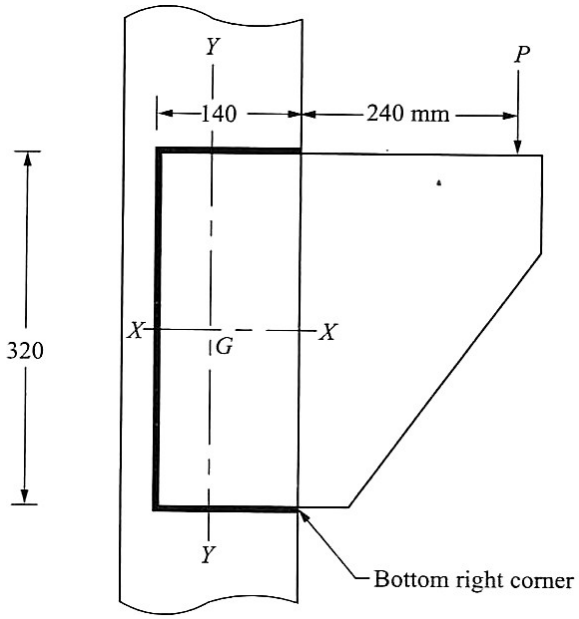


9. A tie member of a roof truss consists of 2 ISA 10075, 8mm.the angles are connected to either side of a 10mm gusset plates and the member is subjected to a working pull of 300KN.design the weld connection. Assume connections are made in the workshop.

10. Design a welded connection to connect two plates of width 200mm and thickness 10mm for 100 percent efficiency.

11. A tie member consists of two ISMC 250.the channels are connected on either side of a 12mm thick gusset plate. Design the welded joint to develop the full strength of the tie. However the overlap is to be limited to 400mm.

12. Determine the maximum load that can resist by the bracket shown in fig. By fillet weld of size 6mm, if it is shop welding.



Unit – 2

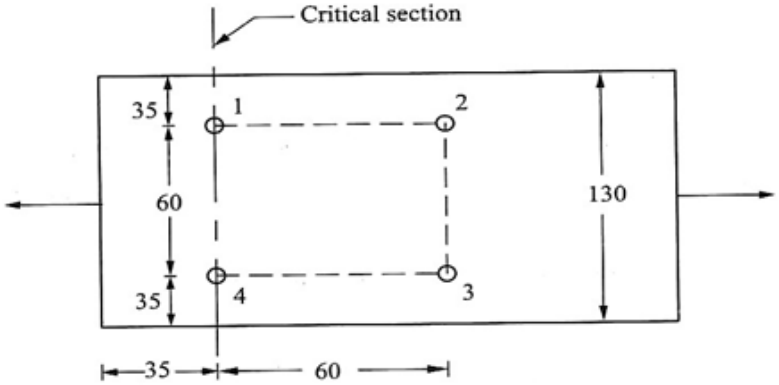
Part – A

1. Draw any two typical cross sections of tension member using angle sections.
2. What is block shear?
3. List out the typical failure modes in tension member.
4. What is the formula for design strength due to yielding of critical section?
5. List out the different types of bolts.
6. Define slenderness ratio.
7. What are the various types of tension members?

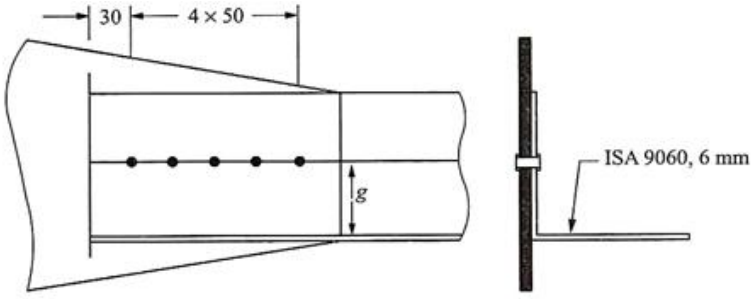
8. What is mean by built up members?
9. What is net sectional area?
10. Explain the tension member.
11. Explain Behavior of tension members
12. Write note on Load-elongation of tension member
13. How Angle sections eccentrically loaded through gussets plate?
14. What is a Lug angle?
15. Why Stiffener required in tension members?
16. Different types of tension members?
17. Write note on tension member splice.
18. What is the condition for design strength of a tension member?
19. Define tension member splice.
20. Define gusset plate.

Part – B

1. Determine the design tensile strength of the plate 200mmx12mm with the holes for 16mm diameter bolts as shown in fig. Steel used is of Fe415 grade quality.

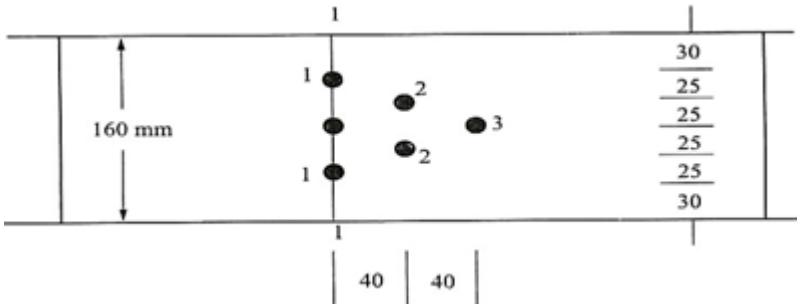


2. A single unequal angle ISA 9060, 6mm is connected to a 10mm gusset plates at the ends with 5nos.of 16mm bolts to transfer tension. Determine the design tensile strength of the angle a) If the gusset is connected to 90mm leg. b) If the gusset is connected to 60mm leg.



g =50 mm, if 90 mm leg is connected
=30 mm, if 60 mm leg is connected

3. Determine the design tensile strength of 160x8mm plate with the holes for 16mm bolts as shown in fig. plates are of steel, grade Fe415.



4. Determine the tensile strength of a roof truss member 2 ISA 9060, 6mm connected to the gusset plate of 8mm plate by 4mm weld as shown in fig. The effective length of weld is 200mm.
5. Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225Kn.the member is subjected to the possible reversal of stress due to the action of wind. The length of the member is 3m.use 20mm shop bolts of grade4.6 for the connection.
6. Design a double angle tension member connected on each side of a 10mm thick gusset plate, to carry an axial factored load of 375Kn.use 20mm black bolts. Assume shop connection.
7. Design a splice to connect a 300x20mm plate with a 300x10mm plate. The design load is 500kn.use 20mm black bolts, fabricated in the shop.
8. A tension member of a roof truss carries a factored axial tension of 430Kn.design the section and its connection a) Without using lug angle b) Using lug angle
9. Design a T-section to act as a tension member carrying an axial tension of 220kN.
10. Design a tension member using a channel section to carry an axial tension of 220kN.

Unit – 3

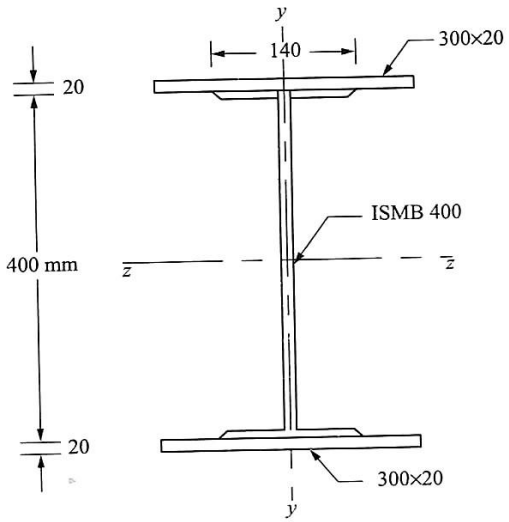
Part – A

1. Define effective length of a column.
2. Draw a neat sketch of column with double lacing and mention the specifications for lacing.
3. What are the different types of column base connections?
4. How does the code account for imperfections in a compression member?
5. What do you mean by latticed column?
6. What is the use of lug angle?
7. Draw the shapes of compression members.
8. What is the formula for effective sectional area required?
9. What are the steps involved in design of compression members?
10. What is meant by short strut?
11. Draw the diagram of buckling of column
12. What are the assumptions made in Euler's analysis
13. What are the effect of strain hardening and the absence of clearly defined yield point?
14. Write the effect of eccentricity of applied loading
15. What are the buckled modes for different end connections?

16. What are the different effective lengths for different boundary condition?
17. What is meant by flexural buckling and torsional –flexural buckling?
18. What are Steps in the design of axially loaded columns?
19. Write about batten plate's compression member.
20. What are the three classifications for determination of size of plate?
21. Draw the column base plate diagram.
22. What is the purpose for providing anchors bolt in base plate?

Part – B

1. In a truss a strut 3m long consists of two angles ISA 100100, 6mm.find the factored strength of the member if the angles are connected on both sides of 12mm gusset plate by
   a) One bolt b) Two bolt c) Welding, which makes the joint rigid.
2. Determine the load carrying capacity of the column section shown in fig. If its actual length is 4.5m.its one end may be assumed fixed and other end hinged. The grade of steel is Fe415



3. A column am long has to support a factored load of 6000kN.the column is effectively held at both and restrained in direction at one of the ends. Design the column using beam section and plates.
4. Design a single angle strut connected to the gusset plate to carry 180Kn factored load. The length of the strut between centre to centre intersections is 3m.
5. Design a laced column with two channels back to back of length 10m to carry an axial factored load of 1400kN.the column may be assumed to have restrained in position but not in direction at both ends.
6. A column section ISHB 300@577 N/m is carrying a factored axial load of 600 kN. A factored moment of 30N-m and a factored shear force of 60 kN. Design a suitable column splice. Assume ends are milled.
7. A upper storey column ISHB 300 @577N/m carries a factored load of 1200 kN and a factored moment of 12 kN-m.it is to be spliced with lower storey column ISHB 400 @806N/m. design a suitable splice.
8. Design a slab base for a column ISHB 300 @577N/m carrying an axial factored load of 1000 kN.M20 concrete is used for the foundation. Provide welded connection between column and base plate.

9. Design a gusseted base for a column ISHB 350 @710N/m with two plates 450mmx20mm carrying a factored load of 3600 kN. The column is to be supported on concrete pedestal to be built with M20 concrete.

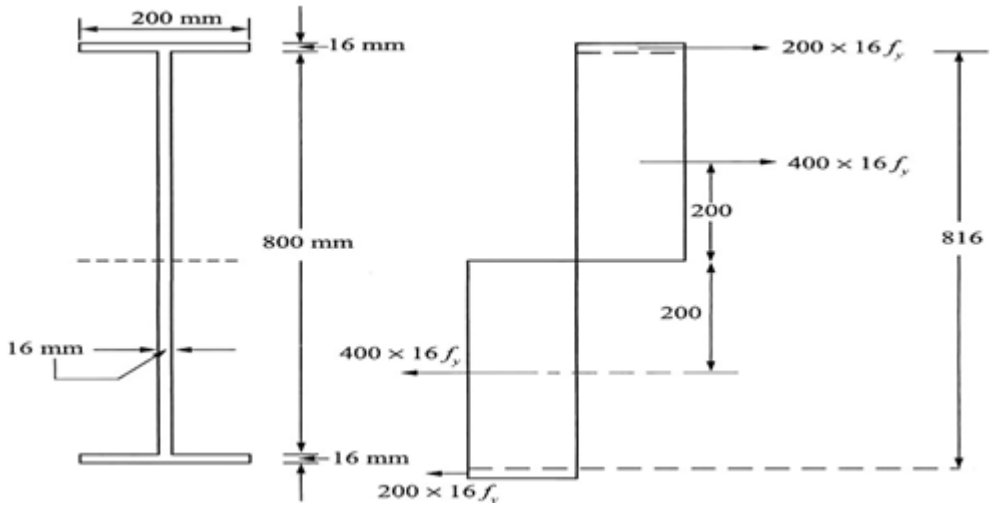
Unit – 4

Part – A

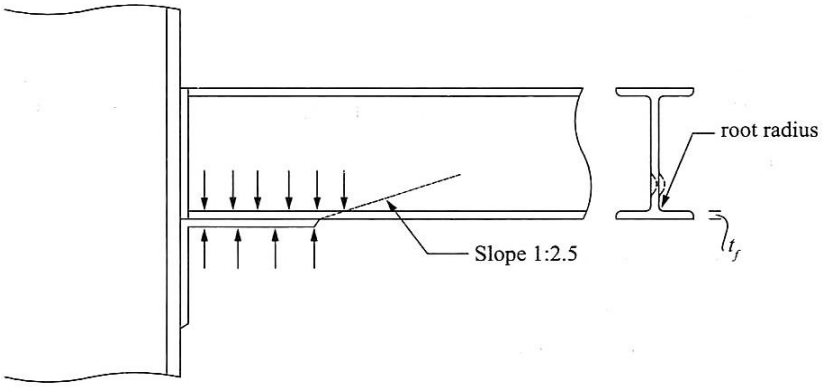
1. What is laterally unsupported beam? Give an example.
2. What is a plate girder? Where is it used?
3. Where are bearing stiffeners used?
4. What do you understand by panel buckling?
5. What do you mean by web buckling?
6. What do you mean by castellated beam?
7. Write short notes on built up beams.
8. What are the classifications of cross sections?
9. What is the design procedure for design of beams?
10. What is meant by limit state design?
11. What are special features of limit state design method?
12. Explain the behavior of steel beams?
13. Write Short notes on compact sections
14. What is meant by slenderness sections?
15. Write short notes on shear lag effects?
16. Draw the curvature for flexural member performance.
17. List the various factors affecting the lateral-tensional buckling strength .
18. How do you improve the shear resistance in plate girder?
19. What are the classifications in Stiffeners?
20. Write about the Box girders.
21. Write Short notes on Purlin and sheeting rails
22. Write the Special features of limit state design method?

Part – B

1. A roof of a hall measuring 8mx12m consists of 100mm thick R.C slab supporting onsteel I beam spaced 3m apart as shown in fig. The finishing load may be taken as 1.5kN/m^2.design the steel beam.
2. Design a simply supported beam of effective span 1.5m carrying a factored concentrated load of 360 kN at mid span.
3. An ISLB 300 carrying udl of 50 kN/m has effective span of 8m.this is to be connected to the web of girder ISMB 450.Design the framed connection using 20mm black bolts.
4. An ISMB 400 beam is to be connected to an ISHB 250@537 N/m to transfer a end force of 140 kN. Design the double plated welded connection
5. Determine the uniformly distributed load carrying capacity of the welded plate girder shown in fig. When it is used as a cantilever beam of 4m effective span and checks it for shear, deflection, web buckling and web crippling. Assuming stiff bearing length as 100mm.



6. Check the section shown in fig for web buckling and web crippling if stiff hearing is over a length b1=75mm.



7. Design a simply supported beam of 10m effective span carrying a total load of 60 kN/m. the depth of beam should not exceed 500mm.the compression flange of the beam is laterally supported by floor construction. Assume stiff end bearing is 75mm.
8. An ISMB 500 section IA used as a beam over a span of 6 m, with simply supported ends. Determine the maximum factored uniformly distributed load that the beam can carry if the ends are restrained against torsion but compression flange is laterally unsupported.
9. Symmetric trusses of span 20m and height 5m are spaced at 4.5m centre to centre. Design the channel section purlins to be placed at suitable distances to resist the following loads: Weight of sheeting including bolts =171 kN/m^2; Live load=0.4 kN/m^2; Wind load=1.2 kN/m^2; Spacing of purlins =1.4m

Unit – 5

Part – A

1. What are the loads to be considered for the design of gantry girder?
2. Give general guidelines for fixing spacing of roof trusses.
3. With a neat sketch show the various components in a steel roof truss.
4. State the purpose of gantry girders.
5. What are the considerations for selection of a suitable type of truss?

6. Name the commonly used roof coverings.
7. What are the types of roof trusses?
8. Name the components of steel roof truss.
9. How to calculate the deflection of trusses?
10. What are main benefits of using composite floors with profiled steel decking?
11. Explain about the importance of steel decking.
12. What is meant by Composite Beam Stage?
13. Write short notes on composite slab stage
14. What are economical considerations for industrial truss?
15. Write about basics of plastic analysis?
16. What is meant by first yield moment?
17. Explain about Crane gantry girders
18. What are the different types of floors used in steel-framed buildings?
19. What are the advantages of steel-decking floors?
20. Write about Pre-cast concrete floors
21. Explain about Drift Analysis

Part – B

1. Explain detail the steps involved in the design of channel purlin of a steel roof truss
2. List out the various elements of the roof truss and mark all its significance
3. Explain the design principles of gantry girder.
4. Design an I section purlin for an industrial building to support a galvanized corrugated iron sheet roof.
   Given: Spacing of the trusses=5.0m; Spacing of purlins=1.5m; Inclination of main rafter to horizontal=30^0; Weight of galvanized sheet taking into account laps and connecting bolts=130N/m^2; Imposed load=1.5kN/m^2; Wind load= 1.0kN/m^2
5. Design angle purlin for the following data by simplified method:
   Spacing of trusses=4m; Spacing of purlins=1.6m; Weight of A.C sheets including laps and fixtures=0.205kN/m^2; Live load=0.6 kN/m^2; Wind load=1 kN/m^2; Inclination of main rafter of truss=21^0
6. Design a welded plate girder of span 30m to carry on superimposed load of 35kN/m. avoid use of bearing and intermediate stiffeners. Use Fe415 steel.
7. Design a welded plate girder of span 30m to carry on superimposed load of 35kN/m. use intermediate stiffeners. Use Fe415 steel.

8. Design a simply supported gantry girder to carry one electric overhead travelling crane, given Span of the gantry crane=6.5m; Span of the crane girder=16m; Crane capacity=250kN; Self weight of crane excluding trolley=280 kN; Self weight of the trolley=50 kN Minimum hook approach=1.0m; Distance between wheels=3.5m; Self weight of rails=0.3 kN/m;

2060125 – GEOTECHNICAL ENGINEERING

B. Tech. III Year II Sem **L T P C**
Pre-requisites:- **3 0 0 3**

Course Objective: The objective of the course is

1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
2. To familiarize the students about the fundamental concepts of compaction,
3. Understand the flow through soil, stress transformation,
4. Analyze stress distribution, consolidation in soil
5. Understand shear strength of soils.
6. To impart knowledge of design of both finite and infinite slopes.

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

1. Classify the soil and assess the engineering properties, based on index properties.
2. Understand the stress concepts in soils
3. Understand and identify the settlement in soils.
4. Analyze stress distribution, consolidation in soil
5. Determine the shear strength of soil
6. Analyze both finite and infinite slopes.

UNIT - I

SOIL CLASSIFICATION AND COMPACTION

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship –Compaction theory – laboratory and field technology – field Compaction method – factors influencing compaction.

Learning Outcome:

At the end of the unit, students should able to,

- Classify the different types of soils
- Understand the structural arrangement of soils
- Assess the engineering properties of soils
- Understand the concept of compaction of soil
- Apply the concepts in the field.

UNIT - II

EFFECTIVE STRESS AND PERMEABILITY

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Permeability – Factors influencing permeability of soils -Darcy's law –

Determination of Permeability – Laboratory Determination (Constant head and falling head methods)

Learning Outcome:

At the end of the unit, students should able to,

- Understand the relationship between soil and water
- Interpret the stresses in soils
- Understand the concept of flow through different soils
- Evaluate the flow parameters using darcys law
- Identify the factors influencing permeability of soils.

UNIT - III

STRESS DISTRIBUTION AND SETTLEMENT

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and udl) Use of New marks influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory

Learning Outcome:

At the end of the unit, students should able to,

- Understand the concept of stress distribution and settlement
- Explain the Boussines theory
- Use the new marks influence chart
- Identify the components of settlement
- Understand the Terzaghi's one dimensional consolidation theory

UNIT - IV

SHEAR STRENGTH

Shear strength of cohesive and cohesion less soils – Pore pressure parameters -Factors influences shear strength of soil-Mohr-Coulomb failure theory – shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests

Learning Outcome:

At the end of the unit, students should able to,

- Understand the concept of shear strength of soils
- Identify the factors influencing permeability of soils.
- Explain the Mohr-Coulomb failure theory
- Assess the of shear strength of soils
- Evaluate the shear strength of soils using different equipments

UNIT - V

SLOPE STABILITY

Infinite slopes and finite slopes — Friction circle method – Use of stability number –

Guidelines for location of critical slope surface in cohesive and c - φsoil – Slope protection measures.

Learning Outcome:

At the end of the unit, students should able to,

- Classify the types of slopes
- Understand the Friction circle method
- Use the stability number for slop analysis
- Identify the location of critical slope in different conditions
- Enlighten the slope protection measures

TEXT BOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi.2014
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. NewDelhi, 16th Edition, 2017.

REFERENCES:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice-Hall,2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
3. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
4. Palanikumar.M., "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi,2013.
5. Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017.
6. Purushothama Raj. P., "Soil Mechanics and Foundations Engineering",2nd Edition, Pearson Education, 2013.

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	SOIL CLASSIFICATION AND COMPACTION History – formation and types of soil			
2	1	2	composition - Index properties			

3	1	3	Clay mineralogy structural arrangement of grains			
4	1	4	Description – Classification			
5	1	5	BIS – US – phase relationship			
6	1	6	Compaction theory – laboratory technology			
7	1	7	Compaction theory – field technology			
8	1	8	Field Compaction method			
9	1	9	Factors influencing compaction.			
10	1	10	PPT			
11	1	11	Active Learning			
12	1	12	Unit Test - 1			
13	2	13	EFFECTIVE STRESS AND PERMEABILITY Soil - water – Static pressure in water			
14	2	14	Effective stress concepts in soils			
15	2	15	Capillary phenomena			
16	2	16	Permeability			
17	2	17	Factors influencing permeability of soils			
18	2	18	Darcy's law			
19	2	19	Determination of Permeability			
20	2	20	Laboratory Determination (Constant head methods)			
21	2	21	Laboratory Determination (Falling head methods)			
22	2	22	PPT			
23	2	23	Active Learning			
24	2	24	Unit Test - 2			
25	2	25	Stress distribution in homogeneous and isotropic medium			
26	2	26	Stress distribution in homogeneous and isotropic medium			
27	2	27	Boussines of theory – (Point load)			
28	3	28	Boussines of theory – (Line load)			
29	3	29	Boussines of theory – (udl)			
30	3	30	Use of New marks influence chart			
31	3	31	Components of settlement			
32	3	32	Immediate and consolidation settlement			
33	3	33	Factors influencing settlement			

34	3	34	Terzaghi's one dimensional consolidation theory			
35	3	35	PPT			
36	3	36	Active Learning			
37	3	37	Unit Test - 3			
38	4	38	Shear strength of cohesive soils			
39	4	39	Shear strength of cohesion less soils			
40	4	40	Pore pressure parameters			
41	4	41	Factors influences shear strength of soil			
42	4	42	Mohr-Coulomb failure theory			
43	4	43	Shear strength			
44	4	44	Direct shear			
45	4	45	Triaxial compression			
46	4	46	UCC test			
47	4	47	Vane shear test			
48	4	48	PPT			
49	4	49	Active Learning			
50	4	50	Unit Test - 4			
51	5	51	Infinite slopes			
52	5	52	Finite slopes			
53	5	53	Friction circle method			
54	5	54	Use of stability number			
55	5	55	Guidelines for location of critical slope surface in cohesive soil			
56	5	56	Guidelines for location of critical slope surface in c- soil			
57	5	57	Guidelines for location of critical slope surface in φ- soil			
58	5	58	Slope protection measures.			
59	5	59	PPT			
60	5	60	Active Learning			
61	5	61	Unit Test - 5			

Important Questions:

Unit – 1

Part – A

1 State the process of formation of soil
2 What do you mean by three phase system with its use and block diagram.
3 Explain the significance of a grain size distribution curve.
4 Define: a) Water content, b) porosity, c) degree of saturation, d) void ratio.

5 Define : a) Dry density, b) saturated unit weight, c) submerged unit weight.
6 Define consistency limits
7 Write the expression for toughness index, flow index and draw plasticity chart
8 What is IS classification of soil and the principle of soil classification
9 A sample weighing 18kn/m^3 and has water content of 30%. The specific gravity of soil particles is 2.68. Determine void ratio and porosity.
10 Differentiate between saturated density and bulk density.

Part – B

1 Explain the process of formation of soil
2 Explain in detail the laboratory methods for grain size distribution of fine and coarse soil.
3 Starting from three phase representation of soil mass, derive the relationship between bulk unit weight, specific gravity, void ratio and degree of saturation
4 With the help of three phase diagram, define the following: (i) Voids ratio (ii) Porosity (iii) Degree of saturation (iv) Water content (v) Absolute/true specific gravity (vi) Apparent specific gravity (vii) Air content (viii) Percentage of air voids and (ix) Relative density.
5 Explain the principle of hydrometer method.
6 A sample of saturated soil has a water content of 25% and a bulk unit weight of 20kN/m^3 . Determine the (i) dry unit weight (ii) void ratio (ii) specific gravity of the soil. What would be the bulk unit weight of the soil if the soil is compacted for the same void ratio but with adegree of saturation 90%.
7 Explain laboratory tests to determine the (i) specific gravity of soil (ii)water content of soil
8 A sample weighing 20kn/m^3 and has water content of 20%. The specific gravity of soil particles is 2.68. Determine void ratio and porosity and differentiate between the two methods of sieve analysis.
9 Discuss the importance of Atterberg's limits of soil.
10 Discuss the method for determination of shrinkage limit of soil.

Unit – 2

Part – A

1 State Darcy's law and its limitations.
2 Write the expression of permeability in stratified soils.
3 Differentiate between absorbed and capillary water in soils.
4 Explain the factors affecting the permeability of soil.
5 Define effective ,neutral, and total stress
6 What are the uses of flownets.
7 Explain quick sand condition
8 What are the salient characteristics of a flow net

Part – B

1 Explain the factors affecting the permeability of soil.
2 Determination of coefficient of permeability in a laboratory and discuss their limitations.
3 What is darcy'slaw ?what are its limitations?
4 What are the characteristics of flow nets?
5 Discuss the properties and applications of flow nets and explain quick sand phenomenon.
6 Describe the electrical analogy of flow net construction.
7 Describe pumping-out method for the determination of the coefficient of permeability in the field?
8 Describe pumping-in method for the determination of the coefficient of permeability in the field?
9 Differentiate between absorbed and capillary water in soils and what are the advantages and disadvantages of coefficient of permeability.
10 What is seepage velocity, coefficient of percolation and quick sand.

Unit – 3

Part – A

1 What is pressure bulb.
2 What are the expressions for the Boussinesq's and westergaard's solution for point load.
3 State Boussinesq's equation for vertical stress at a point due to a load on the surface of an elastic medium.
4 Derive the principle of construction of Newmark's chart and explain its use.
5 A load 1000KN acts as appoint load at the surface of the soil mass. Estimate the stress at a point 2m below 3m away from the point of action of the load by Boussinesq's formula. Compare the value with the result from Westergaard's theory.
6 A circular area on the surface of an elastic mass of great extent carries a uniformly distributed load of 120KN/m^2. The radius of thecircle is 3m. compute the intensity of vertical pressure at a point 5m beneath the centre of the circle using Boussinesq's method.
7 What is the mechanism of compaction.
8 Discuss the effect of compaction on soil properties.
9 Write a short notes on field compaction control

Part – B

1 State the Boussinesq'sequation for vertical stress at a point due to a load on the surface of an elastic medium .
2 Derive as per Boussinesq's theory, expression for vertical stress at any point in a soil mass due to strip load .

3 Derive the Westergaard'ssolution and limitations of elastic theories.
4 Derive vertical stress under trapezoidal loads, horizontal load, inclined load.
5 Explain the Newmark's Influence charts and their uses.
6 Describe standard proctor test and the modified proctor test.
7 Write short notes on method on compaction and field compactionmethod.
8 Discuss the effect of compaction on soil properties.
9 What is the effect of compaction on the engineering properties of thesoil. How will you decide if the soil is to be compacted towards the dry of the optimum or the wet of the optimum.
10 What are the different methods of compaction adopted in the field? How would you select the type of roller to be used in the field?

Unit – 4
Part – A

1 Define normally consolidated, under consolidated and overconsolidated soils.
2 Explain the significance of pre-consolidation pressure.
3 Explain Terzaghi's assumptions
4 Define compression index, coefficient of consolidation
5 Differentiate between compaction and consolidation of soils.
6 Define immediate settlement, primary consolidation, and secondary consolidation.
7 Explain logarithm of time fitting method
8 Differentiate between standard and modified Proctor test
9 Discuss Terzaghi's theory of consolidation.
10 A sand fill compacted to bulk density of 18.84KN/m^3 is to be placed on a compressible saturated marsh deposit 3.5m thick. The height of the sand fill is to be 3m. if the volume compressibility m_v of thedeposit is 7 x 10^{-4} m^2/KN, estimate final settlement of the fill.

Part – B

1 Explain spring analogy for primary consolidation.
2 Discuss Terzaghi's theory of consolidation, stating the various assumptions and their validity
3 Expalin the different e-log p curves for the consolidation.
4 Differentiate between (i) primary consolidation and secondary consolidation (ii) standard and modified Proctor test.
5 How do you determine the pre-consolidation pressure and its determination in soil engineering practice
6 Explain the significance of pre-consolidation pressure. Describe the Casagrande method of determining it
7 Explain with spring analogy, Terzaghi's theory of one dimensional consolidation
8 Write a brief procedure of consolidation test and to determine the coefficient of consolidation by both logarithmic time fitting method and square root of time

method.

9 What is over consolidation soil? Explain briefly with an example.

10 Explain the square root of time fitting method of determining the coefficient of consolidation of a clay sample.

Unit – 5

Part – A

1 What are the important characteristics of Mohr"s circle

2 What are the different test for shear strength

3 State Mohr- Coulomb failure theories.

4 Define Dilantacy, Critical void ratio ,liquefaction, Shear strength of clays.

5 Explain different types of soils.

6 What are the merits and demerit of triaxial test.

7 What are the merits and demerits of vane shear test.

8 What are the factors effecting ofcohesionless soils.

9 What are the factors effecting of cohesive soils.

Part – B

1 Explain Mohr-Coulomb theory of shear strength. Sketch typical strength envelope for a soft clay, clean sand and a silty clay

2 Classify the shear tests based on drainage conditions. Explain how thepore pressure variation and volume change take place during these tests. Enumerate the field conditions which necessitate each of these tests.

3 What types of field tests are necessary for determining the shear strength parameters of sensitive clays?

4 What are the advantages and disadvantages of a triaxial compression test in comparison with a direct shear test

5 What are the advantages and disadvantages of direct shear test over triaxial test?

6 Explain about triaxial compression test

7 Discuss the characteristics of cohesionless and cohesive soils.

8 Discuss modified failure envelope. What are its advantages and disadvantages over the standard failure envelope.

9 Derive the relation between the principle stress at failure using mohr-coulomb failure criterion.

10 Explain about liquefaction of soils.

2060145 – INTRODUCTION TO FINITE ELEMENT METHODS
(Professional Elective – II)

B. Tech. III Year II Sem **L T P C**
Prerequisites: Structural Analysis I & II **3 0 0 3**
Course Objectives:

1. To equip the students with the finite element analysis fundamentals.
2. To enable the students to formulate the design problems into FEA.
3. To introduce basic aspects of finite elements technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, ad solution of the resulting algebraic systems.

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

1. Develop shape functions and stiffness matrices for bar and beam elements
2. To understand isoparametric formulation, static condensation etc.
3. Analyse continuous beam by stiffness matrix approach
4. Formulate CST and LST element
5. Understand the background of mathematical equations used for development of modeling software modules to develop the various structural related applications
6. Identify mathematical model for solution of common engineering problems.

UNIT – I

Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

UNIT – II

Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D & 3D – Element –shape functions upto quadratic formulation.

Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain relation

UNIT – III

FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

UNIT – IV

FEA Two dimessional problem – CST – LST element – shape function – stress – strain. Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element.

UNIT - V

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

REFERENCES:

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook *et al.*, Wiley India Pvt.Ltd.
3. Applied Finite Element Analysis by G. Ramamurty, I. K. International Publishing House Pvt. Ltd.

2060146 – ADVANCED STRUCTURAL DESIGN
(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Structural Engineering I & II, Structural Analysis **3 0 0 3**

Course Objective: To make the student more conversant with the design principles of critical structures using limit state approach

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

1. Enhance the capabilities to design the special structural elements as per Indian standard code of practice.
2. Design and Detailing of cantilever type of Retaining walls
3. Design of Flat slabs and Ribbed slabs
4. Design of RCC Circular water tank
5. Design of Reinforced Concrete Slab Bridge decks
6. Design of steel gantry girder.

UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counterfort Retaining walls.

UNIT – II

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears

Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

UNIT – III

Design of RCC Circular Water Tanks resting on ground – Flexible, Rigid and Hinged base water tanks

UNIT – IV

Design of strip and raft RC foundation

UNIT – V

Introduction to Gantry Girders - Design Principles - Design of Steel Gantry Girders.

TEXT BOOKS:

1. Advanced RCC by N.Krishna Raju, CBS Publishers & distributors, New Delhi.

2. Advanced RCC by P.C.Varghese, PHI Publications, New Delhi.
3. Reinforced concrete design by S.Unnikrishna Pillai and Devdas Menon, 4th Edition, Tata Mc Graw Hill.
4. Design Reinforced Concrete Structures by N.Subramanian, 1st Edition, Oxford University Press, 2014.

REFERENCES:

1. RCC Designs by Sushil Kumar, Standard publishing house.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S.Chand Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by N.Krishna Raju, Univ. Press, New Delhi
4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi.
5. Design of Steel Structures by S.K.Duggal, 3rd Edition, Tata Mc Graw Hill, 2017.

Session Planner:

S.No	Unit No.	L.No	Topic Details	Date Planned	Date Conducted	Remarks
1	1	1	Retaining wall - Introduction			
2	1	2	Design and Detailing of cantilever type of Retaining walls			
3	1	3	Design and Detailing of cantilever type of Retaining walls			
4	1	4	Design and Detailing of cantilever type of Retaining walls			
5	1	5	Design and Detailing of cantilever type of Retaining walls			
6	1	6	Stability Check			
7	1	7	Principles& Design of Counter fort Retaining walls.			
8	1	8	Principles& Design of Counter fort Retaining walls.			
9	1	9	Principles& Design of Counter fort Retaining walls.			
10	1	10	Principles& Design of Counter fort Retaining walls.			
11	1	11	PPT			
12	1	12	Active learning			
13	1	13	Unit test - 1			
14	2	14	Flat slabs: Direct design method			
15	2	15	Distribution of moments in column strips and middle strip			

16	2	16	Distribution of moments in column strips and middle strip			
17	2	17	moment and shear transfer from slabs to columns			
18	2	18	Shear in Flat slabs			
19	2	19	Check for one way and two way shears			
20	2	20	Ribbed slabs			
21	2	21	Analysis of the Slabs for Moment and Shears			
22	2	22	Ultimate Moment of Resistance			
23	2	23	Design for shear			
24	2	24	Deflection			
25	2	25	Arrangement of Reinforcements.			
26	2	26	PPT			
27	2	27	Active learning			
28	2	28	Unit test - 2			
29	3	29	Water tanks - Introduction			
30	3	30	Design of RCC Circular Water Tanks			
31	3	31	Design of RCC Circular Water Tanks			
32	3	32	Design of RCC Circular Water Tanks			
33	3	33	Design of RCC Circular Water Tanks			
34	3	34	Design of RCC Circular Water Tanks			
35	3	35	Design of RCC Circular Water Tanks.			
36	3	36	PPT			
37	3	37	Active learning			
38	3	38	Unit test - 3			
39	4	39	Bridges: Introduction			
40	4	40	Definition and basic forms			
41	4	41	Components of a bridge			
42	4	42	Classification of bridges			
43	4	43	IRC Loading Standards and specifications			
44	4	44	Design of Reinforced Concrete Slab Bridge decks			
45	4	45	Design of Reinforced Concrete Slab Bridge decks			
46	4	46	Design of Reinforced Concrete Slab Bridge decks			

47	4	47	PPT			
48	4	48	Active learning			
49	4	49	Unit test - 4			
50	5	50	Gantry Girders: Introduction			
51	5	51	Design of Steel Gantry Girders			
52	5	52	Design of Steel Gantry Girders			
53	5	53	Design of Steel Gantry Girders			
54	5	54	Design of Steel Gantry Girders			
55	5	55	Design of Steel Gantry Girders			
56	5	56	Design of Steel Gantry Girders			
57	5	57	Design of Steel Gantry Girders			
58	5	58	PPT			
59	5	59	Active learning			
60	5	60	Unit test - 5			

Important Questions:

Unit – 1

Part – A

1 What are the purposes of constructing retaining wall?
2 Differentiate overturning and sliding.
3 Recall the 'Ka' formula for sloping back fill.
4 Draw the different types of retaining wall.
5 Define retaining wall.
6 Differentiate cantilever & counterfort retaining wall? (any two)
7 What is a shear key?
8 List out the stability checks made in retaining wall
9 What are the types of retaining wall?
10 Draw a typical reinforcement detailing of cantilever retaining wall.
11 Define active earth pressure.
12 When shear key is provided in retaining wall?

Part – B

1. Design the stem, heel & toe slab of a cantilever retaining wall to retain an earth embankment with a horizontal top 3.6 m above ground level. Density of earth= 18 kN/m^3. Angle of internal friction ϕ=30^o. SBC of soil=180 kN/m^2. Coefficient of internal friction between soil and concrete = 0.5. Adopt M20 grade concrete and Fe 415 grade steel.
2. Explain the design procedure for counterfort retaining wall.
3. Design the stem of a cantilever retaining wall to retain an earth embankment with a horizontal top 4 m above ground level. Density of earth = 19 kN/m^3. Angle of internal friction ϕ =30^o. SBC of soil =160 kN/m^2. Coefficient of internal friction between soil and concrete = 0.5. Adopt M20 grade concrete and Fe 415 grade steel.

4. Identify the various stability criteria in retaining wall design with necessary formula.
5. Design the heel slab of a cantilever retaining wall to retain earth 3.5 m high above ground level, using the following data: The density of earth is = 20 kN/m^3; Angle of internal friction is = 25^o ; The safe bearing capacity of soil is = 150 kN/m^2 ; The coefficient of friction between soil and concrete is = 0.45 ; Use M25 grade of concrete and Fe 415 steel.
6. Write the importance of constructing counterfort in retaining wall?
7. Classify the components of cantilever retaining wall.
8. Design the stem of a cantilever retaining wall to retain an earth embankment with a horizontal top 3.5 m above ground level. Density of earth = 18 kN/m^3. Angle of internal friction ϕ=30^o. SBC of soil =170 kN/m^2. Coefficient of internal friction between soil and concrete = 0.5. Adopt M20 grade concrete and Fe 415 grade steel.
9. Distinguish between cantilever and counterfort retaining wall.

Unit – 2

Part – A

1 List the various components in flat slab.
2 What is the minimum thickness of flat slab as per IS:456?
3 What is column head?
4 Outline about Ribbed slab?
5 What are the methods of flat slab design as per IS:456?
6 What is a drop in flat slab?
7 Write any two advantages of flat slab.
8 Distinguish between Ribbed slab and Solid slab.
9 Define flat slab.
10 What purpose of drop is provided in flat slab?
11 Differentiate interior and exterior panel.
12 Write any two advantages of Ribbed slab.

Part – B

1. Write down the assumptions made in direct design method of flat slab as per IS:456.
2. Design a interior panel of a flat slab floor system for a ware house of size 25m x 25m divided into panels of 5m x 5m using the following data. Live load = 4 kN/m2, Column size 400 mm dia, Material = M20 concrete & Fe415 steel.
3. Explain the design procedure for interior panel flat slab.
4. Design an exterior panel of a flat slab floor system for a ware house of size 16m x 16m divided into panels of 4m x 4m using the following data. Live load = 5 kN/m^2, Column size = 300 mm dia, Material = M20 concrete & Fe415 steel.
5. Design a interior panel of a flat slab floor system for a ware house of size 16m x 16m divided into panels of 4m x 4m using the following data. Live load = 5 kN/m^2, Column size 400 mm dia, Material = M20 concrete & Fe415 steel.
6. Write a note on (i) column strip (ii) middle strip (iii) Direct design method

Unit – 3
Part – A

1 What are the different types of water tanks according to location?
2 Define Hoop tension.
3 What are the different types of water tanks according to shape?
4 What is the minimum grade of concrete and minimum Ast in water tank design?
5 Why mostly water tanks are constructed in cylindrical shape?
6 Define modular ratio.
7 Find the diameter of a circular tank which is having a flexible base for capacity of 2,00,000 liters. The depth of water is to be 4m, including a free board of 200mm.
8 Where domes are used?
9 What are the different types of water tanks according to location?
10 What is the minimum grade of concrete and minimum Ast in dome design?
11 What are the forces acting on water tanks?
12 Define hoop tension.

Part – B

1. Describe the analysis procedure of ribbed slabs for moment and shear.
2. Design a circular water tank wall with fixed base to store 2,00,000 liters of water. The depth of water is 3m. Free board =300mm. Use M25 Grade concrete and Fe415 steel.
3. Elaborate the different components of counterfort retaining wall.
4. Design a circular water tank with flexible base having 3.5 m high, resting on the ground to store 1 lakh liters of water. Use M25 grade of concrete and Fe 415 steel. Free board = 100mm. Density of water = 10 kN/m^3.
5. Identify the stability criteria of retaining wall with necessary formula.
6. Design a circular water tank wall with fixed base to store 3,00,000 liters of water. The depth of water is 3m. Free board =200mm. Use M25 Grade concrete and Fe415 steel.
7. Design a circular water tank with hinged base having 3.5 m high, resting on the ground to store 5 lakh liters of water. Use M25 grade of concrete and Fe 415 steel. Free board = 100mm. Density of water = 10 kN/m^3.
8. Design a circular water tank wall with hinged base to store 200 k liters of water. The depth of water is 3m. Free board =300mm. Use M25 Grade concrete and Fe415 steel.
9. Design a circular dome for an overhead RCC cylindrical water tank to store 500 k liters of water. The depth of water is 4m. Live load on dome is 1 kN/m2. Adopt M25 concrete and Fe415 steel.
10. Design a circular water tank wall with hinged base having 3.5 m high, resting on the ground to store 1 lakh liters of water. Use M25 grade of concrete and Fe415 steel. Free board = 100mm. Density of water = 10 kN/m3.

Unit – 4
Part – A

1 What is IRC stands for?
2 List the different loading classes as per IRC.

3 Recall the formula for effective width of dispersion in a bridge.
4 Outline about an abutment.
5 Classify the bridge based on materials.
6 Recall the bending moment formula for two way bridge deck slab.
7 Contrast the formula for minimum thickness of deck slab?
8 List the bridges based on function.
9 Why masonry bridges are constructed in parabolic shape?
10 What is the minimum area of steel incase of RC solid slab bridge structure?
11 Classify bridge according to span.
12 How effective span of solid slab bridge is calculated?

Part – B

1. Analyze the design dead load & live load moments for R.C Slab with specified data given below: Loading : IRC class AA, Carriage way width : Two lane; Foot paths : 1.0 m on either side, Clear span : 5 m ; Wearing coat : 75 mm, Width of bearing : 300 mm ; Materials : M20 grade concrete and Fe415 steel.
2. Classify the different types of bridges with neat sketches.
3. Analyze the design live load moments for R.C Slab with specified data given below: Loading : IRC class AA, Carriage way width : Two lane ; Foot paths : 1.0 m on either side, Clear span : 5.5 m ; Wearing coat : 75 mm, Width of bearing : 300 mm ; Materials : M20 grade concrete and Fe415 steel.
4. Explain in brief Pigeaud's method of determining B.M. in slabs, due to a Wheel load.
5. Analyze the design dead load & live load moments for R.C Slab culvert with specified data given below: Loading : IRC class AA, Carriage way width : 7.5m (Two lane); Foot paths : 1.0 m on either side, Clear span : 8 m ; Wearing coat : 80 mm, Width of bearing : 400 mm ; Materials : M25 grade concrete and Fe415 steel.

Unit – 5

Part – A

1 What are the essential components of crane system in an industrial building?
2 Recall the loads acting on a Gantry girder.
3 List any two advantages of Gantry girder.
4 Outline about Corbel.
5 Why Gantry girder required for an industrial buildings?
6 What is meant by surge load in gantry girder?
7 Recall the limiting deflection of gantry girder as per IS: 800-2007.
8 Draw the different forms of gantry girders.
9 Define Gantry girder.
10 Recall the importance of Gantry girder.
11 Compare plate girder and gantry girder.
12 What is the use of Pigeaud's curves?

Part – B

1. Explain the step by step procedure for the design of Gantry girder with necessary diagram and formulas.
2. Evaluate the total bending moment due to DL, LL & Impact of a gantry girder for an industrial building to carry an electric overhead travelling crane with the following data: Crane capacity is 500 kN. Weight of crane excluding crab is 200 kN. Weight of crab is 5 kN. Span of crane between rails is 15 m. Minimum hook approach is 1m. Wheel base is 3.0 m. Span of gantry girder is 7 m. Weight of rail section is 300 N/m. Assume any missing data.
3. Assess the step by step procedure for the design of Gantry girder with necessary diagrams and formulas.
4. Determine the total bending moment due to DL, LL & Impact of a gantry girder for an Industrial building to support overhead travelling crane. Use the following data: span of gantry = 6 m, Crane capacity = 150 kN, Self weight of crane girder (exclude trolley) 160 kN, Self weight of trolley = 40 kN, Minimum hook approach 1.00 m, Distance between wheel centers of trolley 2.00 m, Span of crane = 12 m, Self weight of rail section 250 N/m, Yield strength of steel 250 MPa.
5. Explain the step by step procedure for the design of Gantry girder with necessary diagram and formulas.
6. Determine the total bending moment due to DL, LL & Impact of a gantry girder for an industrial building to carry an electric overhead travelling crane with the following data: Crane capacity is 300 kN. Weight of crane excluding crab is 200 kN. Weight of crab is 5 kN. Span of crane between rails is 18 m. Minimum hook approach is 1.0 m. Wheel base is 3.0 m. Span of gantry girder is 8 m. Weight of rail section is 300 N/m. Assume any missing data.

2060147 – REPAIR AND REHABILITATION OF STRUCTURES
(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**
Prerequisites: - **3 0 0 3**

Course Objectives: To understand the various concepts of rehabilitation and retrofitting of structures

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

1. Develop various maintenance and repair strategies.
2. Understand corrosion of steel its causes and prevention
3. Assess damages by Non Destructive Testing
4. Understand the common types of repair and method of retrofitting
5. Evaluate the existing buildings through field investigations.
6. Understand and use the different techniques for structural retrofitting and health monitoring of structures

UNIT – I

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

UNIT – II

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

UNIT – III

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

UNIT – IV

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting & Shotcrete – Underpinning.

Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

UNIT – V

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

TEXT BOOKS:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa kumar, Oxford University press

REFERENCES:

1. Defects and Deterioration in Buildings, EF & N Spon, London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
4. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A.Richardson, (1991).

2060148 – PRESTRESSED CONCRETE
(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**
Prerequisites: Reinforced Concrete Design **3 0 0 3**
Course Objectives: The objectives of the course are to

1. Understand the principles & necessity of prestressed concrete structures.
2. Know different techniques of prestressing.
3. Get the knowledge on various losses of prestress.
4. Understand Analysis and design of prestressed concrete members.

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

1. Understand principles of prestressing
2. Know the method and system of prestressing and evaluate losses of prestressing
3. Analysis of section for flexure
4. Analysis of section for shear
5. Acquire the knowledge of evolution of process of prestressing.
6. Analysis of composite beam and deflection

UNIT - I

Introduction: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics - Flexural analysis of prestressed concrete beam including load balancing concept.

UNIT - II

Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

Losses of Prestress: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT - III

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions**.**

UNIT - IV

Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

UNIT - V

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

REFERENCES:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House.

2060101 – AIR AND NOISE POLLUTION CONTROL
(Open Elective – I)

B. Tech. III Year II Sem **L T P C**
Prerequisites:- **3 0 0 3**

Course Objective
To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

Course Outcomes: At the end of the course, the students will be able to:
1. Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. identify meteorological aspects of air pollution dispersion
3. Determine the ambient air quality
4. identify, formulate and solve air and noise pollution problems
5. know how to Control gaseous contaminants
6. monitor and control noise pollution

UNIT - I
Air pollution: composition and structure of atmosphere, global implications of air pollution. Classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

UNIT - II
Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

UNIT - III
Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

UNIT - IV
Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

UNIT - V

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

REFERENCES:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering.
2. Martin Crawford: Air Pollution Control Theory.
3. Warkand Warner: Air Pollution: Its Origin and Control.
4. Rao and Rao: Air Pollution Control Engineering.
5. Keshav Kant and Rajni Kant, "Air Pollution and Control Engineering", Khanna Publishing House.
6. Environmental Pollution Control Engineering-CS Rao, Wiley Eastern Ltd., New Delhi, 1996.
7. C.S. Rao, Air pollution and control
8. Environmental Noise Pollution – PE Cunniff, McGraw Hill, New York, 1987
9. Nevers: Air Pollution Control Engineering.
10. M. P. Poonia and S C Sharma," Environmental Engineering, Khanna Publishing House.
11. My cock, Mc Kenna and Theodore: Handbook of Air Pollution Control Engineering and Technology.

    Suess and Crax ford: W.H.O. Manualon Urban Air Quality Management
12. OP Gupta, Elements of Environmental Polluton Control, Khanna Publishing House.

2060178 - GEOTECHNICAL ENGINEERING LABORATORY

B. Tech. III Year II Sem **L T P C**
Pre-Requisites: Geotechnical Engineering **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.

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

1. Classify and evaluate the behavior of the soils subjected to various loads.
2. determine the atterberg limits
3. determine specific gravity of soil
4. evaluate permeability of soil
5. determine coefficient of consolidation
6. apply direct and vane shear test

LIST OF EXPERIMENTS:

1. Atterberg Limits (Liquid Limit, Plastic Limit, and Shrinkage limit)
2. a) Field density by core cutter method and
   b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

REFERENCE:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International

2060179 - TRANSPOTATION ENGINEERING LABORATORY

B. Tech. III Year II Sem **L T P C**
Pre-requisites: Transportation Engineering **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To gain the practical knowledge of properties of Highway materials
2. To gain the practical knowledge of traffic surveys.
3. To gain the practical knowledge of Bitumen mix designs.

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

1. determine crushing, abrasion and impact value of Highway materials
2. determine specific gravity and water absorption of Highway materials
3. determine Flakiness and elongation Indices of coarse Aggregates
4. identify ductility value of bitumen
5. identify Softening Point value of bitumen
6. Determination of Traffic Volume and parking studies

Note: In the following list of 15 experiments the student has to complete minimum of 12 experiments

List of Experiments:

SECTION I: ROAD AGGREGATES

1. Determination of Aggregate Crushing value.
2. Determination of Aggregate Impact Test.
3. Determination of Specific Gravity and Water Absorption.
4. Determination of Abrasion value of aggregate.
5. Determination of Flakiness and elongation Indices of coarse Aggregates.
6. Determination of Attrition value of aggregate.

SECTION II: BITUMINOUS MATERIALS

7. Determination of Penetration Value.
8. Determination of Ductility value of bitumen.
9. Determination of Softening Point value.
10. Determination of Marshal Stability value
11. Determination of Flash and fire point temperature.

SECTION III: TRAFFIC STUDIES

12. Determination of Traffic Volume Counts-Mid Blocks
13. Determination of Traffic Volume Counts-Junctions
14. Determination of Spot speed study.

15. Determination of Parking Studies

TEXT BOOKS:

1. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay Highway Material Testing by Khanna S.K., Justo C.E.G, Nem Chand & Bros.
2. Principles and practice of Highway Engineering, L.R Kadiyali & N.B.Lal, Khanna, 2007.
3. Traffic Engineering and Transportation planning, L.R Kadiyali, Khanna publications, 2007.

2060075 – ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

	L	T	P	C
B. Tech. III Year II Sem				
Pre-requisites: Communicative English	**0**	**0**	**2**	**1**

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and performthe following:

Gathering ideas and information to organize ideas relevantly and coherently.

Engaging in debates.

Participating in group discussions.

Facing interviews.

Writing project/research reports/technical reports.

Making oral presentations.

Writing formal letters.

Transferring information from non-verbal to verbal texts and vice-versa.

Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

Further, they would be required to communicate their ideas relevantly and coherently in writing.To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language

– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e- mails/assignments etc.

Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

Spacious room with appropriate acoustics.

Round Tables with movable chairs

Audio-visual aids
LCD Projector

Public Address system

P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ

T. V, a digital stereo & Camcorder

Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.Oxford Advanced Learner's Compass, 7th Edition

DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.Lingua TOEFL CBT Insider, by Dream tech

TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt.Ltd. 2nd Edition.

2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill, 2009.

2060180 – INTRODUCTION TO MACHINE LEARNING

B. Tech. III Year II Sem **L T P C**
Pre-requisites:- **0 2 0 0**

List of Experiments:

Module 1 Overview of machine learning concepts in construction - construction process - computerisation in construction

Module 2 Artificial Neural Network

Module 3 Overview of Building Information Modelling

Module 4 Overview of 3D Printing

PLACEMENT CELL

MLR Institutions has a fulltime training and placement cell interacting with the Industry for Student and Faculty Development Programmes.

MLR Thas the unique distinction of placing their First Batch of B.Tech/MCA Students in their prefinal year Study and MBA Students in Multi National Companies like Satyam Computer Services Ltd., L&T Infotech Ltd, Infotech Enterprises Ltd, Dell International, Medha Servodrives Ltd, CyberNet Slash Support, GenPact, India Infoline, Nokia Ltd, ICICI Bank, Axis Bank, NCL Industries Ltd, 24x7 Customer, nLeague, Auro power Systems, Amazon.com, Exensys, Tesco.

The Institute has placed more than 100 Students in Placements/Internship Programmes and interacted with more than 60 Multi National Companies for Placements.

WIPRO, Airtel, Indiabulls, INFOMEDIA, VLS, Satyam, Husys, kotak Kotak Securities, GENPACT, India Infoline, ICICI Securities, NCL Group, BAJAJ CAPITAL, Mahindra Finance, MEDHA, AXIS BANK, Infotech, HDFC BANK We understand your world, MAX NEW YORK LIFE Your Partner for Life, AMEYA GROUP, RELIANCE Money, ValueLabs, CSS Cybernet - SlashSupport, L&T Infotech, Capital IQ A Division of Standard & Poor's, NOKIA, 24/7 Customer, TESCO, DELL, amazon.com, eXensys

Alumni Association:

MLR Institute of Technology conducted the First Alumni Meet of the Institute under the Chairmanship of Sri M Laxman Reddy with the First Outgoing MBA 2006-08 Batch on 14th February 2009.The Meet was to take feedback from Alumni Students to strengthen the bond between the Institute and alma mater and help the students to make a career and find a dream job in the industry of their own choice and help the Institute in filling the gap between Academia and Industry.

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JNTU Kukatpally : 14 Kms
Secunderabad Rly Stn : 24 Kms
Balanagar – 15 Kms

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BHEL-MLRTM 22KM
SECUNDRABAD-MLRITM 24KM
MEDCHAL-MLRITM 7KM
GANDIMAISAMMA- MLRITM 2KM