**Academic Regulations**

**Course Structure**

**And**

**Detailed syllabus**

**For**

**B. Tech Four Year Degree Course – III and IV Year**

**In**

CIVIL ENGINEERING

(CE)

(Applicable for the Batches admitted from 2017-2018)



Sreenidhi Institute of Science and Technology

**(An Autonomous Institution approved by Ugc and affiliated to JNTUH)**

Yamnampet, Ghatkesar, R.R.District-501 301. Telangana State

January, 2019

B. Tech (Civil Engineering)

Program objective:

B. Tech in Civil Engineering program prepares the graduates with necessary knowledge, skills, and tools to analyze, plan and design solutions for basic Civil Engineering problems covering the domains of structures, transportation, surveying, and water resources and hydraulic systems with awareness to environmental preservation and sustainable development.

The first two years of this program have a set of introductory courses, such as Mathematics, Physics, English, Computer Languages (C, C++, Java), Technical Seminars, providing the students with a firm foundation in mathematics, physical sciences, computer languages, and communication skills. These courses include weekly labs in which students use state-of-the art equipment and software tools to analyze and solve practical engineering problems.

The last two years of the program focus on the core civil engineering subjects covering the concepts and techniques used in the analysis, design and development of practical civil engineering problems including investigative and solution tools.

In addition, students can choose from a set of professional elective streams covering various specialized domains in civil engineering. These advanced courses give broad opening for research and help students when they pursue higher studies in that stream. A generous allotment of open elective streams allows students to learn in-demand skills such as data base management systems, advanced managerial techniques, foreign languages etc.

Having completed the course, the student is well prepared to perform independently within a structured professional framework or pursue higher studies.

**DEPARTMENT OF CIVIL ENGINEERING**

**Vision**

* To become a reputed department for Civil Engineering education and applied research in the country with focus on producing professionally competent and highly recognized engineers**.**

**Mission**

1. To prepare and provide conductive environment for Civil Engineering graduates to become competent and quick learners of the latest emerging technologies on the engineering horizon.
2. To become a hub of technical know-how in Civil Engineering and allied domains for the service of industry bodies, governmental bodies, and society at large.
3. To ensure our students are confident with latest and emerging technologies, that affect the traditional roles of civil engineers, so that they could push the envelope to be relevant in the fast changing technical field as practicing engineers, entrepreneurs, or research personnel.
4. Also, the Department aims to train socially and environmentally sensitive professionals as Civil Engineering profession has high contact and visibility with the public.

**Programme Educational Objectives:**

1. Graduates will have a strong foundation in fundamentals of mathematics, natural and environmental sciences, and basic engineering skills with abilities of problem analysis, design and development of optimal solutions to engineering problems.
2. Graduates can apply the knowledge of theory, tools of investigation, and use of modern tools to solve complex problems and become professionally competent and globally employable engineers to assess health, safety, legal, societal, and environmental and sustainable issues maintaining ethical principles.
3. Graduates will have ability to work effectively as an individual, a team member, a leader or an entrepreneur with awareness of gender sensitiveness apart from having good communication, project and finance management skills.
4. Encouraging the graduates to pursue higher studies in internationally reputed institutes or research and development activities thus making them life-long learners.

**Programme Outcomes**

The Programme Outcomes (**POs**) of the B.Tech (Civil Engineering) programme are listed below:

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and specialization of CivilEngineering 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 in the area of Civil Engineering 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 useful for Civil Engineering and related areas 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 Civil 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 finalize technical and financial aspects of a project and to manage 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 changes through individual/group assignments such as technical seminars, lab projects, group projects, mini and main projects in the area of Civil Engineering or in multi disciplinary areas.

**Correlation between the POs and the PEOs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PEOs** | **Programme Outcomes** | | | | | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **I** |  |  |  |  |  |  |  |  |  |  |  |  |
| **II** |  |  |  |  |  |  |  |  |  |  |  |  |
| **III** |  |  |  |  |  |  |  |  |  |  |  |  |
| **IV** |  |  |  |  |  |  |  |  |  |  |  |  |

**Program Specific Objectives (PSOs):**

1. Develop a strong foundation of basic sciences and its applications for Civil Engineering Problems, apply the concepts of analysis and investigation using modern tools to design and solve Civil Engineering problems. *[CORE]*
2. Possess professional skills to investigate, analyze, and design practical solutions to Civil Engineering problems such as basic structures design, basic water conveyance and treatment systems design, basic transportation systems design, and basic survey maps and building drawings development, etc. [*Practical*]
3. Comprehend and apply technological advancements for real life engineering problems using modern instruments and modern analytical and software tools to analyze, plan, design, and implement solutions. [*Tools*]
4. Possess skills to communicate, be a team member, demonstrate professional ethics and exhibit concern for societal and environmental wellbeing for sustainable professional development. *[ENV, Team, Society and Life long learning, professional]*

**ACADEMIC REGULATIONS FOR B.TECH. REGULAR STUDENTS**

**WITH EFFECT FROM THE**

**ACADEMIC YEAR 2017-18 (A-17)**

**1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)**

**1.1** SNIST offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree

programme, under Choice Based Credit System (CBCS) with effect from the academic year 2017-18 in the following branches of Engineering.

|  |  |
| --- | --- |
| **Sl. No.** | **Branch** |
|  | Civil Engineering |
|  | Electrical and Electronics Engineering |
|  | Mechanical Engineering |
|  | Electronics and Communication Engineering |
|  | Computer Science and Engineering |
|  | Information Technology |
|  | Electronics and Computer Engineering |
|  | Biotechnology |

**1.2. Credits (Semester system from I year onwards)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.No.** | **Type of Subject** | **Periods / Week** | **Credits** |
| 1 | Theory | 03/04 | 03/04 |
| 2 | Practical | 02/03/04 | 01/02 |
| 3 | Engineering drawing - I | 01 L/04D (I year I Sem) | 03 |
| 4 | Engineering drawing - II | 01 L/02D (I year II Sem) | 02 |
| 5 | Group Project | 03 | 02 |
| 6 | Industry oriented Mini Project | 4 weeks in summer vacation at the end of III year – II sem | 02 |
| 7 | Project Phase -I | IV year – I sem | 02 |
| 8 | Technical Paper writing and seminar | Iyear – I sem to IV year II Sem\* | 01 each |
| 9 | Project Phase – II | IV year - II Sem | 12 |
| 10 | Comprehensive Viva Voce - I | At the end of II, III, IV year - II Sem\* | 01 |

\*According to the syllabus approved by the Academic Council as per Board of Studies recommendations.

**2.0 Eligibility for admission**

**2.1** Admission to the under merit rank obtained by

graduate programme shall be made either on the basis of the the qualified candidate in entrance test conducted by the

Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

**2.2** The medium of instructions for the entire under graduate programme in E&T will be

**English** only.

**3.0 B.Tech. Programme structure**

**3.1** A student after securing admission shall pursue the under graduate programme in B.Tech. in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. However, the student can take two more years for appearing the examinations.

Each semester is structured to provide 24 credits, totaling to 192 credits for the entire

B.Tech. programme.

Each student shall secure 192 credits (with CGPA ≥ 5) required for the completion of the under graduate programme and award of the B.Tech. degree.

**3.2 UGC/ AICTE** specified definitions/ descriptions are adopted appropriately for various

terms and abbreviations below.

**3.2.1 Semester scheme**

used in these academic regulations/ norms,

which are listed

Each under graduate programme is of 4 academic years (8 semesters) with the academic year being divided into two semesters of 22 weeks ( 90 instructional days) each, each semester having - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and curriculum / course structure as suggested by AICTE are followed.

**3.2.2 Credit courses**

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

One credit for one hour/ week/ semester for theory/ lecture (L) courses.

One credit for two hours/ week/ semester for laboratory/ practical (P) courses or tutorials (T).

Courses like Environmental Science, Professional Ethics, Gender Sensitization lab and other student activities like NCC/NSO and NSS are identified as mandatory courses. These courses will not carry any credits.

**3.2.3 Subject Course Classification**

All subjects/ courses offered

for the under graduate programme in E&T

(B.Tech. degree

programmes) are broadly classified as follows. The university has followed almost all the guidelines issued by AICTE/UGC.

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Broad Course**  **Classification** | **Course Group/ Category** | **Course Description** |
| 1 | Foundation  Courses  (FnC) | BS – Basic Sciences | Includes mathematics, physics and chemistry subjects |
| 2 | ES - Engineering  Sciences | Includes fundamental Engineering subjects |
| 3 | HS – Humanities and  Social sciences | Includes subjects related to humanities, social sciences and management |
| 4 | Core Courses  (CoC) | PC – Professional  Core | Includes core subjects related to the parent discipline/ department/ branch of Engineering. |
| 5 | Elective Courses (EℓC) | PE – Professional  Electives | Includes elective subjects related to the parent discipline/ department/ branch of Engineering. |
| 6 | OE – Open Electives | Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering. |
| 7 | Core Courses | Project Work | B.Tech. project or UG project or UG major project |
| 8 | Industrial training/ Mini- project | Industrial training/ Internship/ UG Mini-project/ Mini-project |
| 9 | Seminar | Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering. |
| 10 | Minor courses | - | 1 or 2 Credit courses (subset of HS) |
| 11 | Mandatory  Courses (MC) | - | Mandatory courses  (non-credit) |

**4.0 Course registration**

**4.1** A ‘faculty advisor or counselor’ shall be assigned to a group of 15 students, who will advise student about the under graduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

**4.2** The academic section of the college invites ‘registration forms’ from students before the beginning of the semester through ‘on-line registration’, ensuring ‘date and time stamping’. The on-line registration requests for any ‘current semester’ shall be **completed before the commencement of SEEs (Semester End Examinations) of the ‘preceding semester’**.

**4.3** A student can apply for **on-line** registration, **only after** obtaining the ‘**written approval**’

from faculty advisor/counselor, which should be submitted to the college academic section

through the Head of the Department. A copy of it shall be retained

Department, faculty advisor/ counselor and the student.

with Head of the

**4.4** A student may be permitted to register for the subjects/ courses of **choice** with a total of 24 credits per semester (minimum of 20 credits and maximum of 28 credits per semester and permitted deviation of ± 17%), based on **progress** and SGPA/ CGPA, and completion of the ‘**pre-requisites’** as indicated for various subjects/ courses, in the department course structure and syllabus contents. However, a **minimum** of 20 credits per semester must be registered to ensure the ‘**studentship**’ in any semester.

**4.5** Choice for ‘additional subjects/ courses’ to reach the maximum permissible limit of 28 credits (above the typical 24 credit norm) must be clearly indicated, which needs the specific approval and signature of the faculty advisor/ counselor.

**4.6** If the student submits ambiguous choices or multiple options or erroneous entries during

**on-line** registration for

the subject(s) / course(s) under a given/ specified course group/

category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

**4.7** Subject/ course options

exercised through **on-line** registration are final and **cannot** be

changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the head of the department, with due notification and time-framed schedule, within the **first week** after the commencement of class-work for that semester.

**4.8** Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor (subject to retaining a minimum of 20 credits), ‘**within a period of 15 days**’ from the beginning of the current semester.

**4.9 Open electives**: The students have to choose one subject each from (OE-I), (OE-II) and (OE-III) from the list of open electives given. However, the student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

**4.10 Professional electives**: students have to choose five professional electives from the list of professional electives given. However, the students may opt for professional elective subjects offered in the related area.

**5.0 Subjects/ courses to be offered**

**5.1** A typical section (or class) strength for each semester shall be 60.

**5.2** A subject/ course may be offered to the students, **only if** a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

**5.3** More than **one faculty member** may offer the **same subject** in any semester. However, selection of choice for students will be based on - ‘**first come first serve** basis and CGPA criterion’ (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

**5.4** If more entries for registration of a subject come into picture, then the Head of Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.

**6.0 Attendance requirements:**

**6.1** A student shall be eligible to appear for the semester end examinations, if student acquires

a minimum of 75% of

attendance in aggregate of all the subjects/ courses (excluding

attendance in mandatory courses Environmental Science, Professional Ethics, Gender

Sensitization Lab, NCC/NSO and NSS) for that semester.

**6.2** 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 student’s representation with supporting evidence.

**6.3** A stipulated fee shall be payable towards condoning of shortage of attendance.

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

**6.5 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 student was detained, by seeking re-admission into that semester as and

when offered; in case 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.

**6.6** A student fulfilling the

attendance requirement in the present semester shall not be

eligible for readmission into the same semester.

**7.0 Academic requirements**

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.**6.**

**7.1** 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% marks (26 out

of 75 marks) in the semester end examination, and a minimum of 40% of 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.

**7.2** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to UG mini-project and seminar, if student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student would be treated as failed, if student (i) does not submit a report on UG mini-project, 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 UG mini-project/ seminar evaluations.

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

**7.3 Promotion Rules**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Promotion** | **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 | i. Regular course of study of first year second semester.  ii. Must have secured at least 24 credits out of 48 credits i.e., 50% of 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 | i. Regular course of study of second year second semester.  ii. Must have secured at least 58 credits out of 96 credits i.e., 60% of |

|  |  |  |
| --- | --- | --- |
|  |  | 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 | i. Regular course of study of third year second semester.  ii. Must have secured at least 86 credits out of 144 credits i.e., 60% of 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. |

**7.4** A student shall register for all subjects covering 192 credits as specified and listed in the

course structure, fulfills

all the attendance and academic requirements for 192 credits,

‘earn all 192 credits’ by securing SGPA 5.0 (in each semester) and CGPA (at the end of each successive semester) 5.0 to successfully complete the under graduate programme.

**7.5** After securing the necessary 192 credits as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects up to 6 credits, that is, one open elective and one professional elective subject or two professional elective subjects for optional drop out from these 192 credits earned; resulting in 186 credits for under graduate programme performance evaluation, i.e., the performance of the student in these 186 credits shall alone be taken into account for the calculation of

‘the final CGPA (at the end of under graduate programme, which takes the SGPA of the IV year II semester into account)’ , and shall be indicated in the grade card of IV year II semester. However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.

**7.6** If a student registers for some more ‘**extra subjects’** (in the parent department or other departments/branches of engg.) other than those listed subjects totaling to 192 credits as

specified in the course

structure of his department, the performances

in those ‘ **extra**

**subjects**’ (although evaluated and graded using the same procedure as that of the required

192 credits) will not be taken into account while calculating the SGPA and CGPA. For such ‘**extra subjects’** registered, % of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1 – 7.5 above.

**7.7** A student eligible to appear in the end semester examination for any subject/ course, but

absent from it or failed (thereby failing to secure **‘C’** grade or above)

may reappear for

that subject/ course in the supplementary examination as and when conducted. In such cases, CIE assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

**7.8** A student **detained in a semester due to shortage of attendance, may be re-admitted when the same semester is offered in the next academic year for fulfillment of**

**academic requirements**. The academic regulations under which student has been

readmitted shall be applicable. However, no grade allotments or

SGPA/ CGPA

calculations will be done for the entire semester in which student has been detained.

**7.9** A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.** The academic regulations under which student has been readmitted shall be applicable to him.

**8.0 Evaluation - Distribution and Weightage of marks**

8.1 The performance of a student in each semester shall be evaluated subject-wise for a maximum of 100 marks for a theory and 100 marks for a practical subject. In addition, industry-oriented mini-project, group project, Project Phase –I will also be evaluated for 100 marks, Project Phase – II for 200 marks, Technical Paper writing and Seminar and comprehensive viva for 100 marks each.

8.2 For all the subjects the distribution of marks shall be 25 for Continuous Internal Evaluation (CIE) and 75 for the Semester End-Examination (SEE).

**8.3 Theory Subjects**

1. **Pattern for Continuous Internal Evaluation** 
   1. **Subjects except Foreign languages (16+5+4=25 Marks)**

* There shall be two mid session examinations in every theory course. 16 **marks** are earmarked for each mid session examination. The marks shall be awarded considering the average of two mid session examination marks in each course. If any candidate is absent for any subject in a mid test and/or wishes to improve the performance, a Third Mid test will be conducted for the Student by the College in the entire syllabus on the same day of the main examination on payment fee as decided by the finance committee of SNIST. The result will be treated equal to Third mid test and average of better two tests will be considered. Each mid test will have compulsory questions without choice and long answer questions as detailed in the following paragraphs.
* The mid test is conducted for 64 marks reduced to 16 marks, test is for two hours duration consisting of two parts, i.e. Part ‘A’, and Part ‘B’.
* **Part–A:** Part Ashall have no choice and will have four short answer questions set for 16marks and reduced to 4 marks.
* **Part–B:** Part B of the question paper shall have subjective type questions set for 48 **marks** reduced to 12 marks and shall have 4 questions out of which 3 are to be answered. At least one question must appear from each unit and fourth question must be with 3 bits each bit from one unit
* Each Mid session examination in theory subjects will be restricted to three units, out of the total of 6 units of syllabus, i.e. Mid test – I will be on Units 1 to 3, Mid test – II will be on Units 4 to 6.
* Two assignments shall be given for a total weightage of 5 marks. Assignment-I is to be submitted before the first mid examination for award of 2 marks and for assignment-II which is to be submitted before the second mid test, for award of 2 marks. Students will be given back the assignment before mid session examinations. One mark is allotted for class notes which are to be signed by concerned teacher every fortnight.
* Five marks for each theory course shall be given for those students who put in attendance in a graded manner as given below:

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Attendance Range** | **Marks Awarded** |
| 1. | 65 and above but less than 75% | 1 |
| 2. | 75% and above and up to 82% | 2 |
| 3. | More than 82% and up to 90% | 3 |
| 4 | More than 90% | 4 |

* Marks for attendance shall be added to each subject based on average of attendance of all subjects put together.
* Award of final sessional marks: Attendance, average marks of two assignments, marks for class notes and mid-examination marks shall be added and the total marks are awarded as final sessional marks.

**(ii) Foreign languages**

|  |  |
| --- | --- |
| 2 written tests (Average of two to be taken) | 12 marks |
| Oral Comprehension | 04 marks |
| Assignment & Class notes | 05 marks |
| Attendance | 04 marks |

**b) Pattern for External Examinations (75 marks)**

* There shall be external examination in every theory course it shall consists of two parts (part-A & part-B). The total time duration for this semester end examination will be 3 hours.
* Part-A shall have 25 marks, which is compulsory. It will have 10 short questions out of which 5 questions are set with 3 marks each and another 5 questions are set with 2 marks
* Part-B of the question paper shall have subjective type questions for 50 marks and shall have 8 questions out of which 5 are to be answered. At least one question must appear from each Unit. . Seventh question must have 2 to 3 bits taking from 1st, 2nd, and 3rd units and 8th question also with 2 to 3 bits taken from 4th, 5th and 6th units. And not more than 2 questions from any one unit. All the questions carry equal marks.

**iv.** **Pattern of Evaluation for Lab subjects** **(100 marks)**

For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 75 marks for semester end examination. Out of the 25 marks for Continuous Internal Evaluation, the distribution is as follows

|  |  |  |
| --- | --- | --- |
| 1. | Day to Day work | 05 marks |
| 2. | Final Record and viva | 05 marks |
| 3. | Average of two tests including viva | 05 marks |
| 4. | Lab Based Project Report viva and demo | 06 marks |
| 6. | Attendance | 04 marks |
| Total | | 25 marks |

The semester end examination for 75 marks shall be conducted by an external examiner and an internal examiner appointed by the Chief Superintendent of Examinations of the college. The marks are distributed as follows:

|  |  |  |
| --- | --- | --- |
| 1. | Procedure to experiment and calculation | 15 marks |
| 2. | Conduct of experiment, observation, Calculation | 30 marks |
| 3. | Results including graphs, discussions and conclusion | 20 marks |
| 4. | Viva voce and Record | 10 marks |
| Total | | 75 marks |

**In case computer based examinations**

|  |  |  |
| --- | --- | --- |
| 1. | Flow chart and algorithms | 15 marks |
| 2. | Program writing and execution | 30 marks |
| 3. | Result and conclusions | 20 marks |
| 4. | Viva voce and Record | 10 marks |
| Total | | 75 marks |

8.5 For the subject having design and/or drawing, (such as Engineering Drawing I, Engineering Drawing II and Machine Drawing), the distribution shall be 25 marks for internal evaluation (10 marks for day-to-day work including drawing, home assignment work, 10 marks for average of two internal tests and 5 marks for attendance) and 75 marks for end semester examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests. Third test facility can be availed as mentioned above (5.3 (a) 1)

8.6 Group Project (25+75=100 Marks) – This can be Inter disciplinary

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year first semester. This work shall be carried out under the guidance of teacher(s) and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also. There will be 100 marks in total with 25 marks of Continuous Internal Evaluation.

**The continuous internal evaluation shall consist of:**

|  |  |
| --- | --- |
| Day to day work | 10 marks |
| Report | 05 marks |
| Demonstration / presentation | 10 marks |
| Total sessional marks | 25 marks |
| Semester End Examination | 75 Marks |

The semester end examination will be carried out by a committee consisting of an external examiner, Head of the department or his nominee, a senior faculty member and the supervisor for 75 marks.

Student shall be deemed to have satisfied the requirement for the subject concerned, if the student secures not less than 35% marks in the semester end examination and minimum of 40% of marks in the sum total of the Continuous Internal Evaluation and semester end examination taken together.

**8.7 Industry oriented mini project (25+75=100 Marks)**

There shall be an industry-oriented mini-Project in their specialization that may be carried out in collaboration with an industry / R & D organization / Academic Institution, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated during IV year I Semester. The industry oriented mini project shall be evaluated for a total of 100 marks with 25 marks for internal assessment and 75 marks for semester end examination. The mini project must be submitted in report form and should be presented before a committee, consisting of an external examiner, Head of the department or his nominee, a senior faculty member of the department and supervisor of the mini project when IV year I semester end examinations are carried out.

**The pattern of Continuous Internal Evaluation** is as follows:

|  |  |
| --- | --- |
| Work in progress as evaluated by internal guide | 5 marks |
| Work in progress as evaluated by External guide | 5 marks |
| Report | 5 marks |
| Seminar presentation and defense of project | 10 marks |
| Total | 25 marks |

If the mini project is conducted within the college, the work in progress is evaluated by the supervisor for 10 marks.

**Student shall be deemed to have satisfied, if the student secures not less than 35% marks in the semester end examination and minimum of 40% of marks in the sum total of the Continuous Internal Evaluation and end examination taken together.**

**8.8. Project Phase -I (25+75=100 Marks)**

A project Phase I in fourth year first semester will be evaluated for 100 marks as follows. This is aimed at the students to identify and show progress in a project on which they are likely to continue for their project in final year second semester.

The Continuous Internal Evaluation shall consist of:

|  |  |
| --- | --- |
| Literature survey and presenting  seminar at the end of 6 weeks | 10 marks |
| Report | 05 marks |
| Demonstration / presentation  at the end of 12 weeks | 10 marks |
| Total sessionals marks | 25 marks |

Semester End Examination 75 marks

**Pattern of external evaluation for project Phase – I.**

|  |  |
| --- | --- |
| Final Project Report | 15 marks |
| Presentation | 10 marks |
| Demonstration / Defense of Project | 50 Marks |
| **Total** | **75 marks** |

**There shall be end semester evaluation in project phase – I. Student must secure 40% marks i.e. 30 marks out of 75 marks to be successful.**

**8.9. Project Phase – II (50+150=200 Marks)**

Out of total 200 marks for project work (in the final year second semester), 50 marks shall be for Continuous Internal Evaluation and 150 marks for the External Evaluation at the end of the Semester.

**The pattern of Continuous Internal Evaluation is as follows:**

**Division of marks for internal assessment – 50 marks**

|  |  |
| --- | --- |
| Progress of Project work and the corresponding interim report  as evaluated by internal guides at the end of 5 weeks | 05 marks |
| Seminar at the end of 5 weeks | 05 marks |
| Progress of Project work as evaluated by guides at the end of 10 weeks | 05 marks |
| Seminar at the end of 10 weeks | 05 marks |
| Evaluation by the Guides ( at the end of 15 weeks) | 10 marks |
| Final Project Report | 05 marks |
| Final presentation and defense of the project | 15 marks |
| Total | 50 marks |

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the chief superintendent. The committee consists of an external examiner, HoD, a senior faculty member and internal guide.

If the project is carried out internally the marks supposed to be given by external guide will be given by internal guide himself.

**Division of Marks for External Evaluation – 150 Marks**

**Pattern of External Evaluation for Project Phase -II**

|  |  |
| --- | --- |
| Final Project Report | 30 marks |
| Presentation | 20 marks |
| Demonstration / Defense of Project | 100 Marks |
| **Total** | **150 marks** |

Student shall be deemed to have satisfied, if the student secures not less than 35% marks in the semester end examination and minimum of 40% of marks in the sum total of the Continuous Internal Evaluation and semester end examination taken together. i.e 80 marks to be successful in this subject.

**8.10. Technical Paper writing & Seminars I to VIII (100 Marks) each**

There shall be a technical Paper writing &seminar evaluated for 100 marks in every Semester from I year I Sem to IV year II Sem\*. The evaluation is purely internal and will be conducted as follows:

Content : 20 marks

Presentation including PPT : 20 marks

Seminar Notes : 10 marks

Interaction : 10 marks

Report : 25 marks

Attendance : 10 marks

Punctuality : 05 marks

Total **100 marks**

\* According to the syllabus approved by the Academic Council as per Board of Studies recommendations

Student must secure 40% i.e. 40 marks to be successful

**8.11 Comprehensive Viva-voce (II-II, III-II and IV-II\*)**

There shall be comprehensive viva voce as stated above which will be evaluated for 100 marks. Out of 100 marks, 50 marks are internal and 50 marks are external. The evaluation is purely internal and will be conducted by a committee consisting of Head of the Department or his nominee and two senior teachers.

|  |  |
| --- | --- |
| First mid-sessional viva at the end of 5 weeks (Internal) | 25 marks |
| Second mid-sessional viva at the end of 10 weeks (Internal) | 25 marks |
| Final viva during practical examinations (External) | 50 marks |
| Total | 100 Marks |

\* According to the syllabus approved by the Academic Council as per Board of Studies recommendations

**8.12** The evaluation has to be carried out by two teachers independently and average be taken. The sessional marks awarded by the Department are not final. They are subject to scrutiny by a committee constituted by the college and scaling is done wherever necessary. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the college norms and shall be produced to the Committee of the college or any external agency like NBA etc. as and when the same are called for.

**9.0 Grading procedure**

**9.1** Marks will be awarded

to indicate the performance of student in each theory subject,

laboratory / practicals, seminar, UG mini project and UG major project. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End

Examination, both taken grade shall be given.

together) as specified in item 8 above, a corresponding letter

**9.2** As a measure of the performance of student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

|  |  |  |
| --- | --- | --- |
| **% of Marks Secured in a Subject/Course**  **(Class Intervals)** | **Letter Grade**  **(UGC Guidelines)** | **Grade Points** |
| Greater than or equal to 90% | O  (Outstanding) | 10 |
| 80 and less than 90% | A+  (Excellent) | 9 |
| 70 and less than 80% | A  (Very Good) | 8 |
| 60 and less than 70% | B+  (Good) | 7 |
| 50 and less than 60% | B  (Average) | 6 |
| 40 and less than 50% | C  (Pass) | 5 |
| Below 40% | F (FAIL) | 0 |
| Absent | Ab | 0 |

**9.3** A student obtaining ‘**F’**

grade in any subject shall be deemed to have ‘**failed’** and is

required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as

those obtained earlier.

**9.4** A student who has not

appeared for examination in any subject, ‘**Ab’** grade will be

allocated in that subject, and student shall be considered ‘**failed’**. Student will be required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered.

**9.5** A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

**9.6** A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding ‘credit points’ (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

**Credit points (CP) = grade point (GP) x credits …. For a course**

**9.7** The student passes the subject/ course only when **GP 5 (‘C’ grade or above)**

**9.8** The semester grade point average (SGPA) is calculated by dividing the sum of credit points (CP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

SGPA = { Ci Gi } / {  Ci } …. For each semester

where ‘i’ is the subject indicator index (takes into account all subjects in a semester), ‘N’

is the no. of subjects ‘**registered’** for the semester (as specifically required and listed

under the course structure of the parent department), Ci the no. of credits allotted to the

ith subject, and Gi represents the grade points (GP) corresponding to the letter grade awarded for that ith subject, and Gi represents the grade points (GP) corresponding to the letter grade awarded for that ith subject.

**9.9** The cumulative grade point average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the

ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula.

**CGPA =** { Cj Gj } / {  Cj } …. For all S semesters registered

**(i.e., up to and inclusive of S semesters, S 2),**

where ‘**M’** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has ‘**registered’** i.e., from the 1st semester onwards up to and inclusive of the 8th semester, ‘j’ is the subject indicator index (takes into account a subjects from 1 to 8 semesters), CJ is the no. of credits allotted to the Jth subjects and Gj represents the grade points (GP) corresponding to the letter grade awarded for that Jth subject. After registration and completion of the first year first semester, SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

**Illustration of calculation of SGPA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course/Subject** | **Credits** | **Letter**  **Grade** | **Grade**  **Points** | **Credit**  **Points** |
| Course 1 | 4 | A | 8 | 4 x 8 = 32 |
| Course 2 | 4 | O | 10 | 4 x 10 = 40 |
| Course 3 | 4 | C | 5 | 4 x 5 = 20 |
| Course 4 | 3 | B | 6 | 3 x 6 = 18 |
| Course 5 | 3 | A+ | 9 | 3 x 9 = 27 |
| Course 6 | 3 | C | 5 | 3 x 5 = 15 |
|  | 21 |  |  | 152 |

SGPA = 152/21 = 7.24

**Illustration of calculation of CGPA:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course/Subject** | **Credits** | **Letter Grade** | **Grade Points** | **Credit Points** |
| **I Year I Semester** | | | | |
| Course 1 | 4 | A | 8 | 4 x 8 = 32 |
| Course 2 | 4 | A+ | 9 | 4 x 9 = 36 |
| Course 3 | 4 | B | 6 | 4 x 6 = 24 |
| Course 4 | 3 | O | 10 | 3 x 10 = 30 |
| Course 5 | 3 | B+ | 7 | 3 x 7 = 21 |
| Course 6 | 3 | A | 8 | 3 x 8 = 24 |
| **I Year II Semester** | | | | |
| Course 7 | 4 | B+ | 7 | 4 x 7 = 28 |
| Course 8 | 4 | O | 10 | 4 x 10 = 40 |
| Course 9 | 4 | A | 8 | 4 x 8 = 32 |
| Course 10 | 3 | B | 6 | 3 x 6 = 18 |
| Course 11 | 3 | C | 5 | 3 x 5 = 15 |
| Course 12 | 3 | A+ | 9 | 3 x 9 = 27 |
|  | Total Credits =  42 |  |  | Total Credit Points =327 |

CGPA = 327/42 = 7.79

**9.10** For merit ranking or comparison purposes or any other listing, **only** the ‘**rounded off’**

values of the CGPAs will be used.

**9.11** For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/ courses

(securing **F** grade) will

also be taken into account, and the credits

of such subjects/

courses will also be included in the multiplications and summations. After passing the failed subject(s) newly secured letter grades will be taken into account for calculation of SGPA and CGPA. However, mandatory courses will not be taken into consideration.

**10.0 Passing standards**

**10.1** A student shall be declared successful or ‘passed’ in a semester, if student secures a GP ≥

5 (‘C’ grade or above) in every subject/course in that semester (i.e. when student gets an SGPA 5.00 at the end of that particular semester); and a student shall be declared successful or ‘passed’ in the entire under graduate programme, only when gets a CGPA

5.00 for the award of the degree as required.

**10.2** After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

**11.0 Declaration of results**

**11.1** Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

**11.2** For final percentage of formula may be used.

**12.0 Award of degree**

marks equivalent to the computed final CGPA, the following

**% of Marks = (final CGPA – 0.5) x 10**

**12.1** A student who registers

for all the specified subjects/ courses as listed in the course

structure and secures the required number of 192 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 the B.Tech. degree in the chosen branch of Engineering as selected at the time of admission.

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

**12.3** Students with final CGPA (at the end of the under graduate programme) 8.00, and fulfilling the following conditions -

(i) Should have passed all the subjects/courses in ‘**first appearance’** within the first

4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA 8.00, at the end of each of semesters, starting from first year first semester onwards.

(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in ‘first class with distinction’.

**12.4** Students with final CGPA (at the end of the under graduate programme) 6.50 but <

8.00, shall be placed in ‘**first class’**.

**12.5** Students with final CGPA (at the end of the under graduate programme) 5.50 but <

6.50, shall be placed in ‘**second class’**.

**12.6** 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**’.

**12.7** 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.

**12.8** Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of

‘**university rank**’ and ‘**gold medal**’.

**13.0 Withholding of results**

**13.1** If the student has not paid the fees to the university/ college at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

**14.0 Transitory regulations**

**14.1** A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the degree programme, may be considered eligible for readmission to the same subjects/ courses (or equivalent subjects/ courses, as the case may be), and same professional electives/ open electives (or from set/category of electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the date of commencement of student's first year first semester).

**15.0 Student transfers**

15.1There shall be no branch transfers after the completion of admission process.

15.2 The students seeking transfer to Sreenidhi Institute of Sc. & Tech. from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of SNIST, and also pass the subjects of SNIST which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier semesters of SNIST, the students have to study substitute subjects in SNIST.

15.3 The transferred students from other Universities/institutions to SNIST who are on rolls to be provide one chance to write the CBT (internal marks) in the failed subjects and/or subjects not studied as per the clearance letter issued by the Institution.

15.4 The autonomous affiliated colleges have to provide one chance to write the nternal examinations in the failed subjects and/or subjects not studied, to the students transferred from other universities/institutions to SNIST who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 Scope

16.1 The academic regulations should be read as a whole, for the interpretation. purpose of any interpretation.

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

16.3 The Institution may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the Institution.

**Academic Regulations for B.Tech.**

**(Lateral Entry Scheme)**

**w.e.f the AY 2018-19**

**1. Eligibility for award of**

**B. Tech. Degree (LES)**

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 failing which he will forfeit the seat.

**2.** The student shall register for 144 credits and secure 144 credits with CGPA ≥ 5 from II

year to IV year B.Tech. programme (LES) for the award of B.Tech. degree. **Out of the**

**144 credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects

resulting in 138 credits for B.Tech programme performance evaluation**.**

**3.** The students, who fail

to fulfil the requirement for the award of the degree in six

academic years from the year of admission, shall forfeit their seat in B.Tech.

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

**5. Promotion rule**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Promotion** | **Conditions to be fulfilled** |
| 1 | Second year first semester to second year second semester | Regular course of study of second year first semester. |
| 2 | Second year second semester to third year first semester | (i) Regular course of study of second year second semester.  (ii) Must have secured at least 29 credits  out of 48 credits i.e., 60% of credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Third year first semester to third year second semester | Regular course of study of third year first semester. |
| 4 | Third year second semester to fourth year first semester | (i) Regular course of study of third year second semester.  (ii) Must have secured at least 58 credits out of 96 credits i.e., 60% of credits up to third year second semester from all the  relevant regular and supplementary examinations, whether the student takes  those examinations or not. |
| 5 | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

**6.** All the other regulations as applicable to B. Tech. 4-year degree course (Regular)

will hold good for B. Tech. (Lateral Entry Scheme).

**MALPRACTICES RULES**

**DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS**

|  |  |  |
| --- | --- | --- |
|  | **Nature of Malpractice/Improper conduct** | **Punishment** |
|  | If the student: |  |
| 1. (a) | Possesses or keeps accessible in  examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| (b) | Gives assistance or guidance or receives  it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing. | Expulsion from the examination hall and  cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.  The hall ticket of the student is to be cancelled and sent to the university. |
| 3. | Impersonates any other student in connection with the examination. | The student who has impersonated shall be  expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and UG major project) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation |

|  |  |  |
| --- | --- | --- |
|  |  | of the course by the student is subject to the  academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |
| 4. | Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive  language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the chief  superintendent/assistant – superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |

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|  |  |  |
| --- | --- | --- |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and  cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. |
| 8. | Possess any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and  cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. |
| 9. | If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges expulsion from the  examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.  Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them. |
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and  cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject  and all other subjects the student has appeared including practical examinations and UG major project of that semester/year examinations. |

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12.

If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the university for

further action to punishment.

award suitable

**Malpractices identified by squad or special invigilators**

1. Punishments to the students as per the above guidelines.

2. Punishment for institutions: (if the squad reports that the college is encouraging malpractices)

a. A show cause notice shall be issued to the college. b. Impose a suitable fine on the college.

c. Shifting the examination centre from the college to another college for a specific period of not less than one year.

\* \* \* \* \*

**SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY**

**DEPARTMENT OF CIVIL ENGINEERING**

**B.Tech Course Structure – Autonomous Regulation: 2017-18**

**I Year I Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6H101 | English – I | 2 | - | - | 2 | 25 | 75 |
| 2 | 6H111 | Engineering Mathematics – I | 3 | 2 | - | 3 | 25 | 75 |
| 3 | 6H121 | Engineering Physics – I | 3 | 1 | - | 3 | 25 | 75 |
| 4 | 6H131 | Engineering Chemistry | 2 | 1 | - | 2 | 25 | 75 |
| 5 | 6F101 | Computer Programming | 3 | 1 | - | 3 | 25 | 75 |
| 6 | 6B101 | Engineering Drawing – I | 1 | 1 | 4 | 3 | 25 | 75 |
| 7 | 6H171 | English Language Communication skills lab | - | - | 2 | 1 | 25 | 75 |
| 8 | 6H181 | Engineering Physics Lab – I | - | - | 2 | 1 | 25 | 75 |
| 9 | 6H186 | Engineering Chemistry Lab | - | - | 2 | 1 | 25 | 75 |
| 10 | 6F171 | C Programming Lab | - | - | 4 | 2 | 25 | 75 |
| 11 | 6B171 | Engineering Workshop – I | - | - | 2 | 1 | 25 | 75 |
| 12 | 6F172 | IT Workshop – I | - | - | 2 | 1 | 25 | 75 |
| 13 | 6K191 | Seminar on Current affairs / Technical Topic | - | - | 2 | 1 | 100 | - |
|  |  | **Total :** | **14** | **5** | **20** | **24** | **400** | **900** |

**I Year II Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6H202 | English – II | 2 | 2 | - | 2 | 25 | 75 |
| 2 | 6H213 | Engineering Mathematics – II | 3 | 2 | - | 3 | 25 | 75 |
| 3 | 6E201 | Data Structures | 3 | 1 | - | 3 | 25 | 75 |
| 4 | 6B202 | Engineering Drawing – II | 1 | 1 | 2 | 2 | 25 | 75 |
| 5 | 6H232 | Environmental and Applied Chemistry | 2 | 1 | - | 2 | 25 | 75 |
| 6 | 6BC03 | Engineering Mechanics | 3 | 1 | - | 3 | 25 | 75 |
| 7 | 6H224 | Applied Physics – II | 3 | 1 | - | 3 | 25 | 75 |
| 8 | **6Z233** | Gender Sensitization, Values, Ethics and Yoga | 1 | 1 | - | 1 | 25 | 75 |
| 9 | 6E271 | Data Structures Lab (C, C++) | - | - | 4 | 2 | 25 | 75 |
| 10 | 6B272 | Engineering Workshop-II | - | - | 2 | 1 | 25 | 75 |
| 11 | 6H282 | Applied Physics– II Lab | - | - | 2 | 1 | 25 | 75 |
| 12 | 6K292 | Seminar on Science and its Impact/Technical Topic | - | - | 2 | 1 | 100 | - |
|  |  | **Total:** | **18** | **9** | **12** | **24** | **375** | **825** |

**II Year I Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6H373 | Functional Communicative English | 1 | 2 | - | 1 | 25 | 75 |
| 2 | 6H316 | Engineering Mathematics - III | 3 | 2 | - | 3 | 25 | 75 |
| 3 | 6K301 | Strength of Materials - I | 3 | 1 | - | 3 | 25 | 75 |
| 4 | 6K302 | Fluid Mechanics (FM-I) | 3 | 1 | - | 3 | 25 | 75 |
| 5 | 6K303 | Surveying | 3 | 1 | - | 3 | 25 | 75 |
| 6 | 6ZC01 | Managerial Economics and Financial Analysis | 2 | 1 | - | 2 | 25 | 75 |
| 7 | 6BC66 | Basic Mechanical Engineering | 2 | 1 | - | 2 | 25 | 75 |
| 8 | 6EC70 | Java Programming | 2 | 2 | - | 2 | 25 | 75 |
| 9 | 6K371 | Strength of Materials Lab | - | - | 3 | 2 | 25 | 75 |
| 10 | 6K372 | Surveying – I Lab | - | - | 3 | 1 | 25 | 75 |
| 11 | 6K373 | Computer Aided Drafting of Buildings Lab | - | - | 3 | 2 | 25 | 75 |
|  |  | **Total :** | **19** | **10** | **9** | **24** | **275** | **825** |

**II Year II Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6HC18 | Probability and Statistics | **3** | 2 |  | 3 | 25 | 75 |
| 2 | 6K401 | Strength of Materials - II | **3** | 1 | - | 3 | 25 | 75 |
| 3 | 6K402 | Structural Analysis – I | **3** | 1 | - | 3 | 25 | 75 |
| 4 | 6K403 | Open Channel Flow and Hydraulic Machinery (FM-II) | **3** | 1 | - | 3 | 25 | 75 |
| 5 | 6K404 | Building Materials and Construction Planning | **3** | - | - | 3 | 25 | 75 |
| 6 | 6K405 | Engineering Geology | **3** | - | - | 2 | 25 | 75 |
| 7 | 6K471 | Fluid Mechanics Lab | - | - | 3 | 2 | 25 | 75 |
| 8 | 6K472 | Surveying – II Lab | - | - | 3 | 2 | 25 | 75 |
| 9 | 6K473 | Engineering Geology Lab | - | - | 3 | 2 | 25 | 75 |
| 10 | 6K494 | Survey Camp with Seminar | - | - | 2 | 1 | 100 | - |
|  |  | **Total :** | **18** | **4** | **11** | **24** | **325** | **675** |

**III Year I Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6K501 | Reinforced Concrete Design | **3** | 1 | - | 3 | 25 | 75 |
| 2 | 6K502 | Structural Analysis - II | **3** | 1 | - | 3 | 25 | 75 |
| 3 | 6K503 | Environmental Engineering | **3** | 1 | - | 3 | 25 | 75 |
| 4 | 6K504 | Geotechnical Engineering | **3** | 1 | - | 3 | 25 | 75 |
| 5 |  | Professional Elective – I | **3** | - | - | 3 | 25 | 75 |
| 6 |  | Open Elective – I | **2** | 1 | - | 2 | 25 | 75 |
| 7 | 6K571 | Geographic Information Systems Lab | **-** | - | 3 | 2 | 25 | 75 |
| 8 | 6K573 | Environmental Engineering Lab | **-** | - | 3 | 2 | 25 | 75 |
| 9 | 6K574 | Geotechnical Engineering Lab | **-** | - | 3 | 2 | 25 | 75 |
| 10 | 6h576 | Quantitative Aptitude | **1** | 1 | - | 1 | 25 | 75 |
|  |  | **Total:** | **18** | **6** | **9** | **24** | **250** | **750** |

**Professional Elective** – **I: List of Subjects (III-I)**

|  |  |  |  |
| --- | --- | --- | --- |
| Sr. **No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Construction Technology | 6KC51 | Construction Technology & Project Management |
| 2 | Structural Engineering | 6KC52 | Structural Dynamics |
| 3 | Water Resources and Environmental Engineering Stream | 6KC53 | Advanced Environmental Engineering |
| 4 | GIS, Surveying, and Transportation Stream | 6KC54 | Geographic Information Systems |
| 5 | Geotechnical & Geo-environmental Engineering Stream | 6KC55 | Foundation Engineering |

**Open Elective** – **I: List of Subjects (III-I)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Entrepreneurship Stream | 6ZC22 | Basics of Entrepreneurship. |
| 2 | Social Sciences Stream | 6ZC25 | Basics of Indian Economy. |
| 3 | Technology Entrepreneurship Stream | 6ZC20 | Product and Services. |
| 4 | Finance Stream | 6ZC05 | Banking Operations, Insurance and Risk Management. |

**III Year II Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 |  | Professional Elective – II | **3** | - | - | **3** | 25 | 75 |
| 2 | 6K601 | Design of Steel Structures | **3** | 1 | - | **3** | 25 | 75 |
| 3 | 6K602 | Irrigation and Water Resources Engineering | **3** | 1 | - | **3** | 25 | 75 |
| 4 | 6K603 | Transportation Engineering | **3** | 1 | - | **3** | 25 | 75 |
| 5 |  | Open Elective – II | **2** | 1 | - | **2** | 25 | 75 |
| 6 |  | Open Elective– III | **2** | 1 | - | **2** | 25 | 75 |
| 7 | 6K673 | Transportation Engineering Lab | **-** | - | 3 | **2** | 25 | 75 |
| 8 | 6K672 | Hydraulics and Hydraulic Machinery Lab | **-** | - | 3 | **2** | 25 | 75 |
| 9 | 6K671 | MATLAB Programming Lab | **-** | - | 3 | **2** | 25 | 75 |
| 10 | 6H474 | Effective English communication & Soft Skills | **-** | 1 | **2** | **1** | 25 | 75 |
| 11 | 6h677 | Logical Reasoning | **1** | 1 | **-** | **1** | 25 | 75 |
|  |  | **Total:** | **17** | **7** | **11** | **24** | **275** | **825** |

**Professional Elective** – II**: List of Subjects (III-II)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Construction Technology | 6KC61 | Advanced Construction Techniques |
| 2 | Structural Engineering | 6KC62 | Earthquake resistant design of buildings |
| 3 | Water Resources and Environmental Engineering Stream | 6KC63 | Ground Water Hydrology |
| 4 | GIS, Surveying, and Transportation Stream | 6KC64 | Digital Image Processing |
| 5 | Geotechnical & Geo-environmental Engineering Stream | 6KC65 | Soil Dynamics |

**Open Elective** – II**: List of Subjects (III-II)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Entrepreneurship Stream | 6ZC24 | Innovation and Design Thinking |
| 2 | Social Sciences Stream | 6ZC26 | Basics of Polity and Ecology |
| 3 | Technology Entrepreneurship Stream | 6ZC24 | Innovation and Design Thinking |
| 4 | Finance Stream | 6ZC19 | Entrepreneurship Project Management and Structured Finance |

**Open Elective** – III**: List of Subjects (III-II)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Entrepreneurship Stream | 6ZC23 | Advanced Entrepreneurship |
| 2 | Social Sciences Stream | 6ZC27 | Indian History, Culture and Geography |
| 3 | Technology Entrepreneurship Stream | 6ZC21 | General Management and Entrepreneurship |
| 4 | Finance Stream | 6ZC15 | Financial Institutions, Markets and Services |

**IV Year I Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6K701 | Structural Engineering Design & Detailing (Concrete) | **3** | 1 | - | **3** | 25 | 75 |
| 2 | 6K702 | Concrete Technology | **3** | 1 | - | **3** | 25 | 75 |
| 3 | 6K703 | Estimation and Valuation | **3** | 1 | - | **3** | 25 | 75 |
| 4 | 6K704 | Finite Element Method for Civil Engineers | **3** | 1 | - | **3** | 25 | 75 |
| 5 |  | Professional Elective – III | **3** | - | - | **3** | 25 | 75 |
| 6 |  | Professional Elective – IV | **3** | - | - | **3** | 25 | 75 |
| 7 | 6K772 | Concrete Technology Lab | **-** | - | 4 | **2** | 25 | 75 |
| 8 | 6K774 | Computer Applications in Civil Engineering Lab | **-** | - | 4 | **2** | 25 | 75 |
| 9 | 6K780 | Project Phase – I | **-** | 1 | 3 | **3** | 100 | - |
| 10 | 6GC49 | Intellectual Property Rights | **1** | - | - | **1** | 25 | 75 |
| 11 | 6K777 | Industry Oriented Mini Project (3\_2 & 4\_1 break) | **-** | - | - | **2** | 25 | 75 |
|  |  | **Total:** | **19** | **5** | **11** | **28** | **350** | **750** |

**Professional Elective** – III**: List of Subjects (IV-I)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Construction Technology | 6KC71 | Services, Maintenance and Repair of Buildings |
| 2 | Structural Engineering | 6KC72 | Health Monitoring and Retrofitting of Structures |
| 3 | Water Resources and Environmental Engineering Stream | 6KC73 | Water Resources Systems Planning and Management |
| 4 | GIS, Surveying, and Transportation Stream | 6KC74 | Land and Water applications of Remote sensing |
| 5 | Geotechnical & Geo-environmental Engineering Stream | 6KC75 | Ground Improvement Techniques |

**Professional Elective** – IV**: List of Subjects (IV-I)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Construction Technology | 6KC81 | Alternative Building Materials and Technologies |
| 2 | Structural Engineering | 6KC82 | Pre-stressed Concrete Structures |
| 3 | Water Resources and Environmental Engineering Stream | 6KC83 | Applied Hydrology and Meteorology |
| 4 | GIS, Surveying, environmental Engineering and Transportation Stream | 6KC84 | GIS Analysis and Modelling |
| 5 | Geotechnical & Geo- Stream | 6KC85 | Elements of Geo-Environmental Engineering |

**IV Year II Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **Max Marks** | |
| **CIE** | **SEE** |
| 1 | 6K801 | Design and Detailing of Hydraulic Structures | **3** | 1 | - | **3** | 25 | 75 |
| 2 |  | Professional Elective – V | **3** | - | - | **3** | 25 | 75 |
| 3 | 6K898 | Technology Review and Seminar | **-** | - | 2 | **1** | 100 | - |
| 4 | 6K883 | Comprehensive Viva Voce - II | **-** | - | - | **1** | 50 | 50 |
| 6 | 6K880 | Project - Final Phase | **-** | - | 20 | **12** | 50 | 150 |
|  |  | **Total:** | **6** | **1** | **22** | **20** | **250** | **350** |

**Professional Elective** – V**: List of Subjects (IV-II)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No** | **Name of Stream** | **Subject Code** | **Subject Name** |
| 1 | Construction Technology | 6KC91 | Urban Planning and Sustainable Development |
| 2 | Structural Engineering | 6KC92 | High Rise Buildings |
| 3 | Water Resources and Environmental Engineering Stream | 6KC93 | Disaster Mitigation & Management |
| 4 | GIS, Surveying, and Transportation Stream | 6KC94 | Intelligent Transportation Systems |
| 5 | Geotechnical & Geo-environmental Engineering Stream | 6KC95 | Flow and Transport through porous media |

**L: Lecture T: Tutorial P/D: Practical / Drawing C: Credits**

**CIE: Continuous Internal Evaluation SEE: Semester End Examination**

# 6K501: Reinforced Concrete Design

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

**3 1 - 3**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| X | X | X | X |  | X |  |  |  |  |  |  |

**Course Objectives:**

To enable the student

1. Understand the applications of concrete, basic requirements of concrete structures and learn the fundamentals of design philosophies.
2. Familiarize with relevant codes of practice (IS 456:2000), professional approaches, working stress method, ultimate load method, limit state method and field problems.
3. Is able to learn Design of flexure failures in beams and deflections in beams.
4. Understand the Design of Reinforced concrete Slabs with different types support conditions.
5. Understand the Design of RC Columns, Footing and Stair cases.
6. Acquire ability to draw, understand and interpret the structural drawings for various RC elements such as beams, slabs, columns and footings, including aspects of detailing.

**Course Outcomes:**

At the end of the course the student

1. Is able to use and suggest concrete for various practical applications.
2. Is able to interpret various specifications of relevant standards, to field problems and professional practices.
3. Is able to design beams in singly reinforced, doubly reinforced rectangular and flanged beams.
4. Is able to design slabs with different conditions and different supports.
5. Is able to design axial loading, Uni-axial and biaxial bending of columns and Design of isolated square, rectangular and circular footings.
6. Interprets and communicates the design and detailing of rc beams, slabs, columns, stair cases and footings, through appropriate structural drawings.

**UNIT-I:**

**Introduction to Reinforced Cement Concrete:**

Applications of Concrete, Need for Reinforcement in Concrete ,Types and Properties of Concrete and Steel, Tests on concrete and steel, RCC as a material, Basic requirements of an RCC Structure ,stability, strength, serviceability and durability.

**Principles of Limit state design and Ultimate strength of R.C. Section:** Development of design philosophies-Working stress method (WSM), Ultimate load method, and Limit state method (LSM) relative merits and demerits. Basic concepts and characteristics loads and strengths, Partial safely factors. Stress strain relationship for concrete and steel.

**UNIT –II:**

**Working stress method:** Theory of bending in RCC beams, balanced, under-reinforced and over reinforced sections; Analysis and design of singly and doubly reinforced rectangular.

**Limit state of collapse (flexure):** Limit State analysis of rectangular RCC beams, balanced, under-reinforced and over reinforced sections; Analysis and design of singly and doubly reinforced rectangular sections.

**UNIT-III:**

**Limit state of collapse(shear & Torsion)~~:~~**Limit State analysis of section for shear and torsion. Assumptions, Analysis and design of flanged beams. Anchorage and development length, Curtailment of reinforcement in beams.

**Limit states of serviceability:** Short term, long term and total deflections, check for deflection and cracking.

**UNIT-IV:**

**Analysis and design of slabs:** Definition of a Slab, Types of Slabs, one way, two way simply supported slabs subjected to only uniformly distributed loads. IS Code method - Design of solid rectangular slabs as per IS 456:2000, Detailing of reinforcement in slabs.

**UNIT-V:**

**Analysis and design of columns**: Assumptions, axially loaded circular, square and Rectangular columns, Uniaxial and biaxial bending of columns- subjected to a axial load & bending. Design as per IS 456:2000 code.

**UNIT-VI:**

**Analysis and Design of Footings:** Design of isolated square, rectangular and circular footings as per IS code 456:2000.

**Design of staircases:** Types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, with waist slabs.

**TEXT BOOKS:**

1. N.Subramanian “Design of Reinforced Concrete Structures” Oxford University Press. First Published in 2013, Second impression 2014.
2. Unni Krishnan Pillai and DevadassMenon,“Reinforced Concrete Design” ,Tata McGraw-Hill Publishing Co Ltd,1998.
3. IS-456-2000 and SP-16.

**REFERENCES:**

1. 1.V.L.Shah&S.R.Karve,”Limit State Theory and Design of Reinforced Concrete”, Structures Publications, 7th Edition, 2014.
2. Limit State Design of Reinforced concrete-by P.C. Varghese, PHI Learning Private Limited 2008-2009.
3. Fundamentals of Reinforced concrete Design-by M.L.Gambhir, PHI Learning Private Limited 2008-2009.
4. Reinforced concrete Design**-**by Pallai and Menon, TMH Education Private Limited.
5. Reinforced concrete Design-by S.N.Shinha, TMH Education Private Limited.
6. Reinforced concrete Desig**n-**by Karve & Shaha, Structures Publishers Pune.
7. Design of RCC Structural ElementsS. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.
8. A.K. Jain, Limit State Design of Reinforced Concrete, Nem Chand & Bros, 1998.

**6K502: STRUCTURAL ANALYSIS - II**

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

**3 1 - 3**

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| x | x | x |  | x |  |  |  |  |  |  |  |

**Course Objectives**

To enable the student

1. Use ILD‟s and to draw influence line diagrams for determinate beams and truss girders.
2. Learn the concepts of moving loads and their effect on structures,analysis of cables and suspension bridges.
3. Apply the basic concepts of matrix methods in structural analysis.
4. Develop stiffness matrices and analyze the structures.
5. Develop flexibility matrices and analyze the structures.
6. Plastic theory and its application in analysis of indeterminate structures.

**Course Outcomes**

At the end of the course, the student is

1. Able to draw the ILD‟s and find the maximum forces and position of the moving loads to get maximum values.
2. Able to understand the concept of moving loads, and analyse the cables and suspension bridges.
3. Able to apply appropriate matrix method for analysis of beams, frames and trusses.
4. Able to develop stiffness matrices for various structures
5. Able to develop flexibility matrices for various structures
6. Able to analyze the indeterminate structures using Plastic theory

**UNIT-I:**

**Moving Loads and Influence Lines:** Introduction-applications to bridges (only description), Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load UDL longer than the span, UDL shorter than the span, two point loads with fixed distance between them and several point loads- Equivalent uniformly distributed load-Focal length. Influence lines for forces in members of deck and through type trusses like Pratt and Warren trusses. Equivalent uniformly distributed load.

**UNIT- II:**

**Arches and suspension cables:** Analysis of Three Hinged and Two Hinged Arches – Parabolic and Circular- Fixed Arches – Influence lines for Three and Two hinged arches for Horizontal thrust, Shear force and B.M. at any section.

**UNIT –III:**

**Suspension bridges and cables**

Suspension bridges -Length of Cable, Maximum tension - Types of supports - Forces in Towers- two hinged and three hinged stiffening girders~~.~~

**UNIT- IV:**

**Flexibility matrix method of analysis:** Introduction, Development of flexibility matrix for beam element and rigid plane frames with sway with static indeterminacy ≤3.

**UNIT V**

**STIFFNESS MATRIX METHOD OF ANALYSIS**

Introduction, Development of stiffness matrix for beam element and rigid plane frame with swaywith kinematic indeterminacy ≤3.

**UNIT VI - PLASTIC ANALYSIS OF STRUCTURES**

Plastic moment of resistance - Plastic Modulus - Shape factor - Load factor - Plastic Hinge and mechanism - Analysis of indeterminate beams and frames- mechanism method.

**TEXT BOOKS:**

1.Structural Analysis by T.S. Thandavamoorthy, Oxford press.

2.Theory of Structures by S.Ramamrutham, Dhanpat rai Publication.    

**REFERENCE BOOKS:**

1. Structural Analysis by R.C Hibbeler, PEARSON Publications, Sixth Edition 2016,   
2.Structural Analysis by Aslam Kassimali, CENGAGE Learning Publication.

# 6K503: Environmental Engineering

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

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| a | b | c | d | e | f | g | h | i | j | k | l |
| X |  | X | X |  | X |  |  |  |  |  |  |

**Course Objectives:**

To enable the student to

1. Know how to estimate population for the forthcoming decades and estimate head loss in water distribution pipe networks
2. Know the design aspects and analysis of water distribution system
3. Know the wastewater collection and characterisation and sewage treatment method
4. Know the layout and general outline of treatment units in a municipal wastewater treatment plant.
5. To know the design aspects and principles involved in basic treatment processes
6. To study the collection, classification, transportation and treatment of solid waste.

**Course Outcomes:**

At the end of the course, the student should have learnt:

1. how to design the treatment units based on the population estimation
2. basics involved in a water supply network.
3. Collection of sewage and treatment of sewage water
4. To understand the basic phenomenon/ units involved in the treatment plants.
5. To understand the basic treatment processes involved in treating water
6. About solid waste management and low cost treatment technologies

**UNIT – I**

**Introduction:** – Protected water supply – Population forecasts, design period – water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards - Waterborne diseases - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

Present Scenario of Urban Sanitation in India- Basic Philosophy of Sewage Treatment- Sewerage and Sewage Treatment Technology. Basic design considerations as per CPHEEO Manual for Sewerage Treatment.

**UNIT-II**

**Water distribution network analysis** : Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

**UNIT-III**

**Waste water collection and characterstics**: Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.

**UNIT IV**

**Waste water treatment :** Layout and general outline of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds.

**UNIT – V**

**Water treatment: –**sedimentation – principles – design factors – coagulation flocculation clarifier design – coagulants – feeding arrangements

FILTRATION AND CLORINATION: Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, and other disinfection practices- Miscellaneous treatment methods.

**UNIT – VI**

**Solid waste** - definition, sources, classification and characteristics, Generation and Quantification. Collection & Transport-Collection equipments, systems of collection, transfer stations, bailing and compacting.

**TEXT BOOKS:**

1. Metcalf and Eddy- Wastewater Engineering, Tata McGraw Hill Publishing Company Ltd., New Delhi 2003.
2. Karia G.L. and Christian R.A. “Wastewater Treatment Concepts and Design Approach” Prentice Hall of India Pvt., Ltd., New Delhi (2001).

**REFERENCE BOOKS:**

1. Eckenfelder and 0' Conner - Biological Waste treatment.
2. Gaudy – Advanced Waste Water treatment.
3. Ramalho, R. S. 1983. Introduction to Wastewater Treatment Processes. New York: Academic Publishers.
4. Santosh kumar Garg. “Sewage Disposal and Air Pollution Engineering” Khanna Publishers New Delhi 2006.
5. Punmia B. C. and Arunkumar Jain, “Environmental Engineering II”, Laxmi Publishers Pvt. Ltd, New Delhi, 2000.
6. P.N.Modi, “Environmental engineering I & II”, [Standard Publishers 2013](https://www.sapnaonline.com/shop/Publisher/Standard%20Publishers%20Distributors)
7. Howard S. Peavy, Donald R. Rowe, George T, “Environmental Engineering”, McGraw Hill, International edition, 1985.
8. Manual on sewerage and sewage treatment-Central Public Health and Environmental Engineering Organization.

# 6K504: Geotechnical Engineering

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

**3 1 - 3**

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| a | b | c | d | e | f | g | h | i | j | k | l |
| X | X | X |  |  | X | X |  |  |  |  |  |

**Course Objective**

The objectives of learning the subject are to understand

1. Origin of soil and their inert relationship and Index properties of soil.
2. Permeability of soil and shear strength of soil
3. Stress distribution in soil and bearing capacity.
4. Effects of Compaction and consolidation of soil.
5. Shear strength parameter of soil.
6. The sub-soil exploration

**Course Outcome**

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

1. Understand the importance of basic properties of soil which will affect its strength characteristics.
2. Understand the mechanism of flow of water through soil in the context of design and construction of embankments, canals etc.
3. Understand the concept of stress distribution in soil and calculate the vertical stress under the loaded area
4. Comprehend the importance of compaction of soil and the parameters which affect degree of compaction
5. Understand the importance of shear strength of soil.
6. Explore sub soil and prepare soil investigation report.

**UNIT-I:**

**Introduction:** Origin and formation of soil, History of soil mechanics, Phase diagrams, Basic Definitions-Voids ratio, Porosity, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density - inter relationships.

**Index Properties of Soils:** Definitions and importance of Index properties, particle size distribution, sedimentation analysis (Hydrometer analysis only) Importance of consistency limits, Classifications of Soils: Necessity, IS classification of soils, plasticity chart and its importance, field identification of soils.

**UNIT-II:**

**Flow of Water Through Soil:** Darcy's law - Assumptions and validity, seepage velocity, superficial velocity and their relationships, coefficient of percolation Coefficient of permeability and its determination (excluding field method). Factors affecting permeability – Permeability of stratified soils,

**Effective stress in Soils** - Total pressure and effective stress and its importance, Quick sand phenomenon Soil moisture and modes of occurrence, capillary phenomenon.

**UNIT-III:**

**Stresses in Soil**: Boussinesq's and Westerguard's theories for concentrated, circular, rectangular loads, strip load - Newmark's chart. Pressure bulb. Contact pressure.

**Bearing Capacity**: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen are bearing capacity equations - assumptions and limitations. Bearing capacity of footings subjected to eccentric loading. Effect of ground water table on bearing capacity.

**UNIT-IV**

**Compaction of Soils:** Definition; objects, concept of compaction, factors affecting compaction, Effect of compaction on soil properties. Field compaction methods -Rollers and vibrators; Field compaction control - Procter's needle.

**Compressibility of Soils:** Meaning, fundamental definition, Mass-spring analogy - Terzaghi's one dimensional consolidation theory - Assumptions, limitations and applications (Derivation and mathematical solution not required) – Normal, under and over consolidated soils, Pre-consolidation pressure, coefficient of consolidation and their importance.

**UNIT-V:**

**Shear Strength of Soil:** Concept of shear strength - Mohr’s strength theory, Mohr - Coulomb theory. Shear strength tests under different drainage conditions. Shear strength parameters, factors affecting shear strength of soils, shear strength of sand, shear strength of clays.

**UNIT-VI:**

**Subsurface Exploration:** Necessity of sub-soil exploration, Borings method of soil exploration, Penetration tests, plate load tests. Types of samplers- undisturbed, disturbed and representative samples, area ratio, recovery ratio, clearance stabilization of bore holes, preparation of soil investigation report.

**TEXT BOOKS:**

1. Murthy, V.N.S., " Principles of Soil Mechanics and Foundation Engineering", 5th Revised Ed., UBS Publishers and Distributors ltd, New Delhi, 2001 ( Ch.1,2,4,5,6,7,8)
2. Punmia, B.C. Ashok Kumar Jain & Arun Kumar Jain, "Soil Mechanics and Foundations", Laxmi Publishing Co., New Delhi. 2003, (Ch.1,2,3,4,5,6&7)

**REFERENCES:**

1. Bowles, J.E, “Foundation Analysis and Designs” 5th Ed. Mc Graw Hill Publishing, New York – 2008.
2. Venkataramaiah,C., "Geotechnical Engineering”, Revised third Ed., New Age International publishers, 2006.
3. Alam Singh and Chowdhary G.R, Soil Engineering in Theory and Practice, (1994), CBS Publishers and Distributors Ltd., New Delhi.
4. Gopal Ranjan and Rao A.S.R, Basic and Applied Soil Mechanics, (2000), New Age International (P) Ltd., New Delhi.

# 6KC51: Construction Technology and Project Management

**Professional Elective\_1**

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

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**Course Objectives**

1. To understand the fundamentals of construction practices and documentation.
2. To apprehend the execution and development of infrastructure.
3. To understand the control and testing of construction elements.
4. To understand and apply the basics of Construction management.
5. To understand the nuances of project management.
6. To understand and apprehend scheduling of Project Scheduling.

**Course Outcomes**

Upon completion of the course the Student shall be able to,

1. Gather knowledge on various regulatory constructional practices.
2. Assimilate the deployment and execution of various infrastructure operations.
3. Learn the various testing and fracture theories.
4. Learn the Management data and Resource levelling.
5. Learn the basics of Project Management and control practices.
6. Learn the exposure and interpretation of Record data.

**UNIT- I:**

Fundamentals of Construction Technology: Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule –Construction Documents – Construction Records – Quality – Safety – Codes and Regulations.

**UNIT- II:**

Preparatory Work and Implementation: Site layout – Infrastructure Development – Construction Methods – Construction Materials – Deployment of Construction Equipment – Prefabrication in Construction – False work and Temporary Works.

**UNIT- III:**

Earthwork: Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging. Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drill ability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting.

**UNIT- IV:**

Basics of Management: Modern scientific management, Management Functions, Management Styles.

Project Controlling: Monitoring and Control, Updating.

**UNIT- V:**

Project Management: Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic-environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multi-storeyed structures, ports, tunnels, Qualities, role and responsibilities of project Manager, Role of Project Management Consultants.

**UNIT- VI:**

Project Scheduling: Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT, RPM (Repetitive Project Modelling) techniques. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).

**TEXT BOOKS**

1. Construction Technology by Subir K.Sarkar, Subhajit Saraswati, Oxford University Press,2008

2. Construction Project Management – Theory and Practice, Neeraj jha, Pearson Education,2011

**REFERENCES BOOKS**

1. Project Planning and Control with PERT and CPM – B.C. Punmia, K.K.Khandelwala – Laxmi Publication, 2011.

2. Construction Project Management by K.K.Chitkara, Tata Mcgraw Hill Education Private Limited, 2010

3. Construction Planning & Management by U.K.Srivastava, Galgotia Publications, 2013

4. Construction Planning Equipment and Methods by Peurifacy, Schexnayder, Sharpira TMH, 2010.

# 6KC52: Structural Dynamics

**Professional Elective-1**

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

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**Course Objectives**

The objective of this course is

1. To study the various types and characteristics of loading, formulation of equations of motion.
2. To study the response of un-damped and damped SDOF and MDOF systems under various loadings.
3. To useofapproximateanditerativemethods.Learntomodelcontinuousvibratory systems.
4. To useofseismiccodesinanalysisanddesignofcivilengineeringstructures.
5. To compute Dynamic response by Numerical methods.
6. To understand the concepts shear buildings and response of the same under base motion.

**Course Outcomes**

On completion of this course, students are able to

1. Understand the fundamental theory of dynamic equation of motions.



1. Understand the fundamental analysis methods for dynamic systems.
2. Understand modelling approach of dynamic response in civil engineering applications.



1. Create simple computer models for engineering structures using knowledge of structural dynamics.
2. Evaluate dynamic response analysis results and understand the possible error sources.



1. Interpret dynamic analysis results for design, analysis and research purposes. Apply structural dynamics theory to earthquake analysis, response, and design of structures.





**UNIT - I**

Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, un-damped, damped, free vibrations, logarithmic decrement.

**UNIT - II**

Forced vibrations of single degree freedom systems, response of un-damped and damped systems subjected to harmonic loading.

**UNIT - III**

Duhamel’s integral, response due to general system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation.

**UNIT - IV**

Free vibration of multi degree of freedom systems, natural frequencies, normal modes, orthoganality property of normal modes, Eigen values.

**UNIT - V**

Shear buildings modelled as multi degree of freedom systems, free vibrations, and natural frequencies.

**UNIT - VI**

Forced vibration motion of shear buildings, modal super position method, and response of shear buildings to base motion, harmonic forced excitation.

**TEXT BOOKS:**

# 1.Mukhopadhaya.M, Vibration Dynamics and Structural Systems-1st Edition,Oxford IBH

## NEW DELHI,PUBLICATION 2007 2. Mario Paz ,Structural Dynamics, SECOND Edition (2012); Publisher: CBS. 2012

**REFERENCE BOOKS:**

* 1. Anil K. Chopra Dynamics of Structures, 4th Edition PHI-Prentice-hall International Series, Publisher: 4 edition, 2011.

1. Ray W. Clough, Joseph Penzien, Structural Dynamics-1993 McGraw-Hill,

# 6KC53: Advanced Environmental Engineering

**Professional Elective\_1**

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

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**Course objective:**

From this course work the student will

1. Understand the importance and necessity of water and its uses.
2. Understand the principles and design of water quality models
3. Understand the environmental policies and regulations.
4. Understand the waste minimization and clean technology
5. Understand air pollution and control
6. Understand the various bio-toilets design and rain water harvesting culture and sewers

**Course outcome:**

From this subject students should have learnt:

1. Importance of water and its uses
2. Water quality models for the water supply treatment
3. different protection acts involved in the environment
4. how to modify the waste minimization Technology towards sustainable future
5. will get to know air pollution and air quality modelling
6. Design the sewers and bio-toilets

**UNIT- I**

Wholesomeness of water, Sources of water, Necessity of treatment, objective of various water uses, Water quality guidelines and standards for various water uses. Principles and design of aeration systems – two film theory, water in air systems, air in water systems.

**UNIT – II**

Water quality models – Historical development – Non point source pollution- Mass balance equation – Streeter - Phelps Equation – Modification to Streeter – Phelps Equation – Waste load allocations – Dissolved oxygen in Rivers and estuaries; Lake Water Quality Models; Models for Nitrogen, Bacteria, Phosphate and toxicants - Ground Water Quality Modelling - Contaminant solute transport equation, Numerical methods legislations for water quality.

**UNIT- III**

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio - economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

**UNIT –IV**

**Waste minimization and clean technology;**

**Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl Human Health, Environmental Ethics, Concept of Green Building, Ecological foot print, Life Cycle Assessment(LCA), Low carbon life style.

**UNIT – V**

Air pollution: Sources, classification and effects of air pollutants, Meteorology of air pollution, wind rose diagrams, lapse rates, atmospheric stability and dispersion of air pollutants, stack height calculation, ambient air quality monitoring, stack sampling, analysis of air pollutants.

**UNIT- VI**

Design of various bio-toilets and different rain water harvesting structure, HOUSE PLUMBING : Design of sewers – shapes and materials – sewer appurtenances manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.

**TEXT BOOKS:**

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B. C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi

**REFERENCES:**

1. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.
2. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers.
3. Water supply and sanitary Engineering by S.K.Garg,
4. Water and Waste Water Technology by Steel
5. Water and Waste Water Engineering by Fair Geyer and Okun
6. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
7. Waste water engineering by Metcalf and Eddy.
8. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International.
9. Environmental engineering by georad. Kiely TMH Pubilications.
10. Introduction to Environmental Engineering by Mackenzie, Devis and David. A. Cornwell, TMH Publications, New Delhi.
11. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
12. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt Ltd.
13. P.N.Modi, “Environmental engineering I & II”, [Standard Publishers 2013](https://www.sapnaonline.com/shop/Publisher/Standard%20Publishers%20Distributors)

# 6KC54: Geographic Information Systems

**Professional Elective\_1**

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

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**Course Objectives:**

The student is being exposed to the subject with following Objectives:

1. To provide the basic definition of GIS and its application.
2. To understand the various model generation pattern.
3. To understand the data formats with editing and error rectification of topology.
4. To learn the basic analysis of data and interpretation of the same.
5. To understand the application of GIS in Project Planning and Execution.
6. To expose the students to the wide areas of application in Civil Engineering arena.

**Course Outcomes:**

On successful completion of the course, the student shall:

1. know the basic definition of GIS.
2. be able to generate various model from raw data.
3. be able to edit and rectify the topography data.
4. be capable to analyze and interpret the data generated.
5. be able to know the concept of application of GIS in Projects.
6. know the various spheres of application for Civil Engineers.

**Unit I**

Introduction – GIS Definition – Development – application areas – Map Concept – Map Definition – Elements of Maps – Types of Maps – Advantages and Disadvantages of analog / digital maps **(Coordinate systems – geometric models of earth – global / local coordinate system – Transformations)**

**Unit II**

Projection systems – classification – cylindrical projection – conical projection – selection of a particular projection – Fundamental concepts of GIS – Modeling Real World Features – Raster data model – **(Data Analysis, Local Operations, Neighbourhood Operations, Zonal Operations Physical Distance Measurement)** – Vector Data model **(Comparison of Raster and Vector Based Data Analysis)**

**Unit III**

Data formats – Spatial and non-spatial data – data collection and input – data conversion – Topology – **Types of Topology – Rules of Topology - Slivers** - Editing and error rectification – topological relationships, **TIN and DEM**

**Unit IV**

Spatial Analysis – Buffer Analysis – Variations in buffering – Applications in buffering – overlay analysis – Feature type and Overlay – Vector Overlay Methods – Network Analysis – Impedance – Shortest Path analysis – Closest facility – concepts of proximity analysis.

**Unit V**

GIS Project Planning – Steps in GIS Project – **(Software engineering as applied to GIS, GIS Project Planning, SDLC, Systems analysis and user requirement studies (only process identification).**

**Unit VI**

GIS Application areas – Transportation – Water Resources – Environment – Geology – Emergency Management – Agriculture – Real Estate (only the concepts and ideas); Advances in GIS – Concepts, Application of mobile and Web GIS.

**TEXTBOOKS:**

1. Kang-Tsung Chang, Intorduction to Geographic Information Systems, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.
2. Peter A. Burrough and Rachael A.McDonnell, Principles of Geographical Information Systems, Oxford University Press, 2005.

**REFERENCES:**

1. C.P. Lo, Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice Hall India Pvt. Ltd, New Delhi, 2002.

# 6KC55: Foundation Engineering

**Professional Elective\_1**

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

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**Course Objective**

The objectives of learning the subject are to understand

1. Site investigation and method of exploration.
2. Concepts of shallow foundation and its types
3. Total and differential Settlement of shallow foundation
4. Classification of pile foundation and settlement of piles
5. Rankine’s and coulombs theories of earth pressure and stability of retaining wall.
6. The stability of finite and infinite slopes and its failure.

**Course Outcome**

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

1. Understand the selection of foundation based on soil condition.
2. Understand the factors affecting shallow foundation and its settlement.
3. Apply the different methods for calculating safe bearing capacity of shallow foundation
4. Analyse the load carrying capacity of group piles in sand and clay.
5. Apply the concept of earth pressure to the analysis of retaining wall and compute the lateral earth pressure for active and passive cases.
6. Analyse the stability of earth slope in the context of construction of canals, road embankments and earth dams etc.,

**UNIT-I:**

**Site Investigation and selection of foundation:** Scope and objective, Method of exploration, Auguring and boring, wash boring and rotatory drilling, depth of bore hole, sampling technique undisturbed sampling, penetration test, selection of foundation based on soil condition.

**UNIT-II:**

**Shallow Foundations :** Definition of shallow foundation, General types of shallow foundation, types of shallow foundation, settlement of foundation – concept and types - immediate, consolidation and secondary settlements (No derivations), Factors affecting bearing capacity and settlement.

**UNIT-III:**

**Shallow Foundations- strength criteria:** Types –choice of foundation-location of depth BIS specification for total and differential settlement for footings and rafts-Problems on settlement. Safe bearing capacity, Terzaghi’s, Meyerhof, Skempton and IS methods,

**UNIT-IV:**

**Pile foundation:** Types of piles-Number of piles and spacing-load carrying capacity of group piles in sand and clays-Group efficiency of piles-settlement of piles, Load carrying capacity of Static pile formula and Dynamic pile formula, and pile load tests. Drilled piers construction, advantage and disadvantage of drilled piles.

**UNIT-V:**

**Earth Pressure:** Active & Passive earth pressure, earth pressure at rest, earth pressure coefficient, and their range. Rankine’s and coulombs theories of earth pressure – Assumptions and limitations. Lateral earth pressure in cohesive and cohesion less soil, earth pressure distribution.

**Retaining walls**: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

**UNIT-VI:**

**Stability of Earth Slopes:** Types of slopes, Causes and types of failure of slopes. Definition of factor of safety. Stability of finite and infinite slopes - Method of slices, Friction Circle method, Fellineous method. Swedish arc method, Bishops simplified, Taylor's stability number, Stability of slopes of earth dams under differential condition

**TEXT BOOKS:**

1. Alam Singh and Chowdhary G.R, Soil Engineering in Theory and Practice. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. Punmia B.C, Soil Mechanics and Foundation Engg. (2005), 16th Edition Laxmi Publications Co. New Delhi 31

**REFERENCES:**

1. Bowles J.E, Foundation Analysis and Design, (1996), McGraw Hill Pub. Co. New York.
2. Murthy V.N.S, Soil Mechanics and Foundation Engineering- (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. Gopal Ranjan and Rao A.S.R, Basic and Applied Soil Mechanics, (2000), New Age International (P) Ltd., New Delhi.
4. Venkatramaiah C, Geotechnical Engineering, (2006), New Age Intl (P) Ltd., New Delhi.
5. Craig R.F, Soil Mechanics, (1987), Van Nostrand Reinhold Co. Ltd.
6. Braja M. Das, Principles of Geotechnical Engineering- (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. Iqbal H. Khan, Text Book of Geotechnical Engineering, (2005), 2nd Edition, PHI, India

**6ZC22 – BASICS OF ENTREPRENEURSHIP**

**Open Elective-1**

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**B. Tech III Year I Sem.**

**L T P/D C**

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**Course Objective:** The objective of the course is to make students understand the nature of Entrepreneurship, and its importance to business to the engineering students, which will allow them to get the required intuition and interest in starting their own start-up’s

**Course Outcomes:**

1. The students’ will acquire basic knowledge on Skills of Entrepreneurship.
2. The students’ will understand the techniques of selecting the customers through the process of customer segmentation.
3. Business Models and their validity are understood by the students’.
4. The basic cost structure and the pricing policies are understood by the students’.
5. The students’ will acquire knowledge about the project management and its techniques.
6. The students’ get exposure on marketing strategies for the Start up.

**Unit – I: Introduction to Entrepreneurship: -** Define Entrepreneurship, Entrepreneurship as a Career option, Benefits and Myths of Entrepreneurship, Success Rate of Entrepreneurs related to Experience and Family Backup, Characteristics, Qualities and Skills of Entrepreneurship, Entrepreneurial Propensity, Life as an Entrepreneur, Impact of Entrepreneurship on Economy and Society.

**Unit – II: Opportunity & Customer Analysis: -** Identify your Entrepreneurial Style, Identify Business Opportunities, Methods of finding and understanding Customer Problems, Process of Design Thinking, Identify Potential Problems, Customer Segmentation and Targeting, Customer Adoption Process, craft your Values Proportions, Customer-driven Innovation.

**Unit – III: Business Model & Validation: -** Types of Business Models, Lean approach, the Problem-Solution Test, Solution Interview Method, difference between Start-up Venture and Small Business, Industry Analysis, Identify Minimum Viable Product (MVP), Build-Measure-Lean Feedback loop, Product-market fit test.

**Unit – IV: Economics & Financial Analysis: -** Revenue sources of Companies, Income Analysis, and Costs Analysis - Product Cost and Operations Cost, basics of Unit Costing, Break Even Analysis Profit Analysis, Customer Value Analysis, different Pricing Strategies, advantages and disadvantage of various Sources of Finance, Investors Expectations, Return on Investment , Practice pitching to Investors and Corporate.

**Unit – V: Team Building & Project Management: -** Leadership Styles, Shared Leadership Model, Team Building in Venture, Role of good team in venture, Roles and Respondents, Explore collaboration tools and techniques- Brainstorming, Mind mapping. Importance of Project Management, Time Management, Workflow, Network Analysis Techniques – Critical Path Method, Project Evaluation Review Technique and Gantt chart.

**Unit – VI: Marketing & Business Regulations: -** Positioning, Positioning Strategies, building Digital presence and leveraging Social Media, Measuring effectiveness of Channels, Customer Decision-making Process, Sales Plans and Targets, Unique Sales Proposition (USP), Follow-up and close Sales. Business regulations of starting and operating a Business, Start-up Ecosystem, Government schemes.

**References:**

* Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, New Delhi, 2006.
* Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006
* Alfred E. Osborne, Entrepreneur’s Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
* Madhurima Lall, Shikha Sahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
* S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
* H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.

• S.R. Bhowmik, M. Bhowmik, Entrepreneurship-A tool for Economic Growth   And A   
 key to Business Success, New Age International Publishers, First Edition,  (formerly   
 Wiley Eastern Limited), New Delhi, 2007.

**6ZC25 - BASICS OF INDIAN ECONOMY**

**Open Elective-1**

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**B. Tech III Year I Sem.**

**L T P/D C**

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**Course objectives:** To provide basic knowledge relating to the Indian Economy thus making the students aware of the current aspects taking place in the Indian and world economy.

**Course Outcomes**:

1. Gain knowledge relating to Economics, various sectors and its growth
2. Will gain knowledge relating to various concepts of National income and related aggregates
3. Students will learn about Indian Industrial policy and benefits of LPG to India
4. Comprehend knowledge relating to Fiscal policy & Taxation system in India
5. Learn about inflation & business cycles.
6. Know about the BoP and its influence on economy.

**Unit 1:** **Introduction to Economics**:

Definition, Economics and economy, back ground of economy, sectors of the economy, types of economy, growth of economy, primary moving force of Economic growth in India, mixed economy.

**Unit 2: National Income and related aggregates**

Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross and Net Domestic Product (GDP and NDP) - at market price, at factor cost; National Disposable Income (gross and net), Private Income, Personal Income and Personal Disposable Income; Real and Nominal GDP.

**Unit 3: Industrial policy & Liberalization of Economy**

Industrial policy in India, its objectives, Review of Industrial policies up to 1986, Industrial policy 1991 - causes of its implementation, benefits of Liberalization, privatization & Globalization to the Indian economy.

**Unit 4: Fiscal policy & Taxation system**

Fiscal policy- Definition, objectives, importance, setbacks, recent fiscal policy of India, Reforms to strengthen the fiscal policy in India. Taxation system in India, methods of taxation, a good tax system, VAT, GST, Reforms in taxation.

**Unit 5: Inflation & Business Cycles**: Inflation – Definition, types, effects of inflation on various segments of the population and sectors of the economy, measures to control inflation, Business cycles: Introduction, Depression, Recovery, Boom, and Recession.

**Unit 6: Balance of Payments**

Balance of payments account - meaning and components; balance of payments deficit-meaning. Foreign exchange rate - meaning of fixed and flexible rates and managed floating. Determination of exchange rate in a free market

References:.

* Indian Economy, Datt & Mahajan, 70th Edition, Sultan Chand publishers.
* Indian Economy, Misra & Puri, 33rd Edition, Himalaya publishing house.
* Latest Budget document by Ministry of Finance
* Latest Economic survey
* 12th Five year plan
* News articles in The Hindu, The Business Line

**6ZC20 - PRODUCT & SERVICES**

**Open Elective-1**

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**B. Tech III Year I Sem.**

**L T P/D C**

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**Course Objectives**: This course helps to provide the basic concepts of Product and Services. This course will enable the students to study areas of basic insights in product management and Services Design.

**Course Outcomes**:

1. The students will be introduced to basic concepts of product .
2. Will enlighten the students with the process of new product development and stages in the process.
3. Will help the students understand the concept of product testing, product planning and the preparatory groundwork for launching a new product
4. Will help the students to understand the nature of services, its differences with the goods and the application of marketing principles for services.
5. Will enlighten the students to understand the attributes of a good service design and the tools for producing and distributing the services.
6. To make the students understand about the importance of quality of services and also introduce some measurement scales to evaluate the service quality.

**UNIT- I**

**PRODUCT AS A COMMERCIAL FACTOR**

Product concept: premarketing, product definition, product dimensions. Product classification- by its nature, by final use by reasons for purchase, by consumer groups.

**UNIT- II**

**PRODUCT INNOVATION**

New products-What is a new product, Concept, Reasons, Succeed and failure factors, Launch process, Opportunities identification, Idea generation Systems, Evaluation, Check list, Financial analysis, Product concept.

**UNIT- III**

**PRODUCT MANAGEMENT**

Concept test, Product testing, Pre-launch, Market test, Final evaluation “Stage / Gate Process” A sequence system for a product launch. Product planning and development-Product planning, Price planning, Bake even point analysis, Communications Planning, Advertising Planning, Distribution planning

**UNIT - IV: INTRODUCTION TO SERVICE:**

Meaning and Definition of Service, Characteristics of Services, Classification of Service, Five levels of Service, Service verses Physical Goods, 7 P’s for Marketing of Services, Marketing Mix for Tourism, Hospitality, Education, and Health Industry.

**UNIT – V: SERVICE PROCESS DESIGN:**

Challenges & Critical Success Factors, Distribution Methods for Service, Process of Service Delivery, Tools for Service Design, Customer involvement in the Production Process, Tools for Innovation, Role of Intermediaries, Attributes of a Good Design.

**UNIT – VI: QUALITY OF SERVICE:**

Definition of Service Quality, Elements of Service Quality, Service Quality Measuring Tools; SERVQUAL Scale, Service Quality Gap Analysis, Objective Service Metrics, Cost of Quality in Service. Challenges and Problems of Service Quality in Inida.

**References:**

* Dr. S.L. Gupta, Product Management, Wisdom Publications
* C.Merle Crawford ,New Product Management
* Valarie A.Zeithaml & Mary Jo-Bitner: Services Marketing—Integrating Customer Focus Across the Firm, 3/e, Tata McGraw Hill, 2007.
* Thomas J.Delong & Asish Nanda: Managing Professional Servies—Text and Cases, McGraw-Hill International, 2006.
* Christopher Lovelock: Services Marketing People, Technology, Strategy, Fourth Edition, Pearson Education, 2006

**6ZC05 - BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT**

**Open Elective-1**

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**B. Tech III Year I Sem.**

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**Course Objectives:** To make the students understand the concepts and principles of Indian Banking Business, Insurance Business and Capital market business products and services, which facilitate them to understand the nature of market.

**Course Outcomes:**

1. Describe the new dimensions and products served by the banking system in INDIA.
2. Explain the credit control system and create awareness on NPA’s
3. Apply the knowledge of Insurance concepts in real life scenarios
4. Recognize the importance of regulatory and legal frame work of IRDA
5. Identify the risk management process and methods.
6. Calculate the diversity of risk and return

**UNIT I**

**INTRODUCTION TO BANKING BUSINESS:** Introduction to financial services - History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank. KYC norms, New Dimensions and products- E-Banking: Mobile-Banking, Net Banking, Digital Banking, Negotiable Instruments: Cheque system.

**UNIT II**

**BANKING SYSTEMS AND ITS REGULATION: Banking Systems:** Branch Banking, Unit Banking, Correspondent Banking, Group Banking, Deposit Banking, Mixed Banking and Investment Banking - Banking Sector Reforms with special reference to Prudential Norms, Capital Adequacy Norms, Classification of Assets and NPA’s, Functions of RBI, Role of RBI in regulating Indian Banking. Banking Ombudsman scheme.

**UNIT III**

**INTRODUCTION TO INSURANCE:** Introduction to insurance, Need and importance of Insurance, principles of Insurance, characteristics of insurance contract, branches of insurance and types of insurance: Life insurance and its products, General Insurance and its variants.

**UNIT IV**

**INSURANCE BUSINESS ENVIRONMENT:** Procedure for issuing an insurance policy –Nomination - Surrender Value - Policy Loans – Assignment - Revivals and Claim Settlement; Insurance as a tax mitigation tool, Role of IRDA in Insurance Regulation.

**UNIT V**

**FINANCIAL MARKETS AND RISK MANAGEMENT:** Introduction to Financial Markets: Money Market – Capital market; Introduction to Risk Management, meaning and classification of risks, Risk management process, Risk Management Approaches and Techniques.

**UNIT VI**

**DERIVATIVES AS A RISK MANAGEMENT TOOL:** Introduction to Financial Derivatives, Advantages of Derivatives - types of Derivative Contracts - Forwards, Futures, Options and Swaps - Differences among Forwards, Futures and Option Contracts.

**References:**

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General Principles of Insurance Harding and Evantly
3. Mark S. Dorfman: Risk Management and Insurance, Pearson, 2009.

* Scott E. Harringam Gregory R. Nichanus: Risk Management & Insurance, TMH, 2009.
* Geroge E. Rejda: Principles of risk Management & Insurance, 9/e, pearson Education. 2009.

G. Koteshwar: Risk Management Insurance and Derivatives, Himalaya, 2008.

# 6K571: Geographic Information Systems Laboratory

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

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**Course Objectives:**

1. The student shall be trained to extract geographic data from toposheet.
2. The student shall learn to digitize the various features and define their attributes.
3. The student shall learn to generate maps with defined patterns.

**Course Outcomes:**

1. The student will be able to extract various details from the topography survey map.
2. The student shall be able to convert the raw data into vector and raster forms.
3. The student shall be able to generate maps with various geographic features.

**Laboratory Experiments**

1. Georeferencing of Toposheet / satellite Imagery **and verification**
2. Digitization of Points and Lines
3. Digitization of polygons
4. Editing Map Elements
5. Attribute Date Entry and Manipulation
6. Cleaning, Building and Transformation
7. Vector data Analysis – Overlay
8. Vector data Analysis - Buffer
9. Raster data analysis
10. Map Generation With Patterns and Legends
11. Network Analysis
12. Interpolation Methods

**References**

1. Q GIS manuals
2. LABORATORY MANUAL

# 6K573: Environmental Engineering Laboratory

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

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**Course Objectives:**

To enable the students,

1. Conduct common environmental experiments relating to water and wastewater quality.
2. Interpret laboratory results and report the values in comparison with environmental quality standards.
3. Apply the laboratory results for problem identification, quantification, and basic environmental design.

**Course Outcomes:**

At the end of the course, the student should have learnt:

1. to establish water and wastewater quality, and know which tests are appropriate for given environmental problems?
2. to Statistically analyse and interpret laboratory results.
3. to use the water and wastewater sampling procedures and sample preservations.
4. to Obtain the necessary background for subsequent courses in environmental engineering.

**List of experiments:**

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

**NOTE: At least 8 of the above experiments are to be conducted.**

**List of equipment:**

1) pH meter,

2) Turbidity meter,

3) Conductivity meter,

4) Hot air oven,

5) Muffle furnace,

6) Dissolved Oxygen meter,

7) U – V visible spectrophotometer,

8) Reflux Apparatus,

9) Jar Test Apparatus,

10) BOD incubator.

11) COD Extraction apparatus

**REFERENCES:**

1. APHA, Standard Methods for the Examination of Water and Wastewater, 21st Ed. Washington, 2005

# 6K574: Geotechnical Engineering Laboratory

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

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**Course Objective**

Students should understand the methods for:

1. Determine the basic engineering properties of soil.
2. Determine the specific gravity, dry density and field density of soil.
3. Different methods of Sieve analysis.
4. Consistency limits, compaction test and Consolidation of soil
5. Determine Permeability of soil.
6. shear strength for different soil condition

**Course Outcome**

On successful completion of the Laboratory practical course, students will be able to assess

1. The method of determining basic engineering properties of soil
2. The moisture content, Specific gravity, dry density and field density of given soil sample.
3. The particle gradation and recognize the components in terms of gravel, sand and silt.
4. The liquid limit, plastic limit and shrinkage limit of the given soil sample and classification of given soil as per IS specifications - determine compaction of soil by proctor test
5. The permeability of soil by both constant head and variable head methods - determine shear strength of soil using direct shear test apparatus
6. The shear strength by Tri-axial shear test apparatus - Determine compression index and coefficient of consolidation by consolidation test.

**List of experiments conducted.**

1. Determination of moisture content and specific gravity of soil sample
2. Grain size analysis of soil sample by Sieve analysis.
3. Determination of in situ density by core cutter and sand replacement methods
4. Determination of Liquid limit (Casagrande and cone penetration methods) of soil samples
5. Determination of Plastic limit & Shrinkage limit of Soil sample
6. Determination of compaction characteristics of soil by standard Proctor compaction test
7. Determination of compaction characteristics of soil by modified Proctor compaction test
8. Determination of coefficient of permeability of soil sample by constant head method
9. Determination of coefficient of permeability of soil sample by variable head method
10. Determination of Shear strength parameters of soil by Direct shear Test
11. Determination of shear strength parameters of soil sample by Tri-axial shear test and unconfined compression test.
12. Determination of compression index and coefficient of consolidation by consolidation test.

**REFERENCES:**

1. Punmia B.C, Soil Mechanics and Foundation Engg, (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. Lambe T. W., “Soil Testing for Engineers”, Wiley Eastern ltd, New Delhi.
3. Head, K H, “Manual of soil laboratory testing”, Vol-I, II and III Pentech press, London.
4. Bowles, J.E., Engineering properties of soils and their measurements , McGraw Hill Book Co. New York.
5. Relevant BIS Codes of Practice: IS 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.

**6H576: QUANTITATIVE APTITUDE**

**B. Tech III Year I Sem.**

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**Pre Requisites**: Nil

**Course Outcomes:** Students will able to answer

1. The questions given on testing divisibility, prime number and questions of HCF and LCM .
2. The questions given on averages, percentage and profit and loss.
3. The questions given on ratio and proportion.
4. The questions given on simple and compound interest.
5. The questions given on time and work, time and distance.
6. The questions given on mensuration and data sufficiency.

**UNIT I**

Number System: Test for Divisibility, Test of prime number, Division and Remainder – HCF and LCM of Numbers - Fractions.

**UNIT II**

Average: Average of different groups, Replacement of some of the items - Percentage - Profit and Loss.

**UNIT III**

Ratio and Proportion: Properties of Ratio, Comparison of Ratios, Useful Simple Results on Proportion – Partnership and Share.

**UNIT IV**

Simple Interest: Effect of change of P, R and T on Simple Interest - Compound Interest: Conversion Period, Difference between Compound Interest and Simple Interest.

**UNIT V**

Time and Work- Pipes and Cisterns, Time and Distance- Problems on Trains- Boats and Streams, Allegation or Mixtures.

**UNIT VI**

Mensuration: Area of Plane Figures, Volume and Surface Area of Solid Figures.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

**TEXT BOOKS:**

1. Quantitative Aptitude by R.S.Agarwal

2. Quantitative Aptitude by Abhijit Guha

3. Quantitative Aptitude for Competative Examinations, U.Mohan Rao, Scitech Publication.

# 6KC61: Advanced Construction Techniques

**Professional Elective\_2**

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

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**Course Objectives:**

The objectives of learning the subject are to study

1. The substructure construction techniques like box jacking, sheet piling.
2. The erection and operation of Tall structure elements.
3. The recent and advancement in construction techniques and methods in concreting.
4. The elements of repairs in construction.
5. The various strengthening techniques.
6. The various Demolition and Dismantling Techniques.

**Course Outcomes:**

On successful completion of the course, students will have ability

1. To understand techniques related to substructure
2. To understand the concepts of the superstructure execution.
3. To understand updated techniques in construction industry.
4. To identify the problem and solve with necessary repairs to the structure.
5. To understand the various floor and sub-grade strengthening techniques.
6. To understand the nuances of demolition and dismantling techniques.

**UNIT I**

**SUB STRUCTURE CONSTRUCTION**

Box Jacking -pipe jacking - diaphragm walls types and methods – piling techniques - driving well and caisson – sheet piles – construction procedures and applications-cofferdam - methods -cable anchoring and grouting - dewatering and stand by plant equipment for underground open excavation

**UNIT II**

**TALL STRUCTURES CONSTRUCTION**

Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections launching techniques -Slip form techniques suspended form work -erection techniques of tall structures, large span structures, tubular constructions, shear wall construction and outrigger structures.

**UNIT III**

**LARGE SPAN STRUCTURES CONSTRUCTION**

Types of bridges and loading standards Bow string bridges, cable stayed bridges. Construction aspects and inspection and maintenance of bridges. Launching and pushing of box decks. Construction sequence and methods in domes and pre-stressed domes – various construction techniques of domes –methods-merits and demerits.

**UNIT IV**

**SPECIAL STRUCTURE CONSTRUCTION**

Erection of lattice towers and rigging of transmission line structures –construction procedures of cooling towers, silos, chimney. Advanced construction techniques in offshore construction practice- Vacuum dewatering of concrete flooring – white topping –methods and application- erection of articulated structures, floating structures-methods

**UNIT V**

**COMMON STRENGTHENING TECHNIQUES**

Mud Jacking grout through slab foundation - micro piling for strengthening floor and shallow profile pipeline laying - protecting sheet plies, screw anchors – sub grade water proofing -under pinning.

**UNIT VI**

**DEMOLITION and DISMANTLING**

Demolition Techniques, Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

**TEXT BOOKS**

1. Roy Chudley, Roger Geeno ,”Advanced Construction Technology” Latest Edition, 2005.

2. Ponnuswamy .S,”Bridge Engineering “Second Edition, 2008.

**REFERENCES**

1. Sankar .S.K. And Saraswati .S, Construction Technology, Oxford University Press, New Delhi, 2008.

2. Gahlot .P.S & Sanjay Sharma ,”Building repair and maintenance management“ , CBS Publications.2006.

3. Robertwade Brown, "Practical Foundation Engineering Hand Book", Mcgraw Hill Publications, 2005.

4. Patrick Powers .J, “Construction Dewatering: New Methods And Applications”, John Wiley & Sons, 2002.

5. Micheal T.Kubal ,”Construction Waterproofing Handbook”.

# 6KC62: Earthquake Resistant Design of Buildings

**Professional Elective\_2**

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

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**Course objectives:**

The objectives of learning the subject are to study

1. The causes of earthquakes, their Magnitude & effects and various types of earthquake waves.
2. The concepts of damped and un-damped vibrations and the response of single, two and multi-degree systems to these vibrations, and concepts of Response spectrum.
3. The concepts of Seismic Design Philosophy and Earthquake Resistant Design of Masonry, RC and Steel structures.
4. The Seismic Performance of Engineered and Non-Engineered Urban and Rural buildings.
5. The design concepts of Seismic resistant RC construction, Base isolation techniques and other energy dissipation devices.
6. The analysis and design concepts of Seismic resistant masonry buildings.

**Course outcomes:**

On successful completion of the course, students will have ability to

1. Assess the cause of an earthquake, it’s magnitude and its effects on structures.
2. Apply the concepts of Damped and Un-damped Vibrations to single, two and multi-degree systems and deduce a response spectrum.
3. Apply the concepts of Seismic Design Philosophy and Earthquake Resistant Design to Masonry, RC and Steel structures.
4. Evaluate the Seismic Performance of Engineered and Non-Engineered Urban and Rural buildings.
5. Apply the concepts of Seismic Resistant Construction, Base isolation techniques and other energy dissipating devices.
6. Analyse and design Seismic resistant masonry buildings.

**UNIT - I**

Earthquake ground Motion, Engineering Seismology, Theory of plate tectonics, seismic waves, Magnitude and intensity of earthquakes, local site effects, seismic zoning map of India.

Seismic Design Parameters. Types of Earthquakes, earthquake ground motion characteristics, response spectra and design spectrum.

**UNIT – II**

Structural modelling, Code based(IS 1893–2002: Criteria for Earthquake Resistant Design of Structures) seismic design methods. Response control concepts, seismic evaluation and retrofitting methods.  
Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems~~.~~

**UNIT-III**

Seismic design philosophy, Determination of design lateral forces -Equivalent lateral force procedure, dynamic analysis procedure.

**UNIT-IV**

Step by step procedure for seismic analysis of RC buildings (maximum of 4 storeys , without infills) - Equivalent static lateral force method, response spectrum methods.

**UNIT - V**

Earthquake resistant analysis and design of RC buildings – Preliminary data, loading data, load combinations, analysis and design of subframes.( maximum of 4 storeys, without infills).

**UNIT-VI**

Earthquake resistant design of masonry buildings - elastic properties of structural masonry, lateral load analysis, Design of two storied masonry buildings.

**TEXT BOOKS:**

1. Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India.
2. Earthquake Resistant Design of Structures - S.K. Duggal - Oxford University Press, 2007.

**REFERENCES:**

1. IS 1893–2002: Criteria for **Earthquake** Resistant **Design** of Structures.
2. Earthquake Resistant Design- Anil Chopra
3. Earth Quake Engineering Damage Assessment and Structural design- S.F. Borg - (John Wiley and Sons. 1983).

# 6KC63: Ground Water Hydrology

**Professional Elective\_2**

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

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**Course Objectives:**

To enable the student

1. Understand the Hydrologic cycle, types of aquifers, Concepts of permeability, transmissibility and ground water flow.
2. Understand the various types of flows into well.
3. Comprehend the various methods of Geophysical exploration.
4. Understand, interpret and implement the concepts of Ground water recharge and ground water management.
5. To understand the Basics and Principles Groundwater Management, sustainable management of ground water resources.
6. In Modeling and managing ground water resources.

**Course Outcomes:**

At the end of the course, the student is able to

1. Interpret the concepts of permeability, transmissibility and ground water flow to field problems.
2. Evaluate the flow into a well
3. Apply various methods of geophysical explorations to field situations.
4. Interpret and implements the concepts of Ground water recharge and ground water Management.
5. To understand the Basics and Principles Groundwater Management, sustainable management of ground water resources.
6. In Modelling and managing ground water resources.

**UNIT-1:**

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

**UNIT-2:**

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

**UNIT-3:**

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

**UNIT-4:**

**Pollution and quality analysis of ground water:**Municipal**/**industrial /agricultural /miscellaneous sources & causes of pollution, attenuation/ underground distribution / potential evaluation of pollution, physical /chemical /biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples, graphical representations of ground water quality.

**Saline water intrusion in aquifers:**Ghyben-Herzberg relation between fresh & saline waters,shape & structure of the fresh & saline water interface, upcoming of saline water, fresh-saline water relations on oceanic islands, seawater intrusion in Karst terrains, saline water intrusion control.

**UNIT-5:**

**Groundwater management** ‐ Basics and Principles Groundwater Management ‐ Lumped Parameter Models Optimization in Water Quality Management.

**Sustainable management of ground water resources**- Legal provisions of ground water. Role of Central Ground Water Board (CGWB), State Ground water Departments, Existing Ground water Regulatory arrangements. Best Ground water management practices.

Criteria for location and selection of type of water harvesting structures based on site conditions.

**UNIT-6:**

**Modelling and management of ground water**: Ground water modelling through porous media /analog / electric analog / digital computer models, ground water basin management concept, hydrologic equilibrium equation, ground water basin investigations, data collection & field work, dynamic equilibrium in natural aquifers, management potential & safe yield of aquifers, stream-aquifer interaction.

**TEXT BOOKS:**

1. D.K. Todd, Ground Water Hydrology, John Wiley & Sons, Inc., USA
2. H.M. Raghunath, Ground Water, Wiley Eastern Limited, New Delhi.

**REFERENCES:**

1. K.P. Karnath, Ground Water Assessment, Development and Management, Tata McGraw Hill Publishing Company, New Delhi
2. Walton, Ground Evaluation and Management, Mc. Graw Hill

Bouwer, Ground Water Hydrology, Mc. Graw Hill.

# 6KC64: Digital Image Processing

**Professional Elective\_2**

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

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**Course Objectives:**

The student is being exposed to the subject with following purpose:

1. To introduce the concepts of remote sensing, data acquisition and encoding of raw data.
2. To learn the process of imaging and corrections of errors.
3. To learn the various image enhancement and filtering mechanism of images obtained.
4. To analyze the various errors formed in the images and learn mitigate methods.
5. To understand the theories and methodologies involved in the image extractions and patterns.
6. To grasp the various techniques involved in eliminating any accumulated errors in imaging.

**Course Outcomes:**

On successful completion of the course structure, the student shall:

1. Understand the effective use of remote sensing technique and the significance of the data obtained through such a survey.
2. Grasp the imaging methodology, equipped to identify the errors that may occur during data acquisition.
3. Intuit all the enhancement procedures and the mechanism involved in betterment of image quality.
4. Figure out the error correction operation with attention to all the possible errors.
5. Assimilate all the conceptual theories involved in the image extraction process.
6. Understand all the procedures involved in the elimination of errors in images obtained through Remote Sensing.

**UNIT – I:**

**Remote sensing data acquisition:** Introducing concept of photogrammetry, digital Image, Image formation, Digital image data Formats – band sequential format, Band interleaved by line format, Band interleaved by pixel format, Run – length encoding format, Entropy and its significance.

Image processing system considerations, Image processing system characteristics, Software. Image processing systems- IDRISI, ILWIS, SOCET GXP, ERDAS Imagine, ENVI, e-Cognition etc. Univariate and multivariate statistics computed from remotely sensed imagery. The histogram and its significance to digital image processing of remote sensor data.

**UNIT – II:**

**Image pre-processing:** Sources of radiometric distortion – Affect of atmospheric, instrumentation errors. Correction of radiometric distortions

Sources of geometric distortions, earth rotation effects, panoramic distortions, earth curvature, scan time skew, etc.; correction of geometric distortion- use of polynomials for image corrections.

**UNIT – III:**

**Image enhancement :**Image Display Technology (Brief on how Image is Displayed and Display Hardware Knowledge) Image reduction and magnification, Transects; Contrasts enhancement; Ratioing, Spatial filtering; Edge enhancement; Spatial transformation. Thematic Information Extraction.

Radiometric enhancement techniques: Contrast modification, Histogram equalization, Histogram matching, density slicing; Detecting geometric properties- texture, spatial correlation – semi – variogram, shape detection.

**UNIT – IV:**

**Edge detection:** Geometric enhancement techniques: Neighborhood operations, image smoothing, low pass filtering, edge detection & enhancement, Second Order edge detection, Pyramid edge detection, Crack edge detection, Edge following, Crude region detection, Region merging, Region splitting, Sobel edge detection, Creak edge relaxation, Simple edge following.

**UNIT – V:**

**Image classification and change detection:** Supervised Classification, Baye’s minimum – Rank classifier, Mahalanobi’s maximum likelihood algorithm. Unsupervised classification – Cluster building algorithm, Isodata algorithm. The nature of change detection, change detection algorithms. Neural Network Classifiers.

**UNIT – VI:**

**Accuracy assessment:** Sources of Classification Error, Error Characteristics, Measurement of Map Accuracy, Interpretation of the Error Matrix.

**TEXT BOOKS:**

1. John R. Jenson **(**2004) “Introductory Digital Image Processing**”** Prentice Hall.
2. Adrian low (1991) “Introductory computer vision and image processing”, McGraw Hill

**REFERENCES:**

1. Gonzalez (2007) “Digital Image processing” Pearson Publications.
2. Thomas Lillesand and Ralph W Kiefer **(**2008) “Remote Sensing and Image Interpretation” – John Wiley & Sons, Inc.

**6KC65: SOIL DYNAMICS**

**Professional Elective\_2**

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

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**Course Objective**

The objectives of learning the subject are to understand

1. Importance of soil dynamics.
2. Undamped, damped free vibrations and forced vibrations.
3. Earthquake waves – P-wave, S-wave, Rayleigh wave and Love wave.
4. Stresses in soil element, liquefaction.
5. Analysis and Design of machine foundation.
6. Dynamic analyses of various geotechnical structures.

**Course Outcome**

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

1. Know the nature and type dynamic loading.
2. Understand the equation of motion for Undamped, damped free vibrations and forced vibrations.
3. Understand different type of earthquake waves.
4. Find stress in soil element and Estimation of the liquefaction.
5. Design of machine foundation.
6. Analysis of various geotechnical structures.

**UNIT-I:**

**Introduction**: Scope and objective; Nature and types of dynamic loading; Importance of soil dynamics.

**UNIT-II:**

**Vibration theory** -Vibration of elementary systems; Degrees of freedom (SDOF and MDOF systems); Equation of motion for SDOF system; Types of vibrations; Earthquake excitation; Undamped and damped free vibrations; Undamped and damped forced vibration; Constant force and rotating mass oscillators; Dynamic magnification factor; Transmissibility ratio; Non-harmonic, arbitrary, impact and other types of forced vibrations, Vibration measuring instruments; Equation of motion for MDOF system.

**UNIT-III:**

**Wave Propagation** -Longitudinal and torsional waves in infinitely long rod; Solution for one-dimensional and three-dimensional equations of motion; Waves in semi-infinite body; Waves in layered medium; Earthquake waves – P-wave, S-wave, Rayleigh wave and Love wave; Locating earthquake's epicenter.

**UNIT-IV:**

**Dynamic Soil Properties** -Stresses in soil element; Determination of dynamic soil properties; Field tests; Laboratory tests; Model tests; Stress-strain behaviour of cyclically loaded soils; Estimation of shear modulus; Modulus reduction curve; Damping ratio; Linear, equivalent-linear and non-linear models; Ranges and applications of dynamic soil tests; Cyclic plate load test; Liquefaction; Screening and estimation of liquefaction; Simplified procedure for liquefaction estimation; Factor of safety; Cyclic stress ratio; Cyclic resistance ratio;

**UNIT-V:**

**Dynamic Soil-Structure Interaction** -Dynamic earth pressures; Force and displacement based analysis; Pseudo-static and Pseudo-dynamic analysis; Guidelines of various design codes; Dynamic analyses of various geotechnical structures like retaining wall, soil slope, railway subgrade and ballast using MSD model.

**UNIT-VI:**

**Machine Foundations** -Types of machines; Basic design criteria; Methods of analysis; Mass-Spring-Dashpot model; Elastic-Half-Space theory; Tschebotarioff’s reduced natural frequency method; Types of foundations; Modes of vibrations; Vertical, sliding, torsional (yawing) and rocking (and pitching) modes of oscillations; Design guidelines as per codes; Typical design problems.

**TEXT BOOKS:**

1. Srinivasulu and Vaidyanathan, Hand-book of machine foundations, M/s. Tata McGrawHill Publications.
2. B.C.Punmia, Soil Mechanics and Foundation Engineering, Standard Book House, 9th edition,1985.
3. Richart Hall and Woods, Vibrations of soils and Foundations, Prentice Hall Inc., New Jersey.
4. Relevant I.S. Codes.

**REFERENCES:**

1. Shamsher Prakash, “Soil Dynamics”, McGraw-Hill Book Company.
2. Shamsher Prakash, Gopala Ranjan and Swamisaran, Analysis and Design of Foundations and Retaining Structure, M/s Saritha Prakashan, Meerut.
3. Braja M. Das, “Principles of Soil Dynamics”, PWS-KENT Publishing Company.
4. Steven L. Kramer, “Geotechnical Earthquake Engineering”, Prentice Hall Inc.
5. D. D. Barkan, “Dynamics of Bases and Foundations”, McGraw-Hill Book Company.
6. E. E. Richart et al. “Vibrations of Soils and Foundations”, Prentice Hall Inc.
7. Tien Hsing Wu, “Soil Dynamics”, Allyn and Bacon Inc.
8. Deepankar Choudhury, “Soil Dynamics”, NPTEL Video Course, available free online: http://www.nptel.iitm.ac.in/courses/105101005/ Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering, (2009), “ Tata Mc Graw Hill.

# 6K601: Design of Steel Structures

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

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**Course Objectives:**

To enable the students

1. Learn and apply the design philosophies (working stress method and limit state method) for various steel structural components and their connections, as per the relevant standards.
2. Understand the Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members.
3. Understand the design principles of tension members design of lug angles staggered bolting of Steel Structures to field problems.
4. To learn plastic analysis plastic hinge, plastic moment and design of laterally supported beams and laterally unsupported Beams
   1. Draw, understand and interpret the detailing aspects of Steel Structures.
5. Understand the types of trusses, Estimation of loads and design of purlins, design of its members with angle sections
6. To learn design of simple slab base and gusseted base and design of plate girders optimum depth design of main section.

**Course Outcomes:**

At the end of the course, the student

1. Attains fundamental knowledge of the design of various Steel Structures and connections and is able to interpret the specifications of relevant codes.
2. Gets adequate knowledge and skills to apply the design principles to field problems.
3. Is able to design principles to field problems of tension members.
4. Is able to draw, understand and interpret the detailing aspects of steel structural drawings.
5. Is able to investigate into the critical issues of steel structures, compare various options and chose the best solution for the problems in the area of steel structures.
6. Is able to design the end bearing Stiffness and intermediate stiffness.

**UNIT- I:**

**Materials and Specifications**: Chemical composition of steel, types of Structural

Steel - classification of Rolled Steel Sections.

**Loads and Load Combinations**: Design Loads & load Combinations; Characteristic Loads, Partial safety factors for materials and loads.

**Bolted Connections (Limit State Method):** Introduction, Behaviour of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG).

**Welded Connections (Limit State Method):** Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections,

**UNIT –II:**

**Design of Compression Members:** Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members.

**UNIT- III:**

**Design of tension members (Limit State Method):** Introduction to tension members - Applications of tension members, Modes of Failure, Design of Tension Members –Design of Lug Angles - Staggered bolting.

**UNIT –IV:**

**Design of Beams (Limit State Method)** : Introduction to Plastic Analysis – Plastic Hinge, Plastic moment, Shape factor; Classification of Cross Sections, Design of Laterally Supported beams and Eccentric connections.

**UNIT –V:**

**Design of Roof trusses (Limit State Method):** Types of trusses, Estimation of loads- dead load, live load and wind load, Design of Purlins, Analysis of roof trusses and design of its members with angle sections.

**UNIT –VI:**

**Design of Column Bases -** Design of simple slab base and gusseted base.

**Design of Plate girders** - optimum depth design of main section- design of end bearing Stiffness and intermediate stiffness.

**TEXT BOOKS**

1. Design of Steel Structures -, N.Subramanian, Oxford, 2008.
2. Limit State Design of Steel Structures 2ND EDITION –S.K .Duggal. TATA Megra Hill 2010
3. Bureau of Indian Standards, IS800-2007, IS875-1987
4. Steel Tables.

**REFERENCE BOOKS**

1. Design of steel structure – K. S Sai Ram, Person Education.2010
2. Design of steel structure Ashok Kumar Jain ,B.C Punmia, Arun Kumar Jain LAXMI PUBLICATIONS (P)LTD.1998

# 6K602: Irrigation and Water Resources Engineering

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

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**Course objectives:**

To enable the students,

1. Get comprehensive knowledge about occurrence, quantification of surface & Ground water and understand water conservation, water sharing, and water laws, crop water requirements, micro irrigation, irrigation canals, lift irrigation and layouts
2. Apply knowledge of diversion head works and design a weir/barrage, assess and resolve weir failures, understand the importance of Canal regulators and apply the knowledge to field problems.
3. Attain an ability to apply knowledge in water resource projects planning formulation, estimation, execution, and control and managing the projects.
4. To measure Stream flow and establish stage-discharge relationship.
5. To estimate the flood and understand flood routing.
6. To properly plan and manage the water resources project.

**Course outcomes:**

At the End of the course the student will be able to,

1. Derive unit hydrograph method, Gumbel’s method
2. The Skill of functioning & planning of an Irrigation system including canals, ability to understand water harvesting, water sharing and water laws to assess surface and ground water availability
3. Design of lined and unlined canals
4. Will be able to understand multipurpose project management on water supply projects.
5. To estimate the flood and understand flood routing for urban flood storms.
6. To properly plan and manage the water resources project.

**UNIT – I:**

**Elements of Surface water hydrology: H**ydrologic cycle, rainfall, measurement of rainfall and estimation of mean rainfall over a catchment, infiltration, evaporation, evapo-transpiration, and runoff.

**Elements of Groundwater hydrology:** Aquifer parameters: porosity, specific yield, permeability, transmissivity and storage coefficient; types of wells.

**UNIT – II:**

**Introduction to Irrigation Engineering:** Duty, delta and base period of crops, methods of irrigation, irrigation efficiencies depth of irrigation, wilting point, consumptive use, types of canals. The canal system of irrigation, Components of a canal irrigation system, Layout of a canal irrigation system, canal sections, balancing depth of cutting, Kennedy's and Lacey's theories, design unlined canals.

**UNIT – III:**

**Types of Irrigation Schemes and Methods of Field Water Application:** Classification of irrigation projects in India; Direct and Storage methods of irrigation; Structures necessary for implementing irrigation projects (only description); Methods employed for application of water to irrigate fields; Surface and subsurface methods of irrigation; Drip and Sprinkler irrigation systems.

**Lift Irrigation:** Definition, Advantages of Lift Irrigation, Requirements of Lift Irrigation System, Necessity and Component Parts of Lift Irrigation Scheme, Lift Irrigation Scheme in Telangana, Participatory Irrigation Management.

**UNIT – IV:**

**Stream flow Measurement**: Stream flow measurement, stage-discharge relationship and rating curve, Runoff characteristics, catchment characteristics affecting the runoff, yield from a catchment, flow duration curve and flow mass curve Hydrograph.

**Water resources development and management:** systematic canal operation, Warabandhi system, farmers' participation in water management, Integrated River Basin Planning& Management; Interlinking of Indian Rivers (concept and broad frame work only); Water Law and Principles of Water law.

**UNIT-V:**

**Flood Estimation:** Peak discharge estimation procedures, deterministic and probabilistic approaches, enveloping curve, rational method, SCS and unit hydrograph methods, Design flood, return period, flood frequency analysis, probabilistic and statistical concepts, and time series analysis, Gumbel’s and log Pearson Type III methods.

**UNIT – VI:**

**Flood Routing**: Concepts of flow routing, hydraulic and hydrologic routing, Reservoir routing, Channel routing, Muskinghum and Muskingum-Cunge methods of channel routing and flood forecasting.

**TEXT BOOKS:**

1. Irrigation engineering and Hydraulic structures by S.K Garg, Khanna publishers.
2. Irrigation engineering by K.R.Arora
3. Subramanian, K, Engineering Hydrology, Third Edition, McGraw Hill EducationPublishers 2008

**REFERENCES:**

1. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers
2. Irrigation and Water Power Engineering by Punmia and Lal, Laxmi Publications, New Delhi
3. Dash Sushi Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
5. Patra, K.C., Hydrology and water resources Engineering, 2nd edition, Narosa Publishing Company – 2008.
6. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta

# 6K603: Transportation Engineering

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

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**Course Objectives:**

The student is being exposed to the subject with following Objectives:

1. Understand the design concepts of highways, the quality of the materials required for the construction of highways
2. To learn about the different techniques used in construction of flexible and rigid pavements.
3. Know how to collect the field data for the evaluation of traffic patterns.
4. Know the requirements for designing the railway tracks and the material required for the construction of permanent way.
5. Get an idea for the planning of airports and fixing of run way orientation.
6. Applying the various corrections while constructing Airports and runway lighting.

**Course Outcomes:**

On successful completion of the course, the student shall:

1. Applies the Pavement design concepts to different types of pavements
2. Takes precautions required for the execution of construction of pavements and applies relevant IRC standards.
3. Analyze the collected field data and design suitable traffic management system
4. Is able to apply the design concepts of super elevation of railway curves.
5. Knows how to select a site for airport construction and have working knowledge of run way orientation methods,
6. Apply the corrections to the run way length and understands the circumstances in which they are to be applied.

**Unit – I:**

Highway Development and Planning: Development in India, necessity for highway planning, different road development plans, classification of roads, road network patterns, highway alignment, factors affecting highway 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.

**Unit – II:**

Design of horizontal alignment, design of super elevation and extra widening, design of transition curves, design of vertical alignment, gradient, vertical curves. Traffic Engineering and Regulations: Basic parameters of traffic, volume, speed and density, traffic volume studies, data collection and presentation, speed studies, data collection and presentation, origin and destination studies, parking studies, on street and off street parking,

**Unit – III:**

Road accidents, causes and preventive measures, accident data recording, condition diagram and collision diagram, traffic signs, types and specifications, road markings, need for road markings, types of road markings, design of traffic signals – Webster method.

Highway material, construction: Highway material characterization, sub grade soil, stone aggregates, bitumen material, construction of gravel roads, construction of water bound macadam roads, construction of bituminous pavements, surface dressing, bitumen bound macadam, bituminous concrete, construction of cement concrete pavements.

**Unit – IV:**

Permanent way components, cross section of permanent way, functions of various components like rails, sleepers, and ballast, gauge, creep of rails, theories related to creep, sleeper density- Geometric design of railway track: Gradients, grade compensations, cant and negative super elevation

**Unit – V:**

Cant deficiency, degree of curve, points and crossings, rail joints and welding of joints railway stations and yards, signalizing and interlocking.

Airport Engineering: Airport site selection, runway orientation, basic runaway length.

**Unit – VI:**

Corrections for elevation, temperature, airport classification, runway geometric design, factors controlling taxiway layout - Terminal area, apron, hangar, blast consideration, typical airport layouts, wind rose diagram, runway lighting system and marking.

**TEXTBOOKS**

1. Khanna, S. K. and Justo, C. E. G (1994), "Highway Engineering", Nemchand & Bros, New Delhi. India.
2. Chandra, S and Agarwal, M. M. (2007) "Railway Engineering" Oxford Higher Education, University Press New Delhi
3. Khanna. S. K. Arora, M. G. and Jain. S. S. (1994) "Airport Planning and Design" Fifth edition. Nem Chand & Bros, Roorkee, India.

**REFERENCES**

1. Saxena S.C and Arora, S, “Text book of railway Engineering” Dhanpat Rai and Sons., 1988.
2. Yang, H. and Huang., “Pavement Analysis and Design”, Prentice Hall India Ltd-2004.
3. McShane, W.R., Roess, R.P. and Prassas, E.S., Traffic Engineering. Prentice Hall. Englewood Cliffs, 1997.

**6ZC24 - INNOVATION & DESIGN THINKING**

**Open Elective-2**

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**B.Tech III Year II Sem.**

**L L T P/D C**

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**Course Objective:** The objective of the course is to make students understand the nature of Innovation, creativity and IPRs, and to motivate the student to start his/her own enterprise with innovative skills.

**Course Outcomes:**

1. The students gain the knowledge on the inputs required for innovation and also gain familiarity on Entrepreneurship.
2. The students will get exposure on creative methods of ideation and the importance of protecting the ideas.
3. The students gain knowledge on design thinking and types of thinking.
4. The students gain familiarity on emerging technologies like Internet of things (IOT).
5. The students understand the process of building the startup.
6. The students gain knowledge on various startup funding and also to branding building for the startup.

**Unit – I: Introduction to Innovation: -**

Meaning of Innovation, Difference between innovation and invention, Difference between Innovation and Creativity, Need to be Creative , Importance of Innovation, Innovation as a Competitive Advantage, Innovation Continuum, Innovation Cycle, Disruptive Innovation, , Breakthrough innovations and its consequences on the society, Challenges in Innovation.

**Unit – II: Creative Thinking: -**

Types of Creative Thinking, Creative Thinking Process, Components of Creativity, Characteristics of a Creative Mindset, New product ideas, Idea generation methods, Principles of Idea Generation, Difference between Idea Generation and Brainstorming, Killing the ideas through Stage Gate Models, Process of Reverse Thinking. Intellectual Property Rights, Importance of IPR, Role of WIPO, Case Studies on Patents and Infringement of Rights.

**Unit – III: Design Thinking & Liberal Art: -**

Concept of Design Thinking, Difference between Designer and Scientist, Stages of Design Thinking, Difference between Convergent Thinking and Divergent Thinking. Definition of Liberal Art and its Importance of Liberal Art , Role of Art and Culture to Innovate Business.

**Unit – IV: Emerging Technologies: -**

Meaning of Internet of Things, Components of IoT, Benefits of IoT, Types of Product – Service hybrid, examples of IoT enabled Innovations, Impact of IoT on Business, Future of IoT. Case Study on IoT.Innovation Leadership &Network: - Leadership, Skills and Characteristics of an Innovation Leadership, Meaning of Innovation Network, Significant of Innovation Network, Define Social Media Analysis, Steps to Build an Innovation Network.

**Unit –V Building Startup**

Kelly Johnsons KISS Principle, Road map for building a startup, identify, analyze and evaluate

funding, advantages of crowd funding. Pricing strategies. Determining factors for Monetizing Innovation, Process of Monetization, Fixing the price of an Innovative Project . Detailed study on market potential, pitfalls and Negative effects of Monetizing innovation. Reasons for failure of Monetization of Innovation. Schemes of Government through Startup India, role of Institutional support and Commercial Banks.

**References:**

* Peter Drucker (1993), “Innovation and Entrepreneurship”, Hyper Business Book.
* C.K. Prahalad, M.S. Krishnan, The new age of Innovation – TATA McGRAW-HILL     Edition 2008.
* “Innovation by Design", Gerald H. (Gus) Gaynor, AMACOM {American Management Association), NYC, 2002
  + Bholanath Dutta: Entrepreneurship – Text and cases, Excel, 2009.
  + Vasanth Desai: Entrepreneurship, HPH, 2009
  + Barringer: Entrepreneurship, Pearson, 2009.
  + H. Nandan: Fundamentals of Entrepreneurship, PHI, 2009.
* John M Nicholas “Project Management for Business and Technology” Prentice Hall of India Pvt. Ltd.

Stay Hungry Stay Foolish, Rashmi Bansal and published by IIM., Ahmedabad

**6ZC26 - BASICS OF POLITY AND ECOLOGY**

**Open Elective-2**

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**B.Tech III Year II Sem.**

**L L T P/D C**

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**Course Objectives:**

To provide basic knowledge relating to the Indian Polity and Ecology, thus making the students appreciate the current aspects related to both polity and ecology.

**Course Outcomes:**

1. Gain knowledge relating to the Indian Constitution and the Preamble to the Constitution.
2. Gain knowledge relating to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
3. Students will learn about the federal structure and judiciary of India.
4. Comprehend knowledge relating to the conservation of the environment.
5. Learn about bio-diversity and climatic changes occurring in the environment.
6. Know about the international treaties, conventions and organizations active in the field of environmental protection.

**Unit 1: Introduction to Salient Features of Constitution**

Significance of the Constitution, Distinction between Written and Unwritten Constitution, Composition of the Constituent Assembly and the role and objectives of the Drafting Committee, Main features and the nature of the Constitution of India. Preamble to the Constitution and its relevance; Basic principles of Preamble and their reflection in the constitutional provisions.

**Unit 2: Fundamental Rights, Duties and Directive Principles of State Policy**

Fundamental Rights and Duties of Citizens- Importance of Rights and Duties, Dignity of an individual, Safeguards against deprivation of life and personal liberty; Writs for the protection of Fundamental Rights; Meaning of Directive Principles of State Policy, Classification of the Directive Principles, Role of Directive Principles, Role of Directive Principles in the establishment of economic and social democracy.

**Unit 3: Government and Judiciary**

Legislative, financial and judicial powers of the President; Appointment of Prime Minister and constitution of Council of Ministers; Powers and functions of Prime Minister; Individual and collective responsibility; Powers and discretionary powers of the Governor; Appointment of the Chief Minister, Formation of the Council of Ministers; Powers and jurisdiction of the Supreme Court and High Courts of India.

**Unit 4: Ecology and Environment**

Environment-Origin, Evolution of Environment and its uses by Humans; Degradation of Natural Environment, Principles of Ecology; Composition and various types of Ecosystem; International Solar Alliance.

**Unit 5: Bio-diversity and Climate Change**

Classification of Biodiversity, Biodiversity loss, Methods of biodiversity conservation, Conservation of Natural Resources such as Soil, Land, Water and Energy. Sustainable Development and Cleaner Technology. Green house effect and Global Warming, Strategies to cope with Green House Effect, Desertification, Depletion of ozone layer.

**Unit 6: International Treaties, Conventions & Organizations:**

Indian Board for Wildlife (IBW). United Nations Environmental Programme (UNEP), United Nations Framework Convention for Climate Change (UNFCCC). International Union for conservation of Nature and National Resources (IUCN), World Wide Fund for Nature (WWF).Montreal Protocol (1987), Kyoto Protocol (1997), Paris Agreement (2016).

**References:**

* Indian Polity - M. Laxmikanth, 5th Edition, McGraw Hill Education, Chennai
* Environment And Ecology A Complete Guide for Civil Services Preliminary and Main Examinations – R. Rajgopalan, 2017, Oakbridge Publishing Pvt. Limited.
* Introduction to Constitution of India – Dr. Durga Das Basu, 22nd Edition, 2015, LexisNexis
* Our Constitution – Subhash C Kashyap, 5th Edition, 2015, National Book Trust, India
* Environment and Ecology – Anil Kumar De and Arnab Kumar De, 2009, New Age International (P) Limited.
* ICSE Environment Education for Class X – Dr. M.P. Mishra , 2009, S.Chand and Company.

**6ZC19 - ENTREPRENEURSHIP, PROJECT MANAGEMENT AND STRUCTURED FINANCE**

**Open Elective-2**

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**B.Tech III Year II Sem.**

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**Course Objective:** The objective of the course is to make students understand the nature of Entrepreneurship, its importance and to create an awareness regarding the systematic planning and implementation of projects; highlight the components of structured finance and establish a framework of CMBS with respect to Servicing Agreements

**Course Outcomes:**

1. Students will understand the nature of Entrepreneurship and its importance
2. Will gain knowledge regarding project, its life cycle and organization
3. Will gain knowledge relating to project formulation and implementation
4. Comprehend the components of structured finance
5. Establish a framework of CMBS
6. Students will gain knowledge relating to the CRE Servicing

**UNIT I**

**CONCEPTS OF ENTREPRENEURSHIP:** Definition of Entrepreneurship, Evolution of Entrepreneurship, Classification of Entrepreneurs**,** Characteristics of Entrepreneur**,** Selection of Product and the means required for starting an enterprise, Financing and Financial incentives available, Success rate of entrepreneurs – a case study.

**UNIT-II**

**BASICS OF PROJECT MANAGEMENT:** Concept and characteristics of a project - types of projects - Objectives of project management - Project Organizational structure - Project life cycle - Challenges and problems of project management - Qualities & functions of a project manager.

**UNIT III**

**PROJECT FORMULATION AND IMPLEMENTATION:** Generation of Project Ideas; Monitoring the environment; Preliminary Screening of Projects; Feasibility study; Project Selection. Detailed Project Report: Market, Technical, Financial and Economic aspects. Pre-requisites for Successful Project Implementation; Control of in-progress Projects (Gantt chart, PERT, CPM); Project Risk Management Process, Post-audit; Abandonment Analysis

**UNIT-IV**

**INTRODUCTION TO STRUCTURED FINANCE**: Term Loans, Bonds/Debentures, Types of debentures, Issue of debt instruments. Structured Finance: Evolution, Securitization process, characteristics, and structured finance products (ABS, CDO, MBS, CDS)

**UNIT-V**

**COMMERCIAL MORTAGAGE LOAN BASICS**: Definition and characteristics of CMBS, CMBS Vs other Mortgage Backed Securities, CMBS three level perspective: property level, loan level, bond level; Life cycle of commercial real estate loans – Loan cycle, Key players in loan cycle; Property types and characteristics, property performance.

**UNIT-V1**

**BASICS OF CRE SERVICING:** Introduction to servicing, Role of the Servicer, Servicing approaches, Influence of technology, Ethics in commercial servicing, Servicing – sources of income, Overview of servicing agreements, Pooling & Servicing agreement, Sub servicing agreement.

**References:**

* H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
* Jeffrey K. Pinto “Project Management”, 2nd edition, Pearson
* Dhandapani Alagiri “Structured Finance – Concepts & Perspectives”, ICFAI University press.
* Projects by Prasanna Chandra, McGraw-Hill Publishing Co. Ltd
* Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
* The Complete Real Estate Documents by Mazyar M. Hedayat, John J. Oleary
* The Fundamentals of Listing and Selling Commercial Real Estate - By Keim K. Loren (Author)

**6ZC23 - ADVANCED ENTREPRENEURSHIP**

**Open Elective-3**

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**B.Tech III Year II Sem.**

**L L T P/D C**

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**Course Objective:** The course is designed to impart the necessary managerial skills and tactics required for an emerging Entrepreneur for the Engineering students to enhance their prospects as an Entrepreneur.

**Course Outcomes:**

1. The Students’ gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
2. The Students are exposed to the various business models and critically evaluating the effectiveness of the business models.
3. The students understand the method of business traction and the need of customer relationship management.
4. The students understand the various channels of revenue building and exploration of new revenue avenues.
5. The students understand the need of sales planning and sales management and also financial modeling
6. The students are exposed to the legal implications effecting the company’s prospects and the issues related to intellectual property rights.

**Unit – I Orientation to Growth:**

Stages of a Startup Company, Infant Mortality of Startup’s, Sustaining the Phase of Launching, Entrepreneurial Propensity, Locus of Control, First Generation Entrepreneur, Growth Opportunities, Diversification and Expansion of Business, Growth Assessment, SWOT Analysis, Growth strategies adopted by ideal startup, Ansoff Growth Matrix, Six ways of Adjacencies for Growth. Case Study of Nike

**Unit - II - Expanding Customer Base:**

Customer Segmentation: Division of Market into Segments, Evaluating the profitability of Segments. Developing Business Model in relation to the current customers. Changing customer segments and revisit of business models. Evaluation of Business Models for new customer segments. Critical evaluation of business models Old Vs New. Risk of changing the Business Models. Analyzing the scalability of business model using Break Even Analysis.

**Unit- III - Traction of Business:**

Meaning of Business Traction, Business Traction Process, and Metrics to Measure Business Traction, Customer Retention, Customer Churning, Relationship Business, Customer Life Time Value, Identifying the unnecessary moves in business traction. Traction of Business using Bull’s-eye framework. Measuring the effectiveness of selected channels. Budgeting and Planning.

**Unit- IV - Growing Revenues:**

Identifying Growing Revenues, stabilizing growing revenues, Developing additional revenues (licensing and franchising). Exploring New channels and Partnerships for growth revenues. Evaluating the Growth streams based on longevity. Lean Startup Canvas.

**Unit V - Sales Planning & Financial Modeling:**

Understanding the consumer buying decision behavior, setting sales plans, sales targets, Art of pitching the sales, Selling process, Building a professional sales team , Sales Management. Price Sensitivity of the market. Optimization of cost and operational expenses. Financial modeling of the Venture, Assessment of competitors and Peer’s financial models.

**Unit –VI - Support System:**

Legal Management in Startups: Issues and Legal constraints effecting the business. Need for professional services: Legal consultancy and Accounting. Need for proper documentation for fool-proof administration of business. Intellectual Property rights and their importance. Business Mentoring, role of experts in managing business.

**References:**

* Entrepreneurship Rajeev Roy “” oxford ,2012

Entrepreneurship Development Khanka, ,S.Chand 2012

* Small Scale industries and Entrepreneurship Vasanth Desai “Himalya publishing 2012
* Robert Hisrich et al “enterpreneruship TMH 2012
* Entrepreneurship Development Khanka, ,S.Chand 2012
* Entrepreneurship Development B.Janikairam and M Rizwana

**6ZC27 - INDIAN HISTORY, CULTURE AND GEOGRAPHY**

**Open Elective-3**

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**B.Tech III Year II Sem.**

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**Course Objectives**: To equip the students with necessary knowledge relating to ancient, medieval and modern Indian and its culture and also facts relating to existence of earth.

**Course Outcomes**:

1. To appreciate and understand our Indian History, Culture and Indian heritage.
2. To understand secularism of our country.
3. To appreciate and understand the social reformers who brought revolutionary changes in

Indian society.

1. To understand earth evolution and world climatic change.
2. To understand India Oceanography,
3. Able to enhance and understand Indian monsoons, Indian agriculture.

**Unit I: Ancient Indian History**

Fundamental Unity of Indian Harappan and Vedic Civilization – Evolution of Caste System – ainism and Buddhism – Gandhara Art., Political unification of India under Mauryas and Guptas, Historical evolution of Satavahanas., Contribution of Pallavas and Cholas to Art – Chola Administrative Systems .

**Unit II: Medieval India and Culture**

Influence of Islam on Indian Culture – The Sufi, Bhakthi and Vishnavite movements, Historical Achievements of Vijayanagara Rulers., Contribution of Shershah and Akbar to the evolution of administration system in India – Cultural Development under Mughals.

**Unit III: Modern India**

Western Impact on India – Introduction of Western Education – Social and Cultural awakening and social reform movements – Raja Rama Mohan Roy – Dayananda Saraswathi – Theosophical Society – Ramakrishna Paramahamsa and Vivekananda – Iswara Chandra Vidyasagar and Veeresalingam – Emancipaition of women and struggle against Caste. Rise of Indian Nationalism – Mahatma Gandhi – Non Violence and Satyagraha – Eradication of untouchability – Legacy of British rule.

**Unit IV:** **Geo Morphology and Climatology**

The Origin and Evolution of the Earth, Interior of the Earth, Distribution of Oceans and Continents , Minerals and Rocks, Geomorphic Processes, Landforms and their Evolution Composition and Structure of Atmosphere, Solar Radiation, Heat Balance and Temperature.  
Atmospheric Circulation and Weather Systems, World Climate and Climate Change

**Unit V: Oceanography**

Water (Oceans), Movements of Ocean Water, Physical features of India viz., The Mountains in the North , The Northern Plains, The Peninsular Plateau, The Great Indian Desert, The Coast; and The Islands.

**Unit VI: Physical Features Of India And India’s Monsoon**

India’s monsoon., Winter, Summer(pre-monsoon),rainy (monsoon),autumn (post-monsoon)., Indian Agriculture, Agriculture and colonialism, Indian Agriculture after Independence Major crops and yields, Horticulture, Organic farming.

**References:**

* Sharma .R.S., (2011).Indian Ancient past.,Oxford Publications.
* Nitin Singhaniya.,(2017). Indian Culture and Heritage., Publisher: Mcgraw TestPrep., Second Edition.
* Certificate of Physical and Human Geography,Goh Cheng Leong,Oxford University Press.
* Bipin Chandra.(2000). India’s Struggle for Independence., Penguin Global Publishers
* Saveendra Singh: Physical Geograpghy.,Prayag Pustak Bhavan ISBN-10: 8186539298. Edition : 1st Edition Number of Pages : 641 Pages Publication : Year 2006.
* Majumdar, R. C. et al. *An Advanced History of India* London: Macmillan. 1960. [ISBN 0-333-90298-X](http://en.citizendium.org/wiki/Special:BookSources/033390298X)
* Basham, A.L. : The wonder that was India ,New York: Grove Press, 1954. (OUP, Madras 1983)
* Basham, A.L. : Cultural heritage of India , Vols.I to IV ,Oxford University Press, Delhi, 1975.

**6ZC21 GENERAL MANAGEMENT AND ENTREPRENEURSHIP**

**Open Elective-3**

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**B.Tech III Year II Sem.**

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**Course Objective:** The course is designed to impart the necessary managerial skills and tactics required for an emerging Entrepreneur for the Engineering students to enhance their career prospects and ambitions of starting a new Enterprise.

**Pre-requisites**: This course shall require a student to have knowledge in Managerial Economics and Financial analysis, Management Science, Operations management**.**

**Course Outcomes:**

1. Describe the necessary managerial skills and tactics required for an emerging Entrepreneur.
2. Distinguish various methods for business process and product development
3. Demonstrate the skills required for the project planning, implementing and controlling
4. Outline the legal aspects and applying for Intellectual Property Rights
5. Illustrate the various sources of finance for venturing a business project.
6. Designing production plant and quality management system.

**UNIT I**

**INTRODUCTION TO MANAGEMENT AND ENTREPRENEURSHIP:** Changing Face of Management-Entrepreneurship, Modern Management with Entrepreneurial Orientation.. Meaning of Entrepreneurship. Benefits and Drawbacks of Entrepreneurship Reasons feeding the Entrepreneurial fire. Understanding Entrepreneurship as a Process. Multiple roles of Entrepreneur: Intrapreneur, Inventor, Coordinator, Manager and Controller. Psychological and behavioral aspects of First-Generation Entrepreneur. Case Studies

**UNIT II**

**PROCESS DEVELOPMENT AND INNOVATION PROJECT MANAGEMENT:** Business Process Model, Value chain for Manufacturing industries and Service Industries. Frugal Innovation. Creativity process in developing Innovation.. Types of New Products, Forecasting of New Products, Stages in the New Product Development, Prototype building and pitching Going ahead with ideas, killing the ideas through Stage Gate Models, pitching of full fledged idea. Choosing the Start-Up Team.

**UNIT III**

**PROJECT MANAGEMENT AND FEASIBILITY REPORT:** Project Inception, Project Implementation, and Project control. Analyzing the project by employing capital budgeting techniques, Risk Management, tools and techniques. Methods of Appraising the Project. Industry Analysis pertaining to the Product, Competitive Analysis and Market analysis. Preparation of feasibility report, Contents of Feasibility Report. Exercise to write an effective Feasibility report. Case Studies.

**UNIT IV**

**PROTECTION OF IDEAS AND MECHANISM:** Exposure to intellectual property rights to the entrepreneur in the Indian and the World context. Registration process for Patents, Copyrights, Trademarks, Geographical indicators. Legal Framework in administration of Intellectual property rights. Meaning of Infringement, consequences of Infringement. Cases on Infringement. Case Studies.

**UNIT V**

**VENTURE FINANCING AND ISSUES RELATED TO PRICING:** Meaning of Venture Capitalist, Process of Venture Capital, Seed Funding, First Phase Funding, Second Phase Funding and Final Phase funding. Cost analysis, Preparation of standard costing, Finalizing the output, fixing the pricing based on market structure, Monopoly, oligopoly market structures and marketing pricing practices for attracting customers. Case Studies

**UNIT VI**

**MANUFACTURING AND QUALITY MANAGEMENT:** Plant Layout, Process and Product Layout, Service Factory. Introduction to Quality Circles, Quality inspection, ISO Certification, process of certification and exposure to the entrepreneurs of the need for certification. Quality certification for Manufacturing industrial. Case Studies

**References:**

* "Projects: Planning, Analysis, Selection, Financing, Implementation, and Review", Prasanna Chandra, TMH, New Delhi, 2012
* "Project Management", Jeffrey K. Pinto, Pearson, 2011
* Small Scale industries and Entrepreneurship Vasanth Desai “Himalya publishing 2012
* Innovation by Design", Gerald H. (Gus) Gaynor, AMACOM {American Management Association), NYC, 2002
* Entrepreneurship Rajeev Roy “” oxford ,2012
* Fundamentals of Entrepreneurship Nandan H.

**6ZC15 - FINANCIAL INSTITUTIONS, MARKETS AND SERVICES**

**Open Elective-3**

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**B.Tech III Year II Sem.**

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**Course Objective:** The objective of the course is to provide to students an understanding of Financial Markets, the major Institutions involved and the Services offered within this framework.

**Course Outcomes:**

1. 1.This unit enables the students to understand the financial structure and the financial sector reforms after 1991.
2. The unit gives the exposure on the role of RBI and the Regulating and credit policies adopted by the RBI.
3. The students get awareness on the role of Non-Banking financial institutions and the role of financial institutions in India.
4. The unit educates the students to know the role of regulatory bodies like SEBI and also to know the capital and money market instruments
5. The unit equips the students to understand about the asset fund based financial services
6. The students will get exposure about the investment banking and merchant banking.

**UNIT I**

**INTRODUCTION:** The structure of financial system, Equilibrium in financial markets, Indicators of Financial Development, Financial system and Economic Development, Financial Sector Reforms after 1991.

**UNIT II**

**BANKING INSTITUTIONS**: Structure and Comparative performance, Functions and Role of RBI, Competition, Interest rates, Spread; Bank Capital Adequacy norms; Banking Innovations – BPLR to Base rate, Core Banking System, Financial Inclusion, Current rates: Policy rates, Reserve Ratios, Exchange rates, Lending/ Deposit rates.

**UNIT III**

**NON BANKING FINANCIAL INSTITUTIONS:** Structure and functioning of Unit Trust of India and Mutual Funds, Growth of Indian Mutual funds and their Regulation, Role of AMFI. Performance of Non-Statutory Financial Organizations: IFCI, IRBI, NABARD, SIDBI and SFCs.

**UNIT IV**

**FINANCIAL AND SECURITIES MARKETS**: -, Role and functions of SEBI, Structure and functions of Call Money Market, Government Securities Market – T-bills Market, Commercial Bills Market, Commercial paper and Certificate of Deposits; Securities Market – Organization and Structure, Listing, Trading and Settlement, SEBI and Regulation of Primary and Secondary Markets.

**UNIT V**

**ASSET/FUND BASED FINANCIAL SERVICES:** Lease Finance, Consumer Credit and Hire purchase Finance, Factoring - Definition, Functions, Advantages, Evaluation, Forfeiting, Bills Discounting, Housing Finance, Venture Capital Financing. Fee-based Advisory services: Stock Broking, Credit Rating.

**UNIT VI**

**INVESTMENT BANKING AND MERCHANT BANKING**:

Investment Banking: Introduction, Functions and Activities, Underwriting, Banker to an Issue, Debenture Trustees and Portfolio managers, Challenges faced by Investment Bankers.

Merchant Banking: Definition, Merchant Banks Vs Commercial Banks, Services of Merchant Banks.

**References:**

* L.M. Bhole: Financial Institutions and Markets, TMH, 2009.
* E. Gordon, K. Natarajan: Financial Markets and Services, Himalaya Publishing House, 2013.
* Vasant Desai: Financial Markets and Financial Services, Himalaya,2009
* Pathak: Indian Financial Systems, Pearson, 2009
* M.Y. Khan: Financial Services, TMH, 2009.
* S. Gurusamy: Financial Services and System, Cengage,2009
* Justin Paul and Padmalatha Suresh: Management of Banking and Financial Services, Pearson, 2009.
* Gomez, Financial Markets, Institutions and Financial Services, PHI, 2012.
* R M Srivatsava: Dynamics of Financial Markets and Institutions in India, Excel, 2013.

# 6K673: Transportation Engineering LabORATORY

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

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**Course Objectives**:

To enable the student

1. Assess the quality of the material used in pavement construction and compare with IRC specifications.
2. Identify the field data required for assessing the traffic parameters.

**Course Outcomes**

At the end of the course, student should have learnt

1. To apply methods for assessing various types of material to be used in the pavement construction.
2. To plan for the collection of field data, present the same for performing critical analysis and hence aid in taking decisions so as to enable smooth movement of traffic

**List of Experiments**

**Tests on Bitumen**

1. Penetration Test
2. Ductility test
3. Softening point test
4. Specific gravity test
5. Viscosity test
6. Flash and fire point test

**Tests on Aggregates**

1. Aggregate crushing value test
2. Los Angeles Abrasion test
3. Aggregate Impact Value test
4. Shape test (Flakiness Index & Elongation Index)
5. Water absorption test
6. Soundness

**Traffic Studies**

1. Traffic volume study
2. Spot speed study
3. & D studies
4. Speed & delay studies

**Miscellaneous tests (Demonstration only)**

1. Determination of CBR
2. Preparation of representative sample by coning and quartering
3. Bitumen Extraction test
4. Marshall stability – concept and test

**TEXTBOOKS**

1. Khanna, S. K. and Justo, C. E. G, A Veeraraghavan (2013), “[Highway Materials & Pavement Testing](https://www.sapnaonline.com/books/highway-materials-pavement-testing-sk-khanna-8185240213-9788185240213)”, Nem Chand and Brothers.
2. Laboratory Manual

# 6K672: Hydraulics and Hydraulic Machinery Laboratory

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

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**Course Objectives:**

To enable the student

1. Understand uniform and non-uniform flows and the importance of Froude number in open channel flows.
2. Determine the force exerted by fluid jet on vane, determine efficiency and performance of turbine sand centrifugal pumps.
3. Study streamline patterns in a fluid flow system and air pressure distribution around an air foil.

**Course Outcomes:**

At the end of the course, the student should have learnt:

1. To compute the open channel viscosity coefficient in uniform flows and Froude number and energy losses in non- uniform flows.
2. To differentiate between uniform, non-uniform flows and flow in curved channel
3. To determine work done by fluid jet on vane, compute work done and draw performance characteristic curves for turbines and centrifugal pumps.
4. To find the discharge between stream lines and pressure variations around an air foil.

**List of experiments:**

1. Finding chezy’s coefficient and manning’s coefficient for an open channel.
2. Hydraulic jump - Determination of Froude number, Loss of energy
3. To study the flow characteristics over a hump/weir
4. Impact of jet on vanes - Determination of force on vanes.
5. Centrifugal Pump- Determination of efficiency and performance characteristics of a pump.
6. Multistage centrifugal pump test rig
7. Reciprocating pump at constant speed
8. Pelton Wheel Turbine - Determination of efficiency and performance characteristics of a Pelton wheel Turbine.
9. Francis Turbine- Determination of efficiency and performance characteristics of a Francis turbine.
10. Kaplan turbine - efficiency and performance characteristics of a Kaplan turbine
11. Performance of variable speed centrifugal pump.

# 6K671: MATLAB Programming LAB

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

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**Course Objectives**

1. This Lab Course will enable the students to understand the basics of programming knowledge in MATLAB and use them in civil engineering problems.

**Course Outcomes:**

1. Students learn the MATLAB environment and its programming fundamentals.
2. Students are able to write Programs using commands and functions.
3. Students are able to use MATLAB for solving a problem encountered in Civil Engineering.

**LIST OF EXPERIMENTS**

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements.
4. Input-Output functions, Reading and Storing Data.
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Piechart.
9. Solution of a simple problem encountered in Civil Engineering using Matlab. Solving a System of Linear Equations (for beam deflection problems in structural engineering).
10. Write a program to analyse the simple truss using Matlab.
11. Solving the simple differential equation using Matlab.
12. Solving a sample IVP / an ODE Problem (Runge- Kutta Method) (for water resources problems).

**TEXT BOOKS**

1. Bansal .R.K, Goel .A.K, Sharma .M.K, “MATLAB and its Applications in Engineering”, Pearson Education, 2012.
2. Amos Gilat, “MATLAB-An Introduction with Applications”, Wiley India.

**REFERENCES**

1. Stephen J.Chapman, “Programming in MATLAB for Engineers”, Cenage Learning, 2011.

**6H474: Effective English Communication & Soft Skills**

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

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**COURSE OBJECTIVES**

To enable students to -

To enable the students to make self assessment

To enhance their soft skills and behavioural patterns

To equip them for their career advancement

Develop interpersonal communication skills

Participate in group tasks using effective language skills in interviews

To train them to overcome stress and employable

**COURSE OUTCOMES**

Students are be able to

Acquire higher competence in communicative English

Acquire the skill of presenting seminars

Acquire mastery in applying various sub-skills of reading

Develop interpersonal communication skills

Participate in group tasks using effective language

Enhance written communication from the employability perspective

**UNIT-1: KNOW YOURSELF – SWOT / SWOC ANALYSIS**

Importance of Knowing Yourself

Benefits of SWOT/ SWOC analysis

How to go about SWOT analysis

SWOT/ SWOC analysis grid

**UNIT-2: SOFT SKILLS**

Definition and importance of soft skills

Positive attitude

Goal setting

Team building and Leadership qualities

**UNIT-3: 1. PROBLEM SOLVING**

Decision Making

Time Management

**UNIT-4: Conflict Management**

Stress Management – IQ

Emotional Intelligence – EI

**UNIT-5: interview skills**

Resume writing- Types of Résumé - Differences among Bio-data, Curriculum Vitaé and Résumé - Purpose of Curriculum Vitaé and Resume - Tips to write Curriculum Vitaé and Résumé - The DOs and the DON’Ts of Résumé preparation - Cover letter - Types of interviews (Face to Face / Panel Interviews, etc.) - Pre-interview preparation - Types of questions asked – FAQs - Mock Interviews

**UNIT-6: ETIQUETTE AND MANNERS**

Etiquette: Introduction

Classification of etiquette

Modern etiquette and social etiquette

Work etiquette and benefits of following work etiquette

Manners: Introduction:

1. Practicing good manners

**TEXT BOOK:**

1. Soft Skills Know Yourself and Know The World - K Alex and S Chand

**REFERENCES:**

1. Technical communication- Meenakshi Raman and Sangeetha Sharma (Oxford Publications)
2. Technical Writing Process and Product by SharonJ Gerson:Fifth edition.Pearson Publishers.
3. Developing Communication Skills – Krishna Mohan and Meera Benarjee
4. SOFT SKILLS – Dr. K. Alex, S.Chand publications
5. Advanced Technical communication - Kavita Tyagi and Padma Mistri
6. Developing Speaking-Listening Skills in English (With CD)
7. Basic Communication Skills For Technology- Andrea J Rutherfoord- Pearson
8. Developing Communication Skills- Krishna Mohan- Macmillan
9. Written Communication Skills- Michael Hatton-iste
10. Soft Skills Know Yourself And Know The World- K Alex- S Chand

**6H677: LOGICAL REASONING**

**B.Tech III Year II Sem.**

**L T P/D C**

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**Pre Requisites**: Nil

**Course Outcomes:** Students will able to answer

1. The questions given on series completion and analogy.
2. The questions given on odd one out in classification and coding and decoding.
3. The questions given on blood relations.
4. The questions given on directions and Arithmetical reasoning.
5. The questions given on Venn diagrams, cubes and dice. .
6. The questions given on clocks and calendar.

**UNIT–I:** Series Completion: Number Series, Alphabet Series, Alpha – Numeric Series.

Analogy: Completing the Analogous Pair, Simple Analogy, Choosing the Analogous pair, Double Analogy, Word Analogy, and Number Analogy.

**UNIT–II:** Classification / Odd One Out: Word Classification, Number Classification and Letter Classification. Coding – Decoding: Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled Coding.

**UNIT–III:** Blood Relations, Deciphering Jumbled up Descriptions, Relation Puzzle – Direction sense test. Number, Ranking & Time Sequence Test –Mathematical Operations.

**UNIT –IV:** Directions, Arithmetical Reasoning. Puzzle Test: Classification Type Questions, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on given conditions, Family – Based Puzzles, Jumbled Problems.

**UNIT –V:** Assertions and Reason– Logical Venn Diagrams – Alpha Numeric Sequence Puzzle. Cubes and Dice – Analytical Reasoning .Logical Deduction: Logic, Statement – Arguments,

**Unit – VI:** Clocks & Calendar .Data Sufficiency and Syllogism.

**Text Books:**

1. Verbal and Non Verbal Reasoning by R.S.Agarwal.
2. Quantitative Aptitude and Reasoning, R.V.Praveen, Second Edition, PHI Learning Pvt. Ltd.

# 6K701: STRUCTURAL ENGINEERING DESIGN & DETAILING (Concrete)

**B.Tech IV Year - I Sem.**  **L T P/D C**

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**Course objectives:**

The objectives of learning the subject are to study

1. The fundamental concepts and principles of Structural Design of Combined footings.
2. The design and detailing concepts of Retaining walls for cantilever and counter-fort types.
3. The principles of Elastic Design for RCC circular ground level and over-head tanks.
4. The design concepts of RCC Rectangular ground level and over-head tanks.
5. The concepts of designing of RC bridge deck slab.
6. The design concepts of slab-bridges and T-beam bridges.

**Course outcomes:**

On successful completion of the course, students will have ability to

1. Analyse and design combined footings.
2. Analyse and design Retaining walls for cantilever and counter-fort types.
3. Analyse and design RCC Circular ground level and over-head tanks.
4. Analyse and design RCC Rectangular ground level and over-head tanks.
5. Analyse and design RC bridge deck slab using various methods.
6. Analyse and design Slab-bridges and T-beam bridges.

**UNIT – I**

**Combined Footings:** Limit state design & detailing of combined- rectangular and trapezoidal footings as per IS:456-2000 Codal Provisions.

**UNIT – II**

Design & detailing of cantilever and counter-fort Retaining wall as per IS Codal Provisions.

**UNIT – III**

Elastic Design & Detailing for RCC circular ground level and over-head tanks- Design of staging as per IS Codal Provisions.

**UNIT – IV**

Elastic Design & Detailing for RCC Rectangular ground level and over-head tanks, Design of Intze tanks as per IS Codal Provisions.

**UNIT – V**

Elastic design and detailing of RC bridge deck slab using effective width method and Pigeaud's method as per IRC Codal Provisions.

**UNIT – VI**

Elastic design and detailing of Slab Bridges and T-beam bridges.

**TEXT BOOKS:**

* 1. S. Ramanatham, Design of Reinforced Concrete Structures, Dhanpat Rai &Sons, 2002.
  2. D.S. Prakash Rao; Design Principles and Detailing of Concrete Structures, Tata McGraw-Hill Publishing Co. Ltd., 1995.
  3. Johnson Victor, D., “Essentials of Bridge Engineering”, Oxford & IBH Publishing Co., New Delhi, Fourth Edition, 1991
  4. IS 456:2000 Plain and Reinforced Concrete - Code of Practice.

**REFERENCES:**

1. Vazirani and Ratwani, Concrete Structures, Khanna Publishers, 1998.

2. N. Krishna Raju, Structural Design and Drawing: Reinforced Concrete, Universities Press, 1992.

3. Ponnuswamy, S., “Bridge Engineering”, Tata McGraw Hill, New Delhi 1986.

**6K702: Concrete Technology**

**B. Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:** To enable the students to

1. Learn origin and basics of cement, its manufacturing, testing and its applications.
2. Learn about aggregates and its classification and properties.
3. Learn about fresh concrete, its manufacturing process and its behaviour. Also, basics of admixtures and its impact on behaviour of concrete.
4. Understand behaviour of hardened concrete and testing of hardened concrete.
5. Learn the process of Mix-Design of concrete using IS code books.
6. Learn different types of concrete and its behaviour and applications.

**Course Outcomes:** At the End of the course, the student

1. Will be able to test cement and know cement applications.
2. Can appropriately assess aggregates and its properties.
3. Is able to assess fresh concrete and its behaviour on using admixtures.
4. Can evaluate and analyse behaviour of hardened concrete and testing of hardened concrete.
5. Is able to Mix-Design concrete using IS code books.
6. Is able to assess different types of concrete and its behaviour and applications.

**UNIT -I**

**Cement**

Portland cement – chemical composition, hydration, setting of cement , structure of hydrated cement –Tests on physical properties – Different grades of cement – Manufacturing process of concrete (dry-grinding and wet-grinding).

**UNIT –II**

**Aggregates**

Classification of aggregates – Particle shape & texture – bond, strength & other Mechanical properties of aggregates – specific gravity, bulk density, porosity, adsorption & moisture content of aggregate– sieve analysis – fineness modulus - Grading curves - Grading of fine & coarse aggregates – gap graded aggregate –maximum aggregate size – alkali aggregate reaction –thermal properties.

**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 and vibration of concrete - Steps in the manufacture of concrete – Quality of mixing water.

**Admixtures**

Types of Admixtures – Mineral and chemical admixtures – properties – dosages – effects - usage.

**UNIT –IV**

**Hardened concrete**

Water/cement ratio - Abram’s Law – Gel space ratio , Maturity concept; Compression test -Tension Test - Flexure Test - Splitting Test- Factors affecting strength - Factors affecting strength -Relation between compressive & tensile strengths

**Testing of hardened Concrete**

Non-Destructive Testing methods – Codal provisions for NDT - Modulus of Elasticity – Static and Dynamic modulus of elasticity- Poisson’s ratio -Creep & Shrinkage of concrete and factors affecting them.

**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 - BIS method of mix design for ordinary and pumpable concrete

**UNIT-VI**

**Special concretes**

Introduction to Light weight concrete – lightweight aggregates – cellular concrete – No-fines concrete – fibre reinforced concrete – polymer concrete – High performance concrete – Sulphate resistant concrete - Self compacting concrete – Ready Mix concrete.

**TEXT BOOKS:**

1. **Concrete Technology** by M.S.Shetty – S.Chand & Co. ;7th edition, 2006.

2. **Properties of concrete** by A.M.Neville – Low priced edition – 5th edition, 2012.

3. IS : 10262 – 2009 Recommended Guidelines for Concrete Mix Design.

**REFERENCES:**

1. **Concrete Technology** by A. R. Santha Kumar, Oxford university press, New Delhi,3rd edition,2006.
2. **Concrete: Micro Structure, Properties and Materials** – P. K. Mehta and J. M. Monteiro, Mc-Graw Hill Publishers, 4th edition, 2013.
3. **Special Structural concretes** by Rafat Siddique, Galgotia Publications, 1st edition, 2000.

**Concrete Technology** by M.L.Gambhir – Tata Mc.Graw Hill press, New Delhi, 5th edition,2013.

**6K703: Estimation and Valuation**

**B. Tech IV Year I Sem.** **L T P/D C**

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**Course Objectives:**

To enable the students understand

1. The working of detailed estimates for a building.
2. The working of detailed estimates for roads and canals.
3. The rate Analysis for different items of works.
4. The working and scheduling of shuttering and bar bending.
5. About contract, Tenders, Earnest Money Deposit (EMD), M-Book and concept of present practices of tenders.
6. To introduce the student to the basic concept and procedure of valuation.

**Course Outcomes:**

After the successful completion of the course, the student will be able

1. To prepare detailed estimates for different buildings.
2. To do the rate analysis for different items of works of buildings.
3. To prepare the rate analysis for different items of works.
4. To prepare the schedules for shuttering and bar bending.
5. To work out different types of contracts, prepare tenders, to suit the present day practices of tendering.
6. To valuate buildings as per norms.

**UNIT –I:**

General items of works in a building- Standard unit principles of working out quantities for detailed and abstract estimates- Approximate method of estimation. Detailed estimates of buildings.

**UNIT –II:**

Estimation of earthwork for roads and canals.

**UNIT –III:**

Rate Analysis- Working out data for various items of work- over head and contingent charges.

**UNIT –IV:**

Shuttering material requirements and schedules.  Estimation of reinforcement- bar bending scheduling and costing.

**UNIT –V:**

Contracts: Types of contracts- Contract documents- Conditions of contract- Sub contracting.

Bidding: Bid documents and bidding.

**UNIT –VI:**

Valuation of buildings. Standard specifications for different items of building construction.

**TEXT BOOKS:**

1. Estimating and Costing in Civil Engineering – Theory and Practice by B N Dutta, 28th Revised Edition, 2016, UBS Publishers Distributors Pvt. Ltd.

2. Textbook of Estimating and Costing: Civil Engineering by G S Birdie, Dhanpat Rai Publications, 1988.

**REFERENCES:**

1. Estimating and Costing in Civil Engineering by Jagjit Singh, Galgotia Publications, New Delhi, 1996.
2. Estimating, Costing, Specifications and Valuation in Civil Engineering by M. Chakraborthi, Publisher: M Chakraborti, 24th Edition, 2010.
3. Civil Engineering Contracts and Estimation by B S Patil, Universities Press III Edition, (2009), Hyderabad.
4. Standard scheduled rates and relevant BIS codes.

# 6K704: Finite Element Method for Civil Engineers

**B. Tech IV Year I Sem.**  **L T P/D C**

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**Course objectives:**

The objectives of learning the subject are to study

1. The fundamental concepts, advantages and disadvantages of finite element method.
2. Finite Element Method for the analysis of one dimensional problems.
3. Principles of Analysis of Stress and Strain, and to apply the Finite Element Method for the analysis of two dimensional problems.
4. The stress and strain parameters and their inter relations of the continuum.
5. The concepts of assembly of elements and solution techniques for static loads.
6. ANSYS software - modelling, analysis and post processing of the results using the same.

**Course outcomes:**

On successful completion of the course, students will have ability to

1. Understand the fundamental theory of the FEA method.
2. Generate the governing FE equations for systems governed by partial differential equations.
3. Understand the use of the basic finite elements truss, beam, frame, and plane elements for structural applications.
4. To evaluate and interpret FEA analysis results for design and evaluation purposes.
5. Develop a basic understanding of the limitations of the FE method and understand the possible error sources in its use.
6. Create models and analyse different structural elements using ANSYS general-purpose software

**UNIT-I**

**Introduction to Finite Element Method** – Basic Equations in Elasticity – streess strain equations – concept of plane stress – plane strain – advantages and disadvantages of FEM. Element shapes nodes- nodal degree of freedom- strain displacement relations.

**UNIT-II**

**Finite Element Analysis (FEA)** of – one dimensional problems – bar element – shape functions stiffness matrix.  FEA Beam elements- stress strain relation – shape functions- stiffness matrix – continuous beams.

**UNIT-III**

**FEA Two dimensional problem** – CST – LST element – shape function – stress – strain. Lagrangian – Serendipity elements- hermit polynomials – regular, irregular 2 D & 3 D Element – shape functions.

**UNIT-IV**

**Iso-parametric formulation** – Concepts of iso-parametric elements for 2D analysis – formulation of CST element, 4- noded and 8 – noded iso-parametric quadrilateral elements.

**UNIT-V**

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

**UNIT-VI**

**Introduction to ANSYS**, Illustration on different modules of ANSYS / Structural engineering applications of the package/Creation of a simple 1-D model, 2-D model and a 3-D model/ analysis and post processing of the results.

**TEXT BOOKS**:

1. Chandrupatla, T. R. And Belegundu, A. D, (2001). “Introduction to Finite Elements in Engineering”, Prentice Hall of India, New Delhi.
2. Cook, R. D. (1981). “Concepts and Application of Finite Element Analysis”, John Wiley and Sons.
3. Reddy, J. N, (1993). “An Introduction to the Finite Element Method”, McGraw Hill, New York.

**SUGGESTED READING**:

1. Zienkiewicz, O. C. And Taylor, R. L, (1989). “The Finite Element Method”, Vol.1, McGraw Hill Company Limited, London.
2. Seshu. P, (2003). “Finite Element Analysis”, Prentice Hall of India Private Limited, New Delhi.
3. David V. Hutton, (2005). “Fundamentals of Finite Element Analysis”, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Bathe, K. J, (2006). “Finite Element Procedures”, Prentice Hall of India, New Delhi.
5. Desai C.S. and Abel J.F, “Introduction to the Finite Element Method”, Van Nostrand, 2002.
6. Krishna Moorthy C.S., “Finite Element Analysis”, Tata Mc. Graw Hill, 1997.

# 6KC71: Services, Maintenance, and Repair of Buildings

**Professional Elective\_3**

**B. Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:**

The objectives of learning the subject are to study

1. The different services provided in the construction of building.
2. The inspection process of buildings.
3. The maintenance process of building.
4. The repairs of masonry and concrete structures.
5. The repairs of steel structures.
6. The repairs of composite structures.

**Course Outcomes**

On successful completion of the course, students will have ability to

1. Understand the various services related to building construction.
2. Understand the various inspections of buildings.
3. Understand the knowledge about various maintenance techniques.
4. Understand the different concepts of repair works related to the Construction of building.
5. Understand the repairs to steel-structures and testing of structural steel.
6. Understand the repairs of composite structures and design consideration.

**UNIT- I:**

Services: Water supply and Sanitary systems – Inspection , maintenance and repair aspects ; Electrical installations – improving the illumination of a room; Non conventional energy systems – Solar power – Bio- gas; Acoustics for buildings; Lightening arrestors; Air- conditioning systems; Lifts and escalators – operational and maintenance aspects – Statutory examinations.

**UNIT– II:**

Inspection of Buildings: Purpose of Inspection of Buildings – Visual Inspection, Rapid Visual Inspection and NDT – Damage detection in buildings – Causes of Distress in Structures.

**UNIT-III:**

Maintenance of Building: Definitions, objectives, Phases of Maintenance Normal and routine maintenance aspects in a building – Classification of maintenance works – Annual budgetary provision ; Determination of approximate age and strength of an old building.

**UNIT-IV:**

Repairs to Masonry and Concrete Structures: Method of crack repair in masonry and concrete structures grouting and sealing of cracks, reinforcement repair, anchorage, bonding repair materials to existing concrete, material placement methods ; Shot-creting and guniting, grouting-Portland cement grouting, chemical grouting, dry packing, polymer impregnation, strengthening of structures : Techniques.

**UNIT– V:**

Repairs to Steel Structures: Testing of structural steel, lamination, dynamic loading and fatigue, welding technology, weld ability, replacement and addition of new members , different types of steel and concrete joints

**UNIT- VI:**

Repair of Composite Structures: Design consideration, flexural strengthening, shear strengthening, strengthening of columns – jacketing of columns, strengthening by interior and external reinforcing , External pre-stressing, fiber wrapping, corrosion protection: surface treatment, removal and replacement techniques of structural members.

**TEXT BOOKS:**

1. Building Services by HW Harrsion& PM Trotman-IHE BRE press

2. Building Repair and Maintenance Management by F.S. Gahlot, Sanjay Sharma-

3. Building Construction by BC Punmia-Laxmi Publication

**REFERENCES:**

1. Maintenance and Repair of buildings by N.Ellis & BD Hutchinson & J.Barton –Butterworths
2. Building Maintenance Process and Practices by Olanrewaju, Abdul Lateef, Abdul-Aziz, Abdul-Rashid- Springer Publication

# 6KC72: Health Monitoring and Retrofitting of Structures

**Professional Elective\_3**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course objectives:** To enable the students to

1. Understand structural health monitoring as a way of monitoring health of a structure using smart materials.
2. Learn and apply the various techniques for monitoring the health of the structure.
3. Comprehend the methods of condition assessment of damages in buildings.
4. Learn the applications of using capacitive probe method.
5. Learn about implementation of health monitoring in different types of structures.
6. Learn about implementation of repairs of composite structures.

**Course outcomes:** At the end of the course the graduate should be able to

1. Analyze results obtained from monitoring the health of the structures.
2. Select and implement an appropriate technique for health monitoring.
3. Select and implement an appropriate capacitive sensing technique.
4. Perform condition assessment survey of damaged/ existing buildings.
5. Identify possible defects in a concrete structure and suggest necessary repairs.
6. Implement various health monitoring techniques for different types of structures for different situations.

**UNIT­I**

**Introduction of Structural Health Monitoring (SHM) :** Definition & motivation for SHM, SHM – a way for smart materials and structures, SHM and bio mimetic – analog between the nervous systems of a man and structure with SHM, SHM as a part of system management, Passive and Active SHM, NDE, SHM, and NDECS, basic components of SHM, materials for sensor design.

**UNIT­II**

**Application of SHM in Civil Engineering :** Introduction of capacitive methods, capacitive probe for cover concrete, SHM of bridge, applications for external post – tensioned cables, monitoring historical buildings.

**UNIT­III**

**Non Destructive Testing of Concrete Structures :** Introduction to NDT – Situations and contexts, where NDT is needed, classification of NDT procedures, Visual Inspection, half‐Cell electrical potential methods, Schmidt Rebound Hammer Test, resistivity measurement, electromagnetic methods, radiographic testing, ultrasonic testing, Infra-Red thermograph, ground penetrating radar, other methods.

**UNIT­IV**

**Condition Survey & NDE of Concrete Structures :**Definition and objective of Condition survey, stage of condition survey (Preliminary, Planning, Inspection and Testing Stages), possible defects in concrete structures, quality control of concrete structures – Definition and need, Quality control applications in concrete structures, NDT as an option for Non‐Destructive Evaluation (NDE) of Concrete structures, case studies of a few NDT procedures on concrete structures.

**UNIT – V**

**Rehabilitation and Retrofitting of Concrete Structures:** Repair rehabilitation & retrofitting of structures, damage assessment of concrete structures.

**UNIT – VI**

**REPAIRS OF COMPOSITE STRUCTURES**

Materials and methods for repairs and rehabilitation, modeling of repaired composite structure, structural analysis and design – Importance of re‐analysis, execution of rehabilitation strategy, Case studies.

**TEXTBOOKS:**

1. Daniel Balageas, Claus – Peter Fritzenaml Alfredo Guemes, Structural Health Monitoring, Published by ISTE Ltd., U.K. 2006
2. Guide book on Non‐destructive testing of concrete structures, Training course series No. 17. International Atomic Energy Agency, Vienna, 2002

**REFERENCES:**

1. Hand Book on “Repair and Rehabilitation of RCC Buildings”. Published by Director General, CPWD, Govt. of India, 2002
2. Hand Book on Seismic Retrofitting of Buildings, published by CPWD & Indian Building Congress in association with IIT, Madras, Narosa Publishing House, 2008

**6KC73: Water Resources Systems Planning and Management**

**Professional Elective\_3**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course objectives**:

1. To equip the students with the knowledge of applications and analysis of various water resource systems including planning and management.
2. Equip the students with the knowledge of identification and evaluation of water management plans.
3. To introduce concepts of basin management and various issues related to water logging and salinity
4. Enable the students to interpret and implement groundwater recharge and modelling of ground water flow.
5. To introduce the concepts of various artificial recharge methods of ground water.
6. To impart knowledge in managing water through simulation model, linear and dynamic programming.

**Course outcomes:**

The students will be able to,

1. Apply the concepts of analysis for planning of water resource systems.
2. Implement the concepts of artificial ground water recharge.
3. Formulate and solve deterministic optimization models for design and operation of water resources systems.
4. Evaluate ground water response through models.
5. Evaluate the application of various modelling techniques related to reservoir and irrigation operation.
6. Interpret and implement linear and dynamic programming in managing the water resources.

**UNIT-I:**

**Introduction and Basic Concepts:** Introduction, System Components, Planning and management, Concept of a system, Advantages and limitations of systems approach, Modelling of Water Resources Systems, Simulation and optimization, Economics in water resources, Challenges in water sector

**UNIT-II:**

**Introduction to Optimization:** Objective function, Maxima, minima and saddle points, convex and concave functions, Constrained and unconstrained optimization using calculus, Lagrange multipliers, Kuhn-Tucker conditions.

**UNIT-III:**

**Linear Programming and Applications:** General form of LP, Standard and Canonical forms of LP, Elementary transformations, Graphical method, Feasible and infeasible solutions, Simplex method, Dual and sensitivity analysis, LP problem formulation, Reservoir sizing and Reservoir operation using LP.

**UNIT-IV:**

**Dynamic Programming and Applications:** Introduction, multistage decision problem, Recursive Equations, Principle of optimality, Curse of Dimensionality, Water allocation problem, Capacity expansion problem, Reservoir operation, Multi-purpose reservoir operation.

**UNIT-V:**

**Water Resources Systems Modelling & Simulation:** River basin planning and management, Water distribution systems, Groundwater systems, Water quality modelling, Floodplain management, Urban storm water management.

Introduction to Simulation, River basin simulation, Reservoir operation simulation, Performance evaluation - Reliability, Resiliency and Vulnerability, Some simulation models.

**UNIT-VI:**

**Climate Change Impacts :** Climate impacts, vulnerability and risks Assessing climate impacts on key sectors and systems (heat stress, water resources, coastal zones, agricultural systems); Concepts of vulnerability and risk; Assessing vulnerability and risk; Concepts of coping, adaptation and risk management, adaptive capacity, indicators and metrics; Adaptation planning and management including mainstreaming and climate resilient development.

**REFERENCES**

1. Loucks D.P, Stedinger J.R and Haith D.A, ‘Water Resources Systems Planning and Analysis’, Prentice Hall, USA, 1981.
2. Vedula S. and Mujumdar P.P., ‘Water Resources Systems: Modelling Techniques and Analysis’, Tata-McGraw Hill, 2005.
3. Loucks D.P. and van Beek E., ‘Water Resources Systems Planning and Management’, UNESCO Publishing, The Netherlands, 2005.

**ADDITIONAL READINGS**

1. Mays L.W and Tung Y-K, ‘Hydrosystems Engineering and Management’, McGraw Hill, USA, 1992.
2. Jain S.K. and Singh V.P., ‘Water Resources Systems Planning and Management’, Elsevier, The Netherlands, 2003.
3. Introduction to Modern Climate change, Andrew Dessler, Texas A & M University.
4. Global Warming, 4th Edition- John Houghton IPCC, ISBN 978-0-521-70916-3
5. Chaturvedi, M.C., ‘Water Resources Systems Planning and Management’, Tata McGraw - Hill, India, 1992.

**RELATED LINKS**

<http://civil.iisc.ernet.in/~nagesh/stwree.htm>

# 6KC74: Land and Water Applications of Remote Sensing

**Professional Elective\_3**

**B. Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:**

The student is being exposed to the subject with following objective:

1. To understand the interpretation of data acquired from land area mapping.
2. To understand the interpretation of bio-vegetation with AVRR and spectral behaviour.
3. To learn the distribution and features of minerals and their extent using RS data.
4. To learn use of RS in determination of boundaries of water bodies and their mapping.
5. To gather information of land cover with the application of RS inputs.
6. To understand the use of land data and creation of global database.

**Course Outcomes:**

On successful completion of course, the student shall:

1. Learn all the applications of RS in land mapping and soil characteristics.
2. Gather all knowledge about vegetation and green cover through AVRR.
3. Understand in-depth the details of mineral distribution through data acquisition in RS.
4. Learn the application of Remote Sensing in tapping ground water extent.
5. Apply the knowledge of Remote Sensing to classify land use and land cover mapping.
6. Intuit Remote Sensing techniques to track up global database and land Information.

**UNIT – I**

**Image interpretation:**

Fundamentals of Interpretation, Land use/Land cover mapping, Geological and soil mapping, agriculture, water resources, Rangeland and Wildlife Ecology applications, Topographical Analysis and terrain Analysis – Soil characteristics, Land use suitability. Introduction to RADAR, LIDAR its uses and applications

**UNIT – II**

**Plant sciences:** Introduction, Manual Interpretation, Structure of the Leaf, Spectral Behaviour of the Living Leaf, vegetation Indices, Applications of Vegetation Indices, Advanced Very High Resolution Radiometer (AVHRR), Separating Soil Reflectance from Vegetation Reflectance from Vegetation Reflectance, Tasseled Cap Transformation.

**UNIT – III**

**Earth sciences:**

Introduction, photo geology, Lineaments, Geobotany, Direct Multispectral Observation of Rocks and Minerals, Mineral targeting, Photoclinometry, Band Ratios, Soil and Landscape Mapping, Integrated Terrain Units.

**UNIT – IV**

**Hydrospheric sciences:**

Introduction, Spectral Characteristics of Water Bodies, spectral Changes as Water Depth increases, Location and Extent of Water Bodies, Roughness of the water Surface, Bathymetry, Chromaticity diagram, Drainage basin Hydrology, Evapo-transpiration, manual interpretation irrigation and command area development, ground water mapping, watershed delineation.

**UNIT – V**

**Land use and land cover:**

Introduction, Significance of Land Use and Land Cover Information, Applications of Remote Sensing, Land Use classification, mapping land cover studies.

**UNIT – VI**

**Global remote sensing:**

Introduction, Biogeochemical Cycles, Advanced Very High Resolution Radiometer (AVHRR), Earth Observing System, EOS Instruments, EOS Bus, EOS Data and Information System, Long-Term Environment Research Sites, Global Land Information System, Global Data Base.

**TEXT BOOKS:**

1. James B. Campbell (2011), “Introduction to Remote Sensing” Taylor & Francis Ltd.
2. Thomas Lillesand and Ralph W Keifer (2008) “Remote Sensing and Image Interpretation”, John Wiley & Sons

**REFERENCES:**

1. Principles of Geographical Information Systems: 2nd Edition (Spatial Information Systems) by Peter A. Burrough (Author), Rachael A. McDonnell (Author)
2. Geographic Information System and Science by Longley, Godchild, Maguire, Rhind.

# 6KC75: Ground Improvement Techniques

**Professional Elective\_3**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives**

The objectives of learning the subject are to understand

1. Introduction to Ground Improvement techniques, necessity of soil strength improvement
2. Mechanical modification of the ground by compaction.
3. Hydraulic modification of the ground by lowering of water table
4. Mechanical modification and using suitable soil types.
5. Chemical modifications of the ground.
6. Introduction of grouting and its type

**Course Outcomes**

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

1. Learn the necessity of ground improvement and the factors which decide the method of ground improvement.
2. Understand mechanical modification of the ground by compaction and various methods of compaction.
3. Understand hydraulic modification of the ground by lowering of water table and other methods.
4. Understand the necessity of drainage of slopes, vertical drains sand drains etc.,
5. Understand chemical modifications of the ground by lime stabilization and other methods.
6. Understand the method of grouting and other advanced methods.

**UNIT-I:**

**Ground Improvement:** Definition, Objectives of soil improvement, Classification of ground improvement techniques. Factors to be considered in the selection of the best soil improvement technique.

**Mechanical Modification:** Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.

**UNIT-II:**

**Compaction:** Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behaviour like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction Shallow and deep compaction.

**UNIT-III:**

**Hydraulic Modification:** Definition, aim, principle, techniques, gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering.

**Drainage & Preloading:** Drainage of slopes, preloading, vertical drains, sand drains. Assessment of ground condition for preloading electro kinetic dewatering.

**UNIT-IV:**

**Chemical Modification-I,** Definition, aim, special effects, and methods Techniques – sandwich technique, admixtures, cement stabilization on permeability, Swelling and shrinkage, Criteria for cement stabilization, Stabilization using Fly ash.

**UNIT-V:**

**Chemical Modification-II:** Lime stabilization, suitability, process, special effects, criteria for lime stabilization. Other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen tar or asphalt in stabilization.

**UNIT-VI:**

**Grouting:** Introduction, Effect of grouting, Chemicals and materials used. Types of grouting, grouting procedure, Applications of grouting.

**Miscellaneous Methods (Only Concepts):**Introduction, Soil reinforcement. Thermal methods, Soil reinforcement, reinforcement with strip and grid reinforced soil, In situ ground reinforcement, ground an anchor Ground improvement by confinement – Crib walls, Gabions and Mattresses. Anchors, Rock bolts and soil nailing.

**TEXT BOOKS:**

1. Purushothama Raj. P, “Ground Improvement Techniques” Laxmi Publications, New Delhi, 1999.
2. Koerner.R.M. “Construction and Geotechnical Methods in Foundation Engineering” McGraw Hill Publ., New York, 1985.

**REFERENCES:**

1. Manfred Haussmann, “Engineering Principles of Ground Modification”, Mc Graw Hill Pub., New York, 1990
2. Nelson.J.D and Miller.D.J, “Expansive Soils” John Wiley and Sons, 1992.

Bell, F.G. Butterworth, Methods of treatment of unstable ground-Butterworth, London.

1. 5KC81: Alternative Building Materials and Technologies

# 6KC81: Alternative Building Materials and Technologies

**Professional Elective\_4**

**B. Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:**

The student understands:

1. Building elements and its environmental effects
2. Alternative methods and materials used for better environment-friendly technologies
3. Advancement in cement with addition of various metallic, organic and agro products and their field test methods
4. Various advanced technologies and concrete practices for structural elements.
5. Improved material elements for masonry for flexure and shear according to code provisions.
6. An economic and effective building design development.

**Course Outcomes:**

1. Students learn the environmental effects of the building materials in use.
2. Students understand the various methods and materials used in the building construction which are eco-friendly
3. Students are able to do the field tests of the cement.
4. Students are able to get knowledge about advanced technologies and concrete practices for structural element.
5. Students clearly understand the concepts of effective building design.
6. Students clearly understand the concepts of alternative materials.

**UNIT –I**

**INTRODUCTION:**

 Energy in building materials-environmental issues concerned to building materials global warming and construction industry environmental friendly and cost effective building technologies. Requirements for building of different climatic region- traditional building methods and vernacular architecture.

**UNIT -II**

**ALTERNATIVE BUILDING MATERIALS:**

Characteristics of building blocks for walls-stones and laterite blocks-bricks and hollow clay blocks-concrete blocks-stabilized blocks: mud blocks, steam cured blocks, and stone masonry block

**UNIT -III**

**LIME-POZZOLANA CEMENTS**

Raw materials-manufacturing process-properties and uses- fiber reinforced concrete matrix materials-fibers: metal and synthetic-properties and applications-fiber reinforced plastics-matrix materials-fibers: organic and synthetic-properties and applications

Building materials from agro and industrial wastes-types of agro wastes-types of industrial and mine wastes-properties and applications-field quality control test methods

**UNIT - IV**

**ALTERNATIVE BUILDING TECHNOLOGIES**

Alternative for wall construction-types-construction method-masonry mortars types-preparation-properties-ferro-cement and ferro-concrete building components-materials and specifications-properties-construction methods-applications-alternative roofing systems-concepts-filler slabs.

**UNIT -V**

**STRUCTURAL MASONRY**

Compressive strength of masonry elements-factors affecting compressive strength, Strength of units, prisms / wallettes and walls effect of brick work bond on strength bond strength of masonry : flexure and shear -elastic properties of masonry materials and masonry. IS code provisions-design of masonry compression elements.

**UNIT -VI**

**COST EFFECTIVE BUILDING DESIGN**

 Cost concepts in buildings-cost saving techniques in planning, design and construction- cost analysis : case studies using alternatives.

**TEXT BOOKS:**

1. Alternative building methodologies for engineers and architects, lecture notes edited: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of Science, Bangalore.
2. Structural Masonry by Arnold W. Hendry.

**REFERENCE BOOKS:**

1. Relevant IS Codes.
2. Alternative building materials and technologies.
3. Proceedings of workshop on Alternative building material and technology, 19th to 20th December 2003 at BVB College of Engineering & Technology, Hubli.

**6KC82: Pre-stressed Concrete Structures**

**Professional Elective\_4**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:** To enable the student to

1. Understand the need for pre-stressing as well as the methods, types and advantages of pre-stressing.
2. Understand the losses in pre-stress and post-stress concrete structures.
3. Understand the flexural and shear behaviour of Pre-stress elements and design of Pre-stress elements using IS code books.
4. Understand stress distribution and transfer of stresses in pre-stress structures.
5. Learn to design composite and continuous beams.
6. Learn about beam deflections.

**Course Outcomes:** At the end of the course, the student

1. Can assess basics of pre-stress and post-stress concrete structures.
2. Can assess losses in pre-stress and post-stress concrete structures
3. Is able to assess the flexural and shear behavior of Pre-stress elements and design Pre-stress elements.
4. Can assess behavior of stresses in pre-stress structures.
5. Is able to design composite and continuous beams.
6. Can predict short term and long term beam deflections.

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

**UNIT II**

**Losses of Prestress:** Loss of prestress in pretensioned and post-tesnioned 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 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- Bureau of Indian Standards (BIS) 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, Zielinski and Rowe’s methods — Anchorage zone reinforcement- BIS Provisions

**UNIT V**

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

**UNIT VI**

**Deflections:** Importance of control of deflections- Factors influencing deflections — Short term deflections of uncracked beams- prediction of long time deflections- BIS code requirements.

**TEXT BOOKS:**

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Krishna Raju N.,"Prestressed concrete", 5th Edition,TataMcGrawHillCompany,NewDelhi,2012

3. LinT.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", ThirdEdition, Wiley India Pvt. Ltd., NewDelhi,2013.

**REFERENCES:**

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C.and RehatD.R.,"Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994
3. Dayaratnam. P., "Prestressed Concrete Structures", Oxford and IBH,2013
4. Andit. G.S. and Gupta. S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt.Ltd,2012.

5.IS1343:1980,Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New

Delhi,2012

# 6KC83: Applied Hydrology and Meteorology

**Professional Elective\_4**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course objectives**

1. Introduce students to various methods of estimation and analysis of rainfall data.
2. Use techniques to assess stream flow both in natural conditions and in times of flood.
3. Prepare students to take up any advanced course in water resources engineering and management.
4. Expose students to estimate all parameters and characteristics related to hydrological aspects of catchment studies.
5. Expose students for Estimation of flood peak and Drought assessment.
6. Introduce students to various Legal Aspects of Water of our country.

**Course Outcome**

1. It would provide the students an overview of the precipitation process and underlying phenomena
2. It would provide the students with an overview of monitoring and evaluation of hydrologic elements and accurately analyze the parameters involved.
3. Introduces students to Climate change and its effects on the hydrologic processes.
4. Will enable the student in estimating various hydrological parameters.
5. Will enable students to estimate the flood using various methods and also assess the drought conditions.
6. Will ensure the students with various water laws and other legal aspects in the country.

**UNIT – I:**

**Hydrologic Processes:** System concept of watershed; hydrologic cycle; atmospheric water; Reynolds transport theorem, continuity and momentum equations.

**UNIT – II:**

**Hydro climatology:** The Earth’s Climate Machine – Climate Classification - Global Wind Systems – Trade Winds and the Hadley Cell – The Westerlies - Cloud Formation and Monsoon Rains – Storms and Hurricanes; monsoon and jet streams, mechanism of Indian monsoon and rainfall pattern, southern ocean oscillation and influence on monsoon, cyclones; Solar Radiation –The Earth's Natural Green House Effect – Green House Gases and Global Warming – Carbon Cycle; Global climate change and influence on precipitation.

**UNIT – III:**

**Hydrologic Statistics:** Analysis of hydrologic data, presentation of rainfall data–mass curve and hyetograph, precipitation variability, estimation of mean precipitation over an area, depth area relationship, intensity duration-frequency relationship, moving average curve, probable maximum

Precipitation; data consistency check and data gap estimation, supplementing missing precipitation records, commonly used distribution function in hydrology, concept of uncertainty and risk, Time series analysis and forecasting.

**UNIT – IV:**

**Hydrologic Design:** Estimated Limiting Value, Hydrologic design scale and design level; Design storms – Design precipitation, IDF relationships, Design Hyetograph, Estimated limiting storms and PMP; Design Flows – Storm sewer system; Flood plain analysis and flood forecasting, Flood control and Forecasting; Low-flow frequency analysis and drought.

**UNIT – V:**

**Flood studies:** Estimation of flood peak, classification of hydrological modelling-Rational method,

empirical formulae, Unit Hydrograph techniques, SCS method. Flood Routing concept and techniques, hydrologic reservoir routing using Modified Puls method, hydrologic channel routing using Muskingum method, introduction to hydraulic routing. Flood frequency analysis, estimation of

magnitude, empirical formulae, importance of flood studies.

**Drought Management**: Drought assessment and classification, drought analysis techniques, drought mitigation planning. Introduction to Data Analytics(R-Software).(6th to 5th)

**UNIT – VI:**

**Water legislation in India and Telangana:** Pre-Constitutional Water Laws , Constitutional Provisions: Article 14, Article 21, Directive Principles of State Policy, Fundamental Duties, State List-Entry 17 , 73rd and 74th amendments, Article 262 – Legislative Process: Legislative, Judicial, Executive, Natural Justice , Delegation of Powers , Tribunals , Post Constitutional Water Laws.

National-Level Enactments - The Overview of State Acts with Case Laws: Indian Easements Act – Land-Related Legislation –Tanks – Irrigation Management – Cess – Protection of Water Sources – Groundwater – Drinking and Domestic Water Supply – Industrial Use – Water Pollution – Torts and Crimes

**TEXT BOOKS:**

1. Chow, V T., D. R. Maidment and L. W. Mays (1988), “Applied Hydrology”, McGraw-Hill, Inc., New York.
2. Dingman L. S. (2002), “Physical Hydrology”, 2nd Ed. Waveland Press, Inc., USA

**REFERENCES:**

1. Viessman, W. Jr. and G. L. Lewis (2003), Introduction to Hydrology, 5th Edition, PearsonEducation, Inc., New Jersey.
2. Hann C.T. (1995), "Statistical Methods in Hydrology", First East-West Press Edition, New Delhi.
3. Box, G. E. P., G. M. Jenkins, and G. C. Reinsel (2003), “Time Series Analysis, Forecasting and Control”, Pearson Education, Singapore

# 6KC84: GIS Analysis and Modeling

**Professional Elective\_4**

**B. Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:**

The student is being exposed to the subject with following objective:

1. To understand the basis of Spatial Analysis and define attributes to the elements.
2. To learn the calculations of definite geometric objects and their classification.
3. To assimilate the mapping of surface and development of advanced modeling.
4. To apprehend the analysis of patterns and arrangements of spatial data with routing.
5. To learn the overlay operation with various models and view generations.
6. To learn the modelling of data and implementation on various inputs.

**Course Outcomes:**

On successful completion of the course, the student shall:

1. Clearly understand the spatial analysis and defining them based on their attributes and objects.
2. Know all the measurement patterns of various objects and terrain classifications.
3. Assimilate the deciphering of data and the mapping based on their applications.
4. Learn the analysis of spatial arrangement and directionality of objects in linear and aerial objects.
5. Have knowledge in the process of overlay of data in raster and vector inputs and their various types.
6. Learn in perspective the modeling, its working and result observation with various data inputs.

**Unit – I**

Elementary Spatial Analysis – Introduction to GIS Spatial Analysis, location of objects, defining objects based on their attributes, defining points based on their attributes, defining line objects based on their attributes, defining area objects based on their attributes, higher level point objects, higher level line objects, higher level area objects.

**Unit – II**

Measurement – Measuring length of linear objects, measuring polygons, calculating polygon lengths, calculating perimeter, calculating area of polygonal features, measuring shape, measuring sinuosity, measuring polygon shape, measuring distance, functional distance, classification – neighbourhood functions, roving windows, polygon neighbourhoods, terrain reclassification, buffers.

**Unit – III**

Statistical Surfaces – Surface mapping, sampling the statistical surface, the digital elevation model (DEM), raster surface, interpolation, linear interpolation, methods of nonlinear interpolation, uses of interpolation, problems in interpolation, slicing the statistical surface, cut and fill, discrete surfaces, dot distribution maps, choropleth maps. 3D Visualization and Analysis, Line of Sight, View sheds etc.,

**Unit – IV**

Spatial Arrangement – Point patterns, quad tree analysis, nearest neighbour analysis, Theissen polygons, area patterns, linear patterns, line densities, nearest neighbours and line intercepts, directionality of linear and Arial objects, connectivity of linear objects, gravity model, routing and allocation.

**Unit – V**

Overlay – Cartographic overlay, point – in – polygon and line – in – polygon, polygon overlay, automating point – in – polygon and line – in – polygon in raster, automating polygon overlay in raster, automating vector overlay, types of overlay, CAD type overlay, topographical vector overlay, topographical vector point – in – polygon and line – in – polygon overlay, vector polygon overlay.

**Unit – VI**

Cartographic Modelling – Types of cartographic models, inductive and deductive modelling, model flow charting, working through the model, conflict resolution, examples of cartographic models, model implementation.

**Advanced Spatial Analysis**

Spatial Queries, Multi-layer analysis, Multi-Layer Modelling, Overlay, INDEX, Union, Intersection of multiple GIS layers

**TEXT BOOKS:**

1. Fundamentals of GIS by Michael N Demers, Published by John Wiley & Sons Inc.

**REFERENCES:**

1. Principles of Geographical Information Systems: 2nd Edition (Spatial Information Systems) by Peter A. Burrough (Author), Rachael A. McDonnell (Author)
2. Geographic Information System and Science by Longley, Godchild, Maguire, Rhind

# 6KC85: Elements of Geo-environmental Engineering

**Professional Elective\_4**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives**

The objectives of learning the subject are to understand

1. soil physics, soil chemistry, hydrogeology, and biological processes along with the principles of soil mechanics.
2. Role of soil in geo environmental application.
3. The Soil-water-contaminant interaction.
4. Environmental problems related to the reduction of waste, waste disposal facilities and cleanup of contaminated sites.
5. Master concepts in unsaturated soils related to moisture migration
6. Advanced soil characterization.

**Course Outcomes**

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

1. Understand the physical, chemical, biological and hydro geological behaviour of soil.
2. Know the various application of geo environmental engineering.
3. Understand the soil - water characteristics curves.
4. Know the Remediation methods for soil and groundwater.
5. Understand the concepts in unsaturated soils related to moisture migration
6. Analyse soil contaminant using electric method.

**Unit-I:**

**FUNDAMENTALS OF GEOENVIRONMENTAL ENGINEERING** – Introduction to Geo environmental Engineering, Multiphase behaviour of soil, Role of soil in Geoenvironmental applications, Importance of soil physics, soil chemistry, hydrogeology and biological process, Sources and type of ground contamination, Impact of contamination on Geoenvironmental, Some case histories on Geo-environmental problems.

**Unit-II:**

**SOIL-WATER-CONTAMINANT INTERACTION:** Soil mineralogy, formation of soil minerals, important properties of clay minerals, applications of soil mineral analysis in Geoenvironmental engineering, Soil-water-contaminant interaction, Properties of adsorbed water, diffused double layer and different models representing double layer, cation exchange capacity and Factors influencing CEC of the soil, quantification of soil water.

**Unit-III:**

**Movement of Water and Contaminant**: movement of water in different hydrologic horizons: ground water zone, vadoze (unsaturated) zone, root zone, soil-water characteristic curve (SWCC) models, different soil-water-contaminant interaction mechanisms: Chemical mass transfer and attenuation, Mass transport, Other factors.

**Unit-IV:**

**WASTE CONTAINMENT SYSTEM:** Introduction to waste containment facilities and disposal practices, Landfills: Engineered landfills, Methods for landfill site selection; Subsurface investigation for waste management; Design of landfills; Governing differential equation for contaminant transport, Determination of hydrodynamic dispersion and retardation coefficient, Determination of diffusion coefficient.

**Unit-V:**

**CONTAMINATED SITE REMEDIATION:** Contaminated site characterization/ assessment; Selection and planning of remediation methods; Risk assessment of contaminated site; Remediation methods for soil and groundwater: Physico-chemical methods, Biological methods, Electro-kinetic methods, Thermal methods; Some examples of in-situ remediation.

**Unit-VI:**

**ADVANCED SOIL CHARACTERIZATION:** Soil contaminant analysis; Electrical property of soil, Uses of electrical properties of soil, Measurement of electrical properties of soil; Thermal property of soil, Factors influencing soil thermal resistivity, Measurement of soil thermal resistivity; Water content and permeability measurements: Volumetric water content sensors, Guelph permeameter, Tension Infiltrometer, Minidisk infiltrometer; Ground Penetrating Radar for site evaluation; Introduction to geotechnical centrifuge modelling, Potential of geotechnical centrifuge for Geoenvironmental Project.

**TEXTBOOKS:**

1. Lakshmi N. Reddy, Hilary. I. Inyang – Geo-Environmental Engineering – Principles and Applications – Makcel Dekker Ink, 2000
2. Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies. John Wiley & Sons, Inc.
3. Unsaturated Soil Mechanics. John Wiley & Sons, Inc. Mitchell, J.K. (1993).

**REFERENCES:**

1. Fundamentals of Soil Behavior. Second Edition, John Wiley & Sons, Inc. Sharma, H.D. and Lewis, S.P. (1994).
2. Waste Containment Systems, Waste Stabilization, and Landfills: Design and Evaluation. John Wiley & Sons, Inc. Sharma, H.D. and Reddy, K.R. (2004).
3. Daniel, David E. (1993). Geotechnical Practice for Waste Disposal. Chapman & Hall. Koerner, R.B. (2005).
4. Designing with Geosynthetics. Fifth Edition. Prentice Hall. Lambe, T.W, and Whitman R.V. (1969).
5. Proceedings of the International symposium of Environmental Geotechnology (Vol.I and II), Environmental Publishing Company, 1986 and 1989.

**6K772: Concrete Technology Lab**

**B.Tech IV Year I Sem.**  **L T P/D C**

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**Course Objectives:**

1. Perform the test procedures to find Physical properties of Cement
2. Understand the test procedures to find Specific Gravity, Bulking of Aggregates.
3. Evaluate fresh concrete properties
4. Understand the test procedures to find properties of Hardened Concrete

**Course Outcomes:**

The student will be able to:

1. Test Fineness, Specific Gravity, Setting Time, Soundness and Compressive Strength of Cement
2. Test Specific Gravity of Coarse Aggregate and Fine Aggregate, Bulking of Fine Aggregate.
3. Design Concrete Mix Proportioning by Using Indian Standard Method.
4. Test Workability of Fresh Concrete and Compressive strength, Split Tensile Strength of Hardened Concrete.

**LIST OF EXCERCISES**

**Cycle -I**

**I Tests on Cement:**

a) Standard Consistency

b) Initial & final Setting Time

c) Specific Gravity

d) Fineness

e) Soundness

f) Compressive Strength

**II. Tests on Aggregates:**

a) Specific Gravity of Fine Aggregate

b) Specific Gravity of Coarse Aggregate.

c) Bulking of Fine Aggregate.

**Cycle –II**

**III. IS method of mix design of concrete.**

**IV. Tests on Fresh Concrete:**

a) Slump cone Test

b) Compaction factor Test

c) Vee Bee Test

**V. Tests on Hardened Concrete:**

a) Compressive & Split Tensile strength Tests.

b) Modulus of Elasticity of Concrete.

c) Non Destructive Testing of concrete.

**6K774: Computer Applications in Civil Engineering Laboratory**

**B.Tech IV, Year I Sem.**  **L T P/D C**

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**Course Objectives:**

1. To expose the students to various computer programming skills related to Civil Engineering field
2. To empower the students to develop niche programs using Excel /other related softwares.

**Course Outcomes:**

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

1. Use Excel sheets for Civil Engineering applications.
2. Write computer programs for various problems faced by Civil Engineers using latest Civil Engineering related software such as Revit and STAAD Pro.

**List of Experiments:**

**Excel Application &Other Software Programs-**

1. Design of Singly Reinforced beam.
2. Shear Design of a beam.
3. Design of Axially loaded short Column.
4. Stability Analysis of Retaining Wall.
5. Pressure Bulb under a concentrated load.
6. Selection of diameter of a pipe for different types of flows through a circular pipe.
7. Design of circular sewer.
8. Run off calculations.
9. Introduction to STAAD-Pro. (up to Fixed /Continuous beams for various loadings).
10. Design of Two storey residential building using STAAD Pro.
11. Design of Exterior components using Revit Architecture
12. Design of Interior components using Revit Architecture

**6K780: PROJECT PHASE-I**

**B. Tech IV Year I Sem. L T P/D C**

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**Course Objectives :**

To enhance the knowledge on selecting a project , learn related tools and enhance programming and communication skills for employability.

**Course Outcomes: After completing this course, student shall be able to**

1. Students identify vast application areas for mobile / wireless communication / computing.
2. They also understand the working principle of GSM technology.
3. Students understand various media access control methods that are meant for wireless communication, each methods’ pros and cons
4. Understand the issues in the Network layer in the wireless communication and identifying suitable solutions for the same
5. Understand the issues in the Transport layer in the wireless communication and identifying suitable solutions for the same
6. Understand MANETs with an example like Bluetooth technology.
7. Understand Security Issues related to mobile computing and various solutions to mitigate the security problems.
8. Prepare for the Project Phase-II

The evaluation is for 100 marks. It is internal evaluation only.

The committee consists of HOD, a Senior Faculty member and Internal Guide.

**Division of marks for internal assessment – 100 marks**

1. Progress of Project work and the corresponding interim report   
   as evaluated by internal guides at the end of 5 weeks : 10 Marks
2. Seminar at the end of 5 weeks : 10 Marks
3. Progress of Project work as evaluated by guides  
   at the end of 10 weeks : 10 Marks
4. Seminar at the end of 10 weeks : 10 Marks
5. Evaluation by the Guides ( at the end of 15 weeks) : 20 Marks
6. Project Report : 10 Marks
7. Final presentation and defence of the project : 30 Marks

**6GC49:INTELLECTUAL PROPERTY RIGHTS**

**B. Tech IV Year I Sem.**

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**Course Objective:**

This course is intended to impart awareness on intellectual property rights and various regulatory issues related to IPR

**Course Outcomes:**

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| **CO:1** | Demonstrate a breadth of knowledge in Intellectual property |
| **CO:2** | Overview of Patents, Searching ,filling and drafting of Patents |
| **CO:3** | Overview of copyright & GI . |
| **CO:4** | Overview of Trade Mark & Trade Secret, |
| **CO:5** | Overview of Integrated Circuit and Industrial Design. |
| **CO:6** | Knowledge about different national and international : Conventions and Treaties Governing the IPRs |

**Unit I: Introduction to IPR:**Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria

**Unit II: Patents**: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law

**Unit III: Copyrights and Geographical Indications:** Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications -Tirupati Laddu , Darjeeling Tea, Basmati rice

**Unit IV: Trademark and Trade secrets:** Trade Marks –Commercial importance, protection, registration, Case Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies-Kentucky Fried Chicken (KFC), Coca-Cola

**Unit V: Protection of Industrial Designs & Integrated Circuits:** Industrial Designs – Scope, protection, filing, infringement; Integrated Circuits & Layout design, Semiconductors, Unfair competition, Designs Act.

**Unit VI: International Conventions & Treaties:** Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement

**TEXT BOOKS:**

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengage learning, 2012
2. N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

**REFERENCES:**

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009
2. Neeraj Pandey & Khushdeep Dharni, Intellectual Property Rights, Phi Learning Pvt. Ltd
3. Ajit Parulekar and Sarita D’ Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

**6K777: INDUSTRY ORIENTED MINI PROJECT**

**B. Tech IV Year I Sem. L T P/D C**

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**Course Objective :**

To enhance the knowledge on selecting a projcet , learn related tools and enhance programming and communication skills for employabilty.

**Pre-Requisites:** All Courses till this semester

**Course Outcomes: After completing this course, student shall be able to**

1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills largely improve.
5. Work as an individual and in a team.

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year first semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

There will be 100 marks in total with 25 marks of internal evaluation and 75 marks of external

The **internal evaluation** shall consist of:

Day to day work: 10 marks

Report: 5 marks

Demonstration / presentation: 10 marks

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25 marks

End examination: 75 Marks.

The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.

**6K801: Design and Detailing of Hydraulic Structures**

**B.Tech IV Year II Sem.** **L T P/D C**

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**Course Objectives:**

Students are expected to know the details of major and minor irrigation structures and their design. A student, who successfully completes the course, should be able to carry out design of various hydraulic structures in the given field conditions. Also to make the students familiarize with the relevant I.S codes and to enhance the capability of reading the working drawings. The students should understand basic design principles, considerations, and detailing of:

1. Surplus weir;
2. Direct sluice ;
3. Glacis type canal drop;
4. Cross regulator;
5. Design of super passage.
6. and design concepts of syphon

**Course Outcomes:** The Student will be able to arrive at the basic design and detailing of:

1. Surplus weir;
2. Direct sluice ;
3. Glacis type canal drop;
4. Cross regulator;
5. Design of super passage.
6. and understand design concepts of syphon.

**UNIT - I:-**

**Surplus Weir**:- Components of surplus weir - computation of flood discharge - Design of surplus weir & detailing

**UNIT-II:-**

**Direct Sluice:-**Hydraulic particulars - General arrangements of various components - Design of vent way, Sluice barrel, Head walls, Wing Walls and return walls - Detailing

**UNIT-III:-**

**Glacis type Canal Drop:-** Components, General arrangements, Fluming ratio, fixing the crest level, length of weir, U/S and D/S glacis, Transitions - Protection works - Curtain wall, Energy dissipation arrangements - Design & Detailing

**UNIT-IV:-**

**Cross Regulator:** General design principles - General arrangements of various components - design of vent way by drowning ratio - arrangements of energy dissipation - U/S & D/S protection works - Design & Detailing

**UNIT-V:-**

**Super Passage:-** Hydraulic particulars of drain & Canal - U/S & D/S transitions - TEL's - fixing vent way - design of trough - Afflux in the canal - Proposal sketch of the super passage including transitions.

**UNIT-VI:-**

**Syphon: -** Basic principles and design concepts.

**TEXT BOOKS:**

1. Challa Sathya Narayana Murthy, Water Resources Engineering - Principles and Practice, New Age International Publishers.
2. Irrigation Engineering and Hydrualic Structures by S.K.Garg, Khanna Publications.

**REFERENCES:**

1. Punmia B.C., Irrigation & Waterpower Engg., Laxmi Publications
2. Hydraulics of Spillways and Energy Dissipators, R. M. Khatsuria, Marcel Dekker Publishing, New York.
3. Subramanya.K, Engineering Hydrology ,Tata Mcgraw Hill NewDelhi
4. Manual on Barrages and Weirs on Permeable Foundation, Publication 179, (Volumes I and II), Central Board of Irrigation and Power, New Delhi.
5. Jayarami Reddy, A Text Book Of Hydrology, Laksmi Publications, New Delhi.
6. IS 7784 (Part I (1993), Part II Section 1 to 5 (1995)) Design of cross drainage works – Code of Practice
7. IS: 6966 Part I (1989) – Hydraulic design of barrages and weirs – Guidelines
8. IS: 11130 (1984) – Criteria for structural design of barrages and weirs
9. IS:6531 (1972) – Criteria for design of canal head regulator
10. IS:7114(1973) – Criteria for hydraulic design of cross regulator for canal
11. IS:6936 (1992) – Guide for location ,selection and hydraulic design of canal escapes
12. IS:12331– General requirement of canal outlets

# 6KC91: Urban Planning and Sustainable Development

**Professional Elective\_5**

**B.Tech IV Year II Sem.**  **L T P/D C**

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**Course Objectives**

1. The concept of urban development and planning and the various levels and types of urban planning are taught to students.

2. Advanced planning at different levels of regions and development strategies and formulations are taught.

3. Various constraints on different heads and sustainable urban management are taught.

4. Sustainable development on the account of transportation and its allied stakeholders are taught in detail to students.

5. Future of sustainable development and the urban region pattern are taught.

6. Sustainable Development on the basis of rural, sub-urban and urban classifications are taught to students.

**Course Outcomes:**

1. Urban Development and the needs for the same are thoroughly understood by the students.

2. The planning factors and its inclusions are also learnt by the students.

3. The constraints that cause limitation in the development of advanced urban plotting is learnt.

4. Understanding of Sustainable Transportation and its effectiveness and contributions to healthy economy is achieved.

5. The next generation of urban region based knowledge is thoroughly learnt.

6. Various classes of urban and rural development for holistic analysis are understood.

**UNIT I**

**URBAN PLANNING AND DEVELOPMENT**

Introduction-Definition of terms, Explanation of concepts, National policies and strategies on issues related to Urban development – Trends of Urbanization- Positive and Negative impacts of Urban development Principles of planning – Types and levels of Urban plans, Stages in the planning process.

**UNIT II**

**DEVELOPMENT PLANS, FORMULATION & EVALUATION**

Scope and content of Regional Plan, Master Plan, Detailed Development Plan, Structure Plan, Sub Regional Plan, DCR planning and developments of industrial estates, SEZ, Development strategies, formulation and evaluation.

**UNIT III**

**PLAN IMPLEMENTATION AND URBAN MANAGEMENT**

Constraints for plan implementation – Industrial, Financial and Legal Constraints, Institutional Arrangements for Urban Development – Financing of Urban Developments - Decision Support System for Urban Management – Involvement of public, private, NGO, CBO & Beneficiaries.

**UNIT IV**

**SUSTAINABLE URBAN PRINCIPLES**

Urban Environmental Sustainability, Urban Sustainable Development, Methods and Tools for Sustainable Appraisal; Economic & environmental impacts of green buildings.

**UNIT V**

**SUSTAINABLE TRANSPORT PRINCIPLES**

Sustainable Transportation – Principles, indicators and its implications Environment and Resources- Economic Benefits of Sustainable Transportation

**UNIT VI**

**URBAN REGION AND ENVIRONMENT**

Sustainability Assessment, Future Scenarios, Shape of Urban Region, Managing the change, Integrated Planning, Sustainable Development**-** City Centre, Development Areas, Inner City Areas, Suburban Areas, Perurban and Country side.

**TEXT BOOKS:**

1. **Urban Development and Management** by Goel .S.L Deep and Deep publications, New Delhi, 2002.
2. **[Introduction to Sustainable Development](https://www.amazon.in/Introduction-Sustainable-Development-Martin-Ossewaarde/dp/9352806468/ref=sr_1_8?s=books&ie=UTF8&qid=1541839411&sr=1-8&keywords=sustainable+development" \o "Introduction to Sustainable Development)** [by Martin J. Ossewaarde](https://www.amazon.in/Introduction-Sustainable-Development-Martin-Ossewaarde/dp/9352806468/ref=sr_1_8?s=books&ie=UTF8&qid=1541839411&sr=1-8&keywords=sustainable+development" \o "Introduction to Sustainable Development)

**REFERENCES:**

1. CMDA, *“Second Master Plan for Chennai”,* Chennai 2008.

2. Singh .V.B, “*Revitalized Urban Administration in I*ndia”, Kalpaz publication, Delhi 2001.**6KC92: High Rise Buildings**

**Professional Elective\_5**

**B. Tech IV Year II Sem.**  **L T P/D C**

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**Course Objectives**

1. To give a idea on various aspects of High rise buildings.
2. To know about different types of loadsacting on High rise building.
3. To introduce various structural systems for medium rise buildings with their behaviour and analysis.
4. To introduce various structural systems for high rise buildings with their behaviour and analysis.
5. To impart knowledge about stability analysis of various systems and to know about advanced topics.
6. To get the knowledge of future structural system, material used in building and principles of blast resistant design.

**Course Outcomes**

1. The differences between the regular buildings and high rise buildings.
2. Various structural systems usually considered for the functional design of the high rise buildings.
3. Various methods of calculation lateral forces (both wind forces and seismic/ earth quake forces) on the high rise buildings using the relevant IS codes (IS: 875 - Part-3, IS: 1893 - Part-1).
4. The importance of shear wall in resisting the lateral forces on the high rise buildings.
5. The importance of ductility of various structural members in resisting the seismic loads on high rise buildings and the relevant provisions of the IS code (IS: 13920) regarding the reinforcement detailing in achieving this ductility in RCC members.
6. Evolution of future structural systems, material of construction and principles in design of blast resistant design.

**UNIT-I**

**INTRODUCTION:** Design Philosophy-History-Advantages and disadvantages - vertical city concepts - Essential amenities - Fire safety -Water supply - Drainage and garbage disposal - Service systems - Structural and Foundation systems - Factors affecting height, growth and Structural form - Human comfort criteria.

**UNIT-II**

**LOADS:** Design Principles for Lateral Load resistance; Gravity Loading - Dead and Live Load - Reduction of Live Load- Impact and Construction Loads. Wind loading, Computation of wind loads on buildings as per IS code methods; Earthquake loading (Qualitative Treatment only) ductility considerations in earthquake resistant design of concrete buildings - Equivalent Lateral Force- Combination of loading.

**UNIT-III**

**MEDIUM RISE BUILDINGS-BEHAVIOUR AND ANALYSIS:** Behaviour of Medium rise structures -Vertical and Horizontal load resistant systems - Rigid frames -Infilled frames -Approximate Analysis.

**UNIT – IV**

**HIGH RISE BUILDINGS-BEHAVIOUR AND ANALYSIS:** Behaviour of High rise structures -Vertical and Horizontal load transfer systems - Braced frames -Shear walls - Wall frames - Tubular systems - Outrigger-braced systems- Approximate Analysis methods.

**UNIT- V**

**ADVANCED TOPICS:** Stability Analysis (Qualitative Treatment only) - Overall buckling analysis of frames, Wall frames, approximate methods, P-Δ effects and various methods of analysis - Influence of foundation instability, out of plumb effects – Elastic Deformations.

**UNIT- VI**

Structural systems for future generation buildings - Expert systems for consultations - Economics - Research needs in materials, systems and designs.

Principles of design of high rise braced frames for blast resistant design

**TEXT BOOKS:**

1. Taranath B. S., “*Structural Analysis and Design of Tall Buildings*”, McGraw-Hill Book Company, 1988.
2. Schuellar, W, “*High Rise Building Structures*” , John Wiley & Sons Inc, 1977.
3. Bryan Stafford Smith & Alex Coull, “*Tall Building Structures: Analysis & Design*”, Wiley India Pvt Ltd, 1991.

**REFERENCES:**

1. Lynn S. Beedle, “*Advances in Tall Buildings*”, CBS Publishers and Distributors Delhi, 1996.
2. Fintel, M, “*Hand Book of Concrete Engineering*”, Von Nostrand, 1974.
3. Simlu E, “*Wind Effect on Structures: An Introduction to Wind Engineering*”,Wile& Sons, 1978.
4. Emilio Rosenblueth, “*Design of Earthquake Resistant Structures*”, Pentech Press Ltd., 1990.

# 6KC93: Disaster Mitigation and Management

**Professional Elective\_5**

**B.Tech IV Year II Sem.**  **L T P/D C**

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**Course objectives:**

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts.
2. To impart knowledge in students about the nature, mechanism causes, consequences and mitigation measures of the various natural disasters including hydrometereological and geological based disasters.
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters including chemical, biological and nuclear warfare agents.
4. To equip the students with the knowledge of various chronological phases in the disaster management cycle.
5. To create awareness about the disaster management framework and legislations in the context of national and global conventions.
6. To enable students to understand the applications of geospatial technologies like remote sensing and geographical information systems in disaster management.

**Course outcomes**

1. Ability to analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at local, national and international levels
2. Ability to choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Ability to understand various mechanisms and consequences of natural and human induced disasters for the participatory role of engineers in disaster management.
4. Develop an awareness regarding the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans.
5. Ability to understand various participatory approaches/strategies and their applications in disaster management
6. Ability to understand the concepts of remote sensing and geographical information systems for their effective application in disaster management

**UNIT-I**

**Introduction**- Natural, human induced and human made disasters – Meaning, nature, types and effects; International decade of natural disaster reduction (IDNDR); International strategy of natural disaster reduction (ISDR)

**UNIT-II**

**Natural disasters**– Hydro meteorological disasters: Causes, impacts, Early warning systems, structural and non-structural measures for floods, drought and cyclones; Tropical cyclones: Overview, cyclogenesis, drought monitoring and management.

**UNIT III**

**Geographical based disasters**- Earthquakes and Tsunami- Overview, causes, impacts, zoning, structural and non-structural mitigation measures; Tsunami generation; Landslides and avalanches: Overview, causes, impacts, zoning and mitigation measures. Case studies related to various hydrometeorological and geographical based disasters.

**UNIT IV:**

**Human induced hazards**: Risks and control measures in a chemical industry, Causes, impacts and mitigation measures for chemical accidents, chemical disaster management, current status and perspectives; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents and traffic accidents .

**UNIT V:**

**Use of remote sensing and gis**- in disaster mitigation and management; Scope of application of ICST (Information, communication and space technologies in disaster management, Critical applications& Infrastructure; Potential application of Remote sensing and GIS in disaster management and in various disastrous conditions like earthquakes, drought, Floods, landslides etc.

**UNIT VI:**

**Concept of disaster management**- Introduction to disaster management, Relationship between Risk, vulnerability and a disaster, Disaster management cycle, Principles of disaster mitigation: Hazard identification and vulnerability analysis, Early warning systems and forecasting; Infrastructure and development in disaster management; Disaster management in India: National disaster management framework at central, state, district and local levels. Community based disaster management.

**TEXT BOOKS:**

1. Rajib, S and Krishna Murthy, R.R (2012) “Disaster Management Global Challenges and Local Solutions" Universities Press Hyderabad.
2. Battacharya, T. (2012), Disaster Science and Management. Tata McGraw Hill Company, New Delhi.
3. Navele, P & Raja, C.K. (2009), Earth and Atmospheric Disasters Management, Natural and Manmade. B.S. Publications, Hyderabad.

**REFERENCES:**

1. Fearn-Banks, K (2011), Crises computations approach: A case book approach. Route ledge Publishers, Special Indian Education, New York & London.
2. Notes / Reading material published by National Disaster Management Institute, Ministry of Home Affairs, Govt. of India.

**6KC94: Intelligent Transportation Systems**

**Professional Elective\_5**

**B. Tech IV Year II Sem.**  **L T P/D C**

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**Course Objectives:**

The student is being exposed to the course with the following Objectives:

1. Learn about the evolution of ITS, types and benefits
2. To develop an understanding of various sensor technology used in ITS.
3. To describe the ITS architecture and user needs in functional areas of ITS.
4. Understand the various models of ITS and evaluation methods.
5. Know about Traffic and incident management systems and study about travel demand management
6. Learn about Automated Highway Systems and various applications of ITS in developing countries

**Course Outcomes:**

At the end of the course the students:

1. Will have gained a basic understanding and appreciation of the concepts related to ITS technologies.
2. Differentiate different ITS user services.
3. Select appropriate ITS technology, depending upon site specific conditions.
4. Design and implement ITS components.
5. Perform Traffic and incident management and travel demand management works
6. Oversee operations at a typical ITS enabled transportation management centre

**UNIT – I**

Fundamentals of ITS: Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

**UNIT – II**

**Sensor technologies and Data requirements of ITS**: Importance of telecommunications in the ITS. Information Management, Traffic Management Centres (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centres; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

**UNIT – III**

ITS User Needs and Services and Functional areas – Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveller Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).

**UNIT – IV**

**ITS Architecture** – Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS planning.

**UNIT – V**

**ITS applications**: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications;

**UNIT – VI**

ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems – Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

**TEXT BOOKS:**

1. Fundamentals of intelligent transportation systems planning By Mashrur A. Chowdhury, Adel Wadid Sadek.
2. Sensor technologies and Data requirements of ITS., by Lawrence A. Klein,

**REFERENCES:**

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007.

**6KC95: Flow and Transport through Porous media**

**Professional Elective\_5**

**B.Tech IV Year II Sem.**  **L T P/D C**

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**Course Objective**

The objectives of learning the subject are to understand

1. Flow and transport through porous media
2. Basic principles of flows in porous media
3. Percolation theory
4. Single phase flow in a porous medium
5. Continuum approach, Pore network approach
6. Multiphase flows in porous media

**Course Outcome**

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

1. Understand basics of flow and transport through porous media
2. Understand the basic principles of flows in porous media
3. Understand the single Phase Flow in a porous medium
4. Understand the concept of continuum approach
5. Understand the concept pore network approach and its method.
6. Understand Multiphase flows in porous media

**UNIT-I:**

**The Porous Medium** Introduction, the Physical Medium, Relevant Physical Phenomena, Pore Scale vs. Continuum Scale, Fluid and Porous Matrix Properties, Surface Phenomena Adsorption, Wetting, Thin Films, Transport through Membranes.

**UNIT-II:**

**Balance Principles:**Mass, Momentum and Energy Conservation, Equations of Motion; Diffusion and Convective-Diffusion Equations; Fluid Flow in Porous Media; Multiphase Flows in Porous Media

**UNIT-III:**

**Characterization of pore space connectivity: Percolation theory:** Network Models of porous media, Percolation Theory, connectivity and cluster property, Difference between numerical and continuum equation, porous material with low percolation threshold, Network model with correlation.

**UNIT-IV:**

**Single Phase Flow in a Porous Medium: The Continuum Approach:** Derivation of Darcy's Law: Ensemble Averaging, Measurement of Permeability, Exact Results, Fluid Flow, Transport, Effective-Medium and Mean-Field Approximations , Fluid Flow, Transport, Cluster Expansion, Fluid Flow, Rigorous Bounds

**UNIT-V:**

**Single-Phase Flow and Transport in Porous Media: The Pore Network Approach**, the Pore Network Model, Effective-Medium Approximation, Effective-Medium Approximation and Percolation Disorder, the Bethe Lattice Model, Critical Path Analysis, Random Walk Method, Non-Darcy Flow.

**UNIT-VI:**

**Immiscible Multiphase Flow:**Surface Chemistry, Thermodynamics of Interface, Interfacial Tension, Capillary Pressure, Simultaneous Flow of Two Fluids, models of two phase flow in unconsolidated porous media, Relative permeability, Measurement of relative permeability, Effects of wettability on relative permeability

**TEXTBOOKS:**

1. Dynamics of Fluids in Porous Media by Jacob Bear, Dover Publications.
2. Flow and Transport in Porous Media and Fractured Rock by Muhammad Sahimi, VCH.

**REFERENCES:**

1. The physics of flow through porous media by Adrian E. Scheidegge, third edition, University of Toronto Press.
2. Principles of Heat Transfer in Porous Media by M. Kaviany, second edition, Springer.
3. The method of volume averaging by Stephen Whitaker, Kluwer Academic Publishers.
4. Introduction of Modeling of Transport Phenomena in Porous Media by Jacob Bear and Yehuda Bachmat, Kluwer Academic Publishers.

**6K898: TECHNICAL LITERATURE REVIEW AND SEMINAR**

**B. Tech IV Year II Sem. L T P/D C**

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**Course Objective :**

Learn basics of technical paper writing and enhance verbal and writing skills, which is useful for employabilty

**Pre-Requisites:** All Courses till this semester

**Course Outcomes: After completing this course, student shall be able to**

* Identify a topic from the current technologies of their choice in the Civil Engineering domain and the allied fields, after surveying in the internet resources, journals, and technical magazines in the library.
* Arrange the contents of the presentation and also write the report of the research paper.
* Present the technical topic in front of the panel and the fellow students, using the oratory skills and also submit the report of the research paper.
* Interact through answering the questions and also can add some points to the seminar

There shall be a Technical Paper writing and seminar evaluated for 100 marks in Forth Year Second Semester. The evaluation is purely internal and will be conducted as follows:

Content : 20 marks

Presentation including PPT : 20 marks

Seminar Notes : 10 marks

Interaction : 10 marks

Report : 25 marks

Attendance : 10 marks

Punctuality : 5 marks

**Total 100 marks**

**6K883: COMPREHENSIVE VIVA VOCE**

**B. Tech IV Year II Sem.** L T P/D C

- - - 1

**Course Objectives :**

Prepare students in basics and advanced relevant courses to revise and face technical interviews for enhancing employability.

**Course Outcomes:**After completing this course, student shall be able to

1. Assess the relevant courses they have undergone till the completion of that academic year.
2. Assessment is done in the relevant courses they have undergone till the completion of that academic year.
3. Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills.
4. They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills.

There will be 100 marks in total with 50 marks of internal evaluation and 50 marks of external evaluation.

**Internal:**

Comprehensive Viva Voce is Conducted twice in a semester and evaluated for 25 marks each.

**End examination : 50 Marks.**

The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.