Faculty of Technology & Engineering

Chandubhai S. Patel Institute of Technology (CSPIT)

ACADEMIC REGULATIONS & SYLLABUS

(Choice Based Credit System)

Bachelor of Technology Programme

(First Year B. Tech Programme **ME/EE/CL**)

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Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the choicest destinations by students. It has been transformed into Charotar University of Science and Technology (CHARUSAT) through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. of India.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmes, one Institute and an investment of about Rs. 3 Crores (INR 30 million). At present there are seven different institutes falling under ambit of six different faculties. The programmes offered by these faculties range from undergraduate (UG) to Ph.D degrees including M.Phil. These faculties, in all offer 23 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Chandubhai S. Patel Institute of Technology	B. Tech M. Tech Ph. D
	Devang Patel Institute of Technology and Research	B.Tech CE CSE IT
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm M. Pharm Ph. D PGDCT/ PGDPT
Faculty of Management Studies	Indukaka Ipcowala Institute of Management	M.B.A PGDM Ph.D Dual Degree BBA+MBA
Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc M.Phil Ph.D Dual Degree B.Sc+M.Sc

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Faculty	Institute	Programmes Offered
Faculty of Computer Applications	Smt. Chandaben Mohanbhai Patel Institute of Computer Applications	M.C.A/MCA (Lateral) M.Sc IT Ph. D Dual Degree BCA+MCA
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy	B.PT M.PT Ph.D
	Manikaka Topawala Institute of Nursing	B.Sc M.Sc GNM
	Charotar Institute of Paramedical Sciences	Ph.D PGDHA

The development and growth of the institutes have already led to an investment of over Rs.63 Crores (INR 630 Million). The future outlay is planned with an estimate of Rs. 250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 100 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 350 core faculty members, educated and trained in Stanford, IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, CHARUSAT has the vision of entering the club of premier Universities initially in the country and then globally. High Moral Values like Honesty, Integrity and Transparency which has been the foundation of ECC continues to anchor the functioning of CHARUSAT. Banking on the world class infrastructure and highly qualified and competent faculty, the University is expected to be catapulted into top 20 Universities in the coming five years. In order to align with the global requirements, the University has collaborated with internationally reputed organizations like

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Pennsylvania State University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute –UK, ISRO, BARC, etc.

- ☞ Participatory and interactive discussion-based classes.
- ☞ Sessions by visiting faculty members drawn from leading academic institutions and industry.
- ☞ Regular weekly seminars.
- ☞ Distinguished lecture series.
- ☞ Practical, field-based projects and assignments.
- ☞ Summer training in leading organizations under faculty supervision in relevant programmes.
- ☞ Industrial tours and visits.
- ☞ Extensive use of technology for learning.
- ☞ Final Placement through campus interviews.

Exploration in the field of knowledge through research and development and comprehensive industrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

👍 CHARUSAT welcomes you for a Bright Future 👍

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CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (ME/EE/CL) Programme

(Choice Based Credit System)

Charotar University of Science and Technology (CHARUSAT)

CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand

Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in

www.charusat.ac.in

Year – 2017-2018

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FACULTY OF TECHNOLOGY AND ENGINEERING

ACADEMIC REGULATIONS

Bachelor of Technology Programmes

Choice Based Credit System

To ensure uniform system of education, duration of undergraduate and post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1) System of Education

Choice based Credit System with Semester pattern of education shall be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate and Master's levels. Each semester will be at least 90 working day duration. Every enrolled student will be required to take a course works in the chosen subject of specialization and also complete a project/dissertation if any. Apart from the Programme Core courses, provision for choosing University level electives and Programme/Institutional level electives are available under the Choice based credit system.

2) Duration of Programme

i)	**Undergraduate programme**	**(B.Tech)**
	Minimum	8 semesters (4 academic years)
	Maximum	16 semesters (8 academic years)

3) Eligibility for admissions

As enacted by Govt. of Gujarat from time to time.

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4) Mode of admissions

As enacted by Govt. of Gujarat from time to time.

5) Programme structure and Credits

As per annexure – 1 attached

6) Attendance

6.1 All activities prescribed under these regulations and listed by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student from attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Dean/Principal.

6.2 Student attendance in a course should be 80%.

7) Course Evaluation

7.1 The performance of every student in each course will be evaluated as follows:

7.1.1 Internal evaluation by the course faculty member(s) based on continuous assessment, for 30% of the marks for the course; and

7.1.2 Final examination by the University through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, for 70% of the marks for the course.

7.2 Internal Evaluation

7.2.1 A student shall be evaluated through Continuous Evaluation and Semester End Examination.

7.2.2 The weight of continuous assessment and End-semester examination shall be varying from UG to PG and from Faculty to Faculty as approved by Academic Council.

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7.2.3 During the semester, a student shall be going through continuous assessment. The continuous assessment will be conducted by the respective Department / Institute. At the end of semester a student shall be evaluated through semester end examination comprising of theory and/or practical, viva-voce, term work components as decided by Academic Council.

7.2.4 The performance of candidate in continuous assessment and in end-semester examination together shall be considered for deciding the final grade in a course.

7.3 University Examination

7.3.1 The final examination by the University for 70% of the evaluation for the course will be through written paper and 100% for practical test or oral test or presentation by the student or a combination of any two or more of these.

7.3.2 **In order to earn the credit in a course a student has to obtain grade other than FF.**

7.4 Performance at Internal & University Examination

7.4.1 Minimum performance with respect to internal marks as well as university examination will be an important consideration for passing a course. Details of minimum percentage of marks to be obtained in the examinations (internal/external) are as follows

Minimum marks in University Exam per subject	Minimum marks Overall per subject
30%	35%

7.4.2 A student failing to score 35% of the final examination will get a FF grade.

7.4.3 If a candidate obtains minimum required marks per subject but fails to obtain minimum required overall marks, he/she has to repeat the university examination till the minimum required overall marks are obtained.

8) Grade Point System

8.1 Performance of the student in all the components shall be graded using relative grading system.

8.1.1 Performance of the student in all the components shall be graded using relative grading system.

8.1.2 At the end of a semester, a histogram shall be prepared for results of each course. A committee mentioned hereunder shall finalize the histogram based on which results will be prepared.

8.1.3 Result Preparation committee

8.1.4 A committee chaired by Provost and comprising of Dean of Faculty, One Dean other than the faculty and one teacher having expertise of relative grading shall deliberate upon different scenarios of results based on histograms of all the courses. Thereafter, the committee shall finalize the results.

8.1.5 The histogram shall be prepared for each course. After the finalization by the committee, the results shall be declared within 3 weeks duration.

8.1.6 Post Result Mechanism.

8.1.7 The Dean shall discuss the result of each course with the convener and the teacher who has taught the course along with the statistical distribution evident from histogram so as to bring out any anomalies, skewness, left-out topics etc. Its only after this discussion is over the results shall be declared.

8.2 A grade point system, as given in the following table, shall be followed for evaluating a candidate in every course:

☞ A grade point system, as given in the following table, shall be followed for evaluating a candidate in every course.

Table 1: Grading Point System (UG)

Grade	AA	AB	BB	BC	CC	CD	DD	FF
Grade Point	10	09	08	07	06	05	04	00

☞ As a general guideline, a class average of around 6.50 for theory component & around 8.00 for practical component may be maintained while applying relative grading.

☞ In case, a student, of undergraduate programme or diploma, gets less than 30% marks in end-semester examination and less than 35% marks overall (combining continuous

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evaluation and end-semester examination) in a particular course, he / she will not be graded in that course till he / she reappears in said course and obtains specified minimum marks .

- ☞ In case, a student, of postgraduate programme or postgraduate diploma, gets less than 40% marks in end-semester examination and less than 45% marks overall (combining continuous evaluation and end-semester examination) in a particular course, he / she will not be graded in that course till he / she reappears in said course and obtains specified minimum marks.

8. 1. Requirements for the Award of a Degree

- ☞ To be eligible for award of the degree, a student must complete all courses with requisite credits as prescribed under his / her programme of studies without "FF" grade in any course in any of the semesters of the entire programme.

8. 2. Semester Grade Point Average (SGPA):

- ☞ The following mechanism may be used in order to arrive at a grade point for the candidate:
- ☞ SGPA obtained by a student in any degree programme is a weighted average of the grade points in various courses taken by the student.
- ☞ For example:

  If student has taken following courses, then the SGPA (Semester Grade Point Average) is computed as explained below:

Courses	Course – 1	Course – 2	.....	Course – j	…..	Course – n
Credit	C_1	C_2	…..	C_j	…..	C_n
Grade Points	G_1	G_2	…..	G_j	…..	G_n

- ☞ SGPA = $\sum$ {Credits X Grade Point} / Total Credits; for the courses offered in particular semester.

9) Award of Class

- ☞ The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

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Award of Class	CGPA Range
First Class with Distinction	CGPA ≥ 7.50
First class	7.50 > CGPA ≥ 6.50
Second Class	6.50> CGPA ≥ 5.50
Pass Class	5.50 > CGPA ≥ 4.00

☞ Where Cumulative Grade Point Average (CGPA) is computed as:

$$CGPA = \sum_{k=1}^{n} \{\text{Credits x Grade Point}\} / \text{Total Semester Credits}$$

☞ Here the sum is taken over from 1st Semester to nth Semester of the Programme.

Grade sheets of only the final semester shall indicate the class. In case of all the other semesters, it will simply indicate as Pass / Fail.

Indicative percentage of marks equivalent to Cumulative Grade Point Average (CGPA) shall be calculated as (CGPA – 0.5) X 10.

9. 1. Gracing Criteria / Detention Criteria

☞ As relative grading is being adopted gracing of marks shall be redundant. Detention of a student shall be as per prevailing university norms.

9. 2. Maximum Time allowed for Completion of a programme

☞ Maximum time allowed for completion of a particular programme shall not be more than twice the normal duration of the respective programme. For example, a 6-Semester programme should be completed within not more than 12 semesters.

10) Transcript

☞ A transcript issued to the student at the time of leaving the university will contain a consolidated record of all the courses taken by him / her, grades obtained and the final CGPA.

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CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
(CHARUSAT)

FACULTY OF TECHNOLOGY & ENGINEERING
(FTE)

CHOICE BASED CREDIT SYSTEM

FOR

BACHELOR OF TECHNOLOGY & ENGINEERING

CHOICE BASED CREDIT SYSTEM

With the aim of incorporating the various guidelines initiated by the University Grants Commission (UGC) to bring equality, efficiency and excellence in the Higher Education System, Choice Based Credit System (CBCS) has been adopted. CBCS offers wide range of choices to students in all semesters to choose the courses based on their aptitude and career objectives. It accelerates the teaching-learning process and provides flexibility to students to opt for the courses of their choice and / or undergo additional courses to strengthen their Knowledge, Skills and Attitude.

1. CBCS – Conceptual Definitions / Key Terms (Terminologies)

1.1. Types of Courses

The Programme Structure should consist of 4 types of courses, University Core, University Elective, Programme Core and Programme Elective broadly classified in to two categories based on their levels & significance (Core and Elective).

1.1.1. Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. University Core courses:

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme. Environmental science will be a compulsory University core for all Undergraduate Programmes.

B. Programme Core courses:

Programme core courses are compulsory courses offered by respective programme owners, which must be completed in order to meet the requirements of programme.

1.1.2. Elective Courses

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Generally, a course which can be chosen from a pool of courses and which may be very specific or specialised or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses:

The pool of elective courses offered across all faculties / programmes. As a general guideline, Programme should incorporate 2 University Electives of 2 credits each (total 4 credits).

B. programme Elective Courses:

the programme specific pool of elective courses offered by respective programme.

1.1.3 Naming of Courses

Naming of the course shall be as per prevailing university rules.

1.1.4 Medium of Instruction

The Medium of Instruction will be English.

Annexure – 1

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (Effective from CHARUSAT 2016 Batch)

TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN (CIVIL/ELECTRICAL/MECHANICAL) ENGINEERING

CHOICE BASED CREDIT SYSTEM

Sem	Course Code	Course Title	Teaching Scheme				Examination Scheme				
			Contact Hours			Credit	Theory		Practical		Total
			Theory	Practical/ Tutorial	Total		Internal	External	Internal	External	
'First Year Sem 1	HS101A-HS106A	A Course on Liberal Arts(University Elective I)	2		2	2			50	50	100
	MA141	Engineering Mathematics-I	4	1	5	4	30	70	0	0	100
	ME141	Engineering Graphics	2	4	6	4	30	70	50	50	200
	PY141	Engineering Physics	3	2	5	4	30	70	25	25	150
	CL141	Engineering Mechanics	4	2	6	5	30	70	25	25	150
	ME142	Workshop Practices	0	2	2	1			25	25	50
	Assignment Practices /Student counselling /Remedial classes / Library/ Sports/ Extracurricular &co-curricular				10						
	Total				**36**						**750**
	HS121 A	English Language & Literature(University Core 1)	2		2	2	25	25	25	25	100
First Year Sem 2	MA142	Engineering Mathematics-II	4	1	5	4	30	70	0	0	100
	CL142	Environmental Sciences	2	0	2	2	30	70	0	0	100
	IT141	Fundamentals of Computer Programming	3	2	5	4	30	70	25	25	150
	ME143	Basics of Civil & Mech Engineering	4	2	6	5	30	70	25	25	150
	EE141	Basics of Electronics & Electrical Engineering	4	2	6	5	30	70	25	25	150
	Assignment Practices /Student counselling /Remedial classes / Library/ Sports/ Extracurricular &co-curricular				10						
	Total				**36**						**750**

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B. Tech. Programme

(Civil/Electrical/Mechanical Engineering)

SYLLABI

(Semester – 1)

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CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF MANAGEMENT STUDIES

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

HS101A - HS106A: A COURSE FROM LIBERAL ARTS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	-	2	-	2	2
Marks	-	100	-	100	

A. Objective of the Course:

To help learners to

- Recognize the nature of aesthetic values and explore elements of arts and aesthetics with reference to personal, cultural and civic sphere
- Connect art and aesthetics with Science and Technology to understand and extend research and innovation for a society

B. Courses:

Students may select any one course from the following:

Sr. No.	Title of the unit	Credits
1	Painting	02
2	Photography	
3	Sculpting	
4	Music	
5	Drama and Dramatics	
6	Yoga	
7	Dance	
8	Pottery and Ceramic Art	
9	Media and Graphics Design	

Total hours (Theory): 00

Total hours (Lab): 30

Total hours: 30

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C. Instructional Method and Pedagogy:

- Teaching will be practical based on the hands on experiences, live and interactive Participation sessions. It may also run in the workshop mode.

D. Evaluation:

- The students will be evaluated continuously in the form of their consistent performance throughout the semester. There is no theoretical evaluation. There is just practical evaluation. The evaluation (practical) is schemed as 50 marks for internal evaluation and 50 marks for external evaluation.

Internal Evaluation

- Students' performance in the course will be evaluated on a continuous basis through the following components:

Sr No.	Component	Number	Marks Per Incidence	Total Marks
1		-	10	10
2	Performance/ Activities	-	10	10
3	Project	-	25	25
4	Attendance	-	05	05
			Total	50

External Evaluation

- University Practical examination will be for 50 marks and will test the performance, activities and creative presentations of the students with reference to the course selected:

Sr. No.	Component	Number	Marks Per Incidence	Total Marks
1	Viva/Practical	-	50	50
			Total	50

E. Student Learning Outcomes:

At the end of the course, students will have developed the ability to enjoy, interact with and perform arts and aesthetics; and will have developed the ability and creativity to transfer sense of design and innovation in science and technology.

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FACULTY OF APPLIED SCIENCES

DEPARTMENT OF MATHEMATICAL SCIENCES

MA141: ENGINEERING MATHEMATICS – I

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	0	1	5	4
Marks	100	0	-	100	

A. Objective of the Course:

A good Engineer has to have an excellent background of Mathematics. Engineering Mathematics is one of the essential tools for learning Technology, Engineering and Sciences. This course lays the foundation for engineering Mathematics in subsequent semesters, so that students get a sound knowledge and important aspects of the course. The objectives of the course are to:

- Understand applications of differentiation in respective Engineering Branch
- Understand basics of Matrix Algebra and methods to solve problems
- Understand complex numbers, their properties and applications to Engineering problems
- Understand solution to algebraic equations
- Understand the sequence and series, conditions for convergence and divergence

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Higher order derivatives and applications	09
2.	Partial differentiation	10
3.	Applications of Partial differentiation	09
4.	Matrix Algebra –I	10

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5.	Algebra of Complex numbers and Roots of polynomial Equations	12
6.	Infinite Series	10

Total hours (Theory): 60

Total hours (Lab): 00

Total hours: 75

C. Detailed Syllabus:

1	**Higher order derivatives and applications**	**09 Hours**	**15%**
1.1	Set theory and Function		
1.2	Limit, Continuity, Differentiability for function of single variable and its uses.		
1.3	Successive differentiation: n^{th} derivative of elementary functions viz., rational, logarithmic, trigonometric, exponential and hyperbolic etc.		
1.4	Leibnitz rule for the n^{th} order derivatives of product of two functions		
1.5	Expansion of Functions: Maclaurin's & Taylor's series expansion		
1.6	L'Hospital's rule and related applications, Indeterminate forms.		
2	**Partial differentiation**	**10 Hours**	**17%**
2.1	Partial derivative and geometrical interpretation		
2.2	Euler's theorem with corollaries and their applications		
2.3	Chain rule		
2.4	Implicit differentiation		
2.5	Total differentials.		
3.	**Applications of Partial differentiation**	**09 Hours**	**15%**
3.1	Tangent plane and normal line to a surface		
3.2	Maxima and Minima		
3.3	Langrage's method of multiplier		
3.4	Jacobian		

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3.5	Errors and approximations		
4.	**Matrix Algebra- I:**	**10 Hours**	**17%**
4.1	Definition of Matrix, types of matrices and their properties		
4.2	Determinant and their properties		
4.3	Rank and nullity of a matrix		
4.4	Determination of rank		
4.5	Gauss Jordan method for computing inverse, Triangularization of Matrices by Gauss Elimination Process		
4.6	Solution of system of linear equations		
5	**Algebra of Complex numbers and Roots of polynomial Equations**	**12 Hours**	**19%**
5.1	Complex numbers & their geometric representation		
5.2	Complex numbers in polar and exponential forms		
5.3	Demoirve's theorem and its applications		
5.4	Exponential, Logarithmic, Trigonometric and hyperbolic functions.		
5.5	Statement of fundamental theorem of Algebra, Analytical solution of cubic equation by Cardan's method		
5.6	Analytic solution of Biquadratic equations by Ferrari's method with their applications.		
6.	**Infinite Series**	**10 Hours**	**17%**
6.1	Introduction to sequence and series		
6.2	convergence and divergence of infinite series		
6.3	necessary condition for convergence		
6.4	Geometric series		
6.5	Tests of convergence viz., comparison test, p-series test, ratio test, n^{th} root test, Leibnitz test, integral test and power series.		
6.6	Convergence of Taylor's and Maclaurian Series		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.

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- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weighting of 5%.
- Two Quizzes (surprise test) will be conducted which carries 5% component of the overall evaluation.

E. Student Learning Outcomes:

- At the end of the course the students will be able to understand the basic concepts of Engineering Mathematics.
- Student will be able apply concepts of these course to learn MA 142: Engineering Mathematics-II and may be some courses other then Mathematics.
- Students will be able to apply the mathematical concepts in other engineering courses.

F. Recommended Study Material:

❖ **Text Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Ed., Jhon Wiley & Sons, India, 1999

❖ **Reference Books:**

1. M.D. Wier, et. al., Thomas' Calculus, 11th Ed., Pearson Education, 2008
2. Stewart James, Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. Wylie & Barrett, Advanced Engineering Mathematics, Mc graw Hill pub.
4. Greenberg, M.D., Advanced Engineering Mathematics, 2nd ed., Pearson

❖ **Web Materials:**

1. http://mathworld.wolfram.com/
2. http://en.wikipedia.org/wiki/Math

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FACULTY OF TECHNOLOGY & ENGINEERING

CHAMOS MATRUSANSTHA DEPARTMENT OF MECHANICAL ENGINEERING

ME 141: ENGINEERING GRAPHICS

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	-	6	4
Marks	100	100	-	200	

A. Objective of the Course:

This course covers fundamentals of the engineering drawing for first year engineering students. The objective of the course are to:

1. Introduce the universal language and tool of communication for engineers.

2. Develop visualization of the three-dimensional engineering components.

3. Understand and apply the concepts, elements and grammar of engineering drawing.

4. Introduce the computer aided drafting.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Fundamentals of Engineering Graphics	08
2.	Projections of Points and Lines	06
3.	Projections of Planes	06
4.	Projections & Section of Solid	06
5.	Orthographic Projection*	06
6.	Isometric Projections*	06
7.	Computer Aided Drafting*	04
8.	Development of Lateral Surfaces	04

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* indicates the topics are covered in laboratory

Total hours (Theory): 30

Total hours (Practical): 60

Total hours: 90

C. Detailed Syllabus:

1. Fundamentals of Engineering Drawing **08 Hours** **14%**

1.1 Importance of engineering drawing, drawing instruments and materials, BIS and ISO

1.2 Different types of lines used in engineering practice, methods of projections as per SP 46-1988.

1.3 Engineering Scale.

1.4 Engineering Curve.

2. Projections of Points and Lines **06 Hours** **14%**

2.1 Introduction to methods of projections

2.2 Projections of lines inclined to both the planes

3. Projections of Planes **06 Hours** **14%**

3.1 Projection of plane

3.2 Auxiliary Projection Method

4. Projections & Section of Solid **06 Hours** **14%**

4.1 Projection of solids

4.2 Sectional view

4.3 True shape of Sections

4.4 Auxiliary Inclined Plane (AIP), Auxiliary Vertical Plane (AVP)

5. Orthographic Projection **06 Hours** **14%**

5.1 Principle projection

5.2 Methods of first and third angle projection with examples / problems

6. Isometric Projections **06 Hours** **14%**

6.1 Terminology, Isometric scale

6.2 Isometric view and Isometric projection with examples / problems

7. Computer Aided Drafting **04 Hours** **8%**

7.1 Introduction to 2D drafting facilities in CAD software - AutoCAD.

8. Development of Lateral Surfaces **04 Hours** **8%**

8.1 Method of Development

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8.2 Developments of cylinder, cone, prism, pyramid

D. Instructional Methods and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Drawing sheets/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

E. Student Learning Outcomes:

On the completion of the course one should be able to:

1. Understand and interpret various engineering drawings.
2. Learn the concept, application and be able to draw engineering scale and engineering curve.
3. Learn three-dimensional visualization of engineering components through orthographic, sectional orthographic and isometric drawing.
4. Understand the concept, application and be able to draw projection of point and projection of line.
5. Learn the concept, application and be able to draw projection of plane, projection & section of solid and development of lateral surfaces.
6. Learn the overview of computer aided drafting.

F Recommended Study Material:

Text Books:

1. N. D. Bhatt & V. M. Panchal, "Engineering Drawing", Charotar Publishing House Pvt. Ltd.
2. P. J. Shah, "Engineering Graphics", S. Chand Publishing & Co.

Reference Books:

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1. P.B. Patel & P.D. Patel, “Engineering Graphics”, Mahajan Publishing House.
2. Arunoday Kumar, “Engineering Graphics”, Tech-Max Publication.
3. Gopal Krishna K.L., “Engineering Drawing”, Subhas Publications
4. Venugopal, K., “Engineering Drawing made Easy”, Wiley Eastern Ltd.
5. M.L. Agrawal & R.K. Garg, “Engineering Drawing”, Vol. I, Dhanpatrai & Co.
6. T.E. French, C.J. Vierck & R. J. Foster, “Graphic Science and Design”, McGraw Hill.
7. W. J. Luzadder & J. M. Duff, “Fundamentals of Engineering Drawing”, Prentice Hall.
8. K. Venugopal, “Engineering Drawing and Graphics”, New Age international Pry. Ltd.

Reading Materials, web materials with full citations:

1. http://nptel.ac.in/courses/112103019/
2. http://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3. http://www.engineering108.com/pages/Engineering_graphics/Engineering_graphics_tutorials_free_download.html
4. https://law.resource.org/pub/in/bis/S01/is.sp.46.2003.pdf

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FACULTY OF APPLIED SCIENCES

DEPARTMENT OF PHYSICS

PY141: ENGINEERING PHYSICS

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the Course:

The main objective to give the course of Engineering Physics is

- To study the basic concepts of physics and engineering applications of physics.
- To develop physical intuition, mathematical reasoning, and problem solving skills.
- To prepare students for the necessarily rigorous sequence in physics and engineering.
- To develop an ability to identify, formulate and solve physics and engineering problem through numerical analysis and laboratory methods.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Error Analysis	04
2.	Wave motion and sound	08
3.	Modern Optics	09
4.	Solid State Physics	10
5.	Structure of Materials	07
6.	Nanoscience	07

* indicates the topics are covered in laboratory **Total hours (Theory): 45**

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Total hours (Practical): 30

Total hours: 75

C. Detailed Syllabus:

1. Error Analysis: 04 hours 09%

1.1 Introduction and Basic definitions

1.2 Average error, r.m.s error, probable error and error propagation

1.3 significant digit and figures

1.4 Numericals

2. Wave motion and Sound: 08 hours 18%

2.1 Propagation of waves, longitudinal and transverse waves, mechanical and non mechanical waves

2.2 sound waves, Architectural Acoustics, Classification of Sound

2.3 Loudness, Weber-Fechner law, Bel and Decibel

2.4 Absorption Coefficient, Reverberation, Sabine's formula

2.5 Factors affecting acoustics of buildings and their remedies

2.6 Ultrasonics, properties, Production, piczoelectric and magnetostriction method, applications

2.7 Numericals

3. Modern Optics: 09 hours 20%

3.1 Lasers and its properties, spontaneous and stimulated emission, population Inversion

3.2 Einstein coefficients

3.3 Gas laser (Co_2 Laser), Solid (Nd – YaG) Laser

3.4 Hologram- Introduction, construction and reconstruction process

3.5 applications of Lasers

3.6 General ides of optical fibre

3.7 NA of fibre, step index and graded index fibre

3.8 multi-mode and single mode fibre – applications of optical fibre

4. Solid State Physics: 10 hours 22%

4.1 Introduction: Conductors and Semiconductors: Band theory of Solids

4.2 Energy gap, Fermi energy. Electrical conductivity and mobility.

4.3 Hall effect

4.4 X – Ray: properties

4.5 Applications of X – Rays

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4.6 Super conducting materials: Properties

4.7 Types of Super conductors

4.8 Josephson effects

4.9 Applications of Super conductors

4.10 Numericals

5. Structure of Material: 07 hours 16%

5.1 Introduction: Atomic and molecular structure

5.2 Crystal structure, Crystalline and non-crystalline materials

5.3 space lattices and Miller indices

5.4 Relation between Interplanner Distance and cubic Edge

5.5 Numericals

6. Nanoscience: 07 hours 15%

6.1 Introduction

6.2 Structure of nanomaterials, examples of nanomaterials

6.3 Synthesis (qualitative idea only)

6.4 properties and applications nanostructured materials

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcomes:

On the successful completion of the course:

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1. The student would be able to apply the concepts of physics in various branches of engineering.
2. An ability to identify, formulate and solve engineering problems.
3. An ability to use the techniques, skills and modern tools of physics necessary for engineering applications.
4. An ability to design and conduct experiments, analyze and interpret data.

F. Recommended Study Material:

❖ **Text Books:**

1. Vijayakumari, G., Engg. Physics, Vikas Publishing house Pvt. Ltd.
2. Rajagopal, K., Engg. Physics, Prentice Hall of India Pvt. Ltd.
3. Avadhalula, M. N. & Kshirsagar, P. G., A text book of Engg. Physics, S. Chand Pub.

❖ **Reference Books:**

1. Nayak Abhijit, Engg. Physics, S. K. Kataria and Sons Pub.
2. Topping, J., Errors of Observations and their Treatment, 3rd Ed. Chapman and Hall ltd. London
3. Kittle, C., Solid State Physics
4. Resnick and Haliday, Physics Part-I & II, Wiley Eastern publication
5. Beiser Arthur, Concept of Modern Physics
6. Ghatak, Optics, Tata McGraw Hill, 3rd Edition
7. Pillai, S.O., Solid State Physics, Wiley Eastern Ltd.

❖ **Web Materials:**

1. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Guwahati/engg_physics/index_cont.htm
2. http://ncert.nic.in/html/learning_basket.htm
3. http://science.howstuffworks.com/laser1.htm
4. http://physics-animations.com/Physics/English/optics.htm
5. http://physics-animations.com/Physics/English/waves.htm
6. http://www.epsrc.ac.uk
7. http://www.pitt.edu/~poole/physics.html#light
8. http://de.physnet.net/PhysNet/optics.html

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FACULTY OF TECHNOLOGY & ENGINEERING

MANUBHAI SHIVABHAI PATEL DEPARTMENT OF CIVIL ENGINEERING

CL141 ENGINEERING MECHANICS

Credits and Hours:

Teaching Scheme	Theory	Tutorial	Practical	Total	Credit
Hours/week	4	-	2	6	5
Marks	100	-	50	150	

A. Objectives of the Course:

This course covers the basic principles of application of forces on rigid body with emphasis on their analysis and application to simple practical engineering problems. The objectives of the course are to:

1. Understand the vector and scalar representation of forces and moments
2. Identify various forces and understand effect of those forces on rigid bodies at the state of rest or motion.
3. Construct free-body diagrams of rigid bodies at static equilibrium
4. Comprehend mechanics associated with friction forces
5. Identify and analyze the internal forces in statically determinate beams.
6. Understand the distributed loads and the centroid of areas/objects.
7. Understand simple dynamic variables involving kinematics, energy and momentum.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	05
2	Fundamental of Statics	22
3	Friction	10
4	Introduction to Beams	05
5	Centroid and Centre of Gravity	10
6	Fundamentals of Kinematics and Kinetics of Particles	08

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Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Introduction**	**05 Hours**	**08%**
	Introduction of Mechanics, Fundamental concepts and idealization of mechanics, Fundamental principles & Laws of mechanics, Scalar and Vector Quantities, Components , unit vectors and position vector, Composition and resolution of vector, System of Units		
2	**Fundamental of Static**	**22 Hours**	**38%**
2.1	**Coplanar Concurrent Force system**		
	Introduction of Force , Effect of force and Characteristics of force, Types of force, Type of force systems, Principle of Transmissibility, Resultant of force systems, Resolution of a single force , Composition and Resolution of force system, Resolution method for coplanar concurrent force system		
2.2	**Moments and Couples**		
	Moment of a force, Principle of moments, Coplanar applications, Parallel force system, Couples, Equivalent couples, Operations with couples, Equivalent system of forces		
2.3	**Coplanar Non-Concurrent Force system**		
	Introduction, Resultant of coplanar non-concurrent force system, Concentrated and distributed loads		
2.4	**Equilibrium of Rigid bodies**		
	Equilibrium, Resultant & Equilibrant, Principle of action and reaction, Free body diagram & Lami's theorem, Tensions of strings, condition of equilibrium for Coplanar concurrent forces & Coplanar non-concurrent forces, Equilibrium of Coplanar concurrent forces, Equilibrium of Coplanar non-concurrent forces		
2.5	**Forces in Space**		
	Introduction, Force in space, resultant of concurrent forces in		

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space, equilibrium of particle in space.

3	**Friction** Friction and its applications, Types of friction and Laws of dry friction, Angle of friction, Angle of repose, Coefficient of friction, Block Friction, Ladder friction, Wedge friction	**10 Hours**	**14%**
4	**Introduction to Beams** Types of load, supports and beams, support reaction for Statically determinate beam	**5 Hours**	**10%**
5	**Centroid and Centre of Gravity** Introduction, basic definitions and their understanding, Concept of centre of gravity, Centroids of Linear elements & Planar elements, Determination of centroids by integrations, Centroids of Composite sections (1D, 2D)	**10 Hours**	**16%**
6	**Fundamentals of Kinematics and Kinetics of Particles** Rectilinear motion, Curvilinear motion, Motion of rigid bodies, Velocity and acceleration, Newton's law of motion, Energy and momentum.	**8 Hours**	**14%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.

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- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the completion of the course one should be able to:

1. Understand laws of mechanics and their application to engineering problems.
2. Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
3. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple practical problems.
4. Understand the fundamentals of statics and dynamics and be able to apply them to simple structural problems

F. Recommended Study Material:

Text Books:

1. Junarkar, S.B. & Shah, H.J., Mechanics of Structures Vol-I & II, Charotar Publishing House
2. Junnarkar, S. B. & Shah, H. J., Applied Mechanics, Charotar Publishing House
3. Beer and Johnston, Engineering Mechanics (Statics & Dynamics)

Reference Books:

1. Beer and Johnston, Mechanics of Materials
2. Gere & Timoshenko, Mechanics of Materials, CBS Publishers & Distributors, Delhi
3. Hibbler, R.C., Engineering Mechanics, Pearson Education
4. Popov, E.P., Engineering Mechanics of Solids, Prentice Hall of India, New Delhi
5. Meriam, J. L. & Kraige, L. G., Engineering Mechanics Statics, John Wiley & Son, Singapore
6. A K Tayal, Engineering Mechanics (Statics & Dynamics), Umesh Publications

Web Materials:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Mechanics%20Of%20Solids/index.htm
2. http://nptel.iitm.ac.in/video.php?subjectId=105106116

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FACULTY OF TECHNOLOGY & ENGINEERING

CHAMOS MATRUSANSTHA DEPARTMENT OF MECHANICAL ENGINEERING

ME142: WORKSHOP PRACTICES

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	-	2	-	2	1
Marks	-	50	-	50	

A. Objective of the Course:

The objectives of the this course for the first year engineering students is to impart basic knowledge of various tools and their use in different sections of manufacturing such as fitting, carpentry, welding and machine shop etc. The objective of the course are to:

8. Understand importance of workshop practices along with safety precautions in different shops.
9. Understand the carpentry and fitting work by using various marking, measuring, cutting, striking and inspection tools.
10. Demonstrate simple joining processes and other basic processes like hand forging, sheet metal work, plumbing and plastic production process.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to workshop facility.	02
2.	Carpentry shop	06
3.	Fitting shop.	08
4.	Different Metal Joining Processes.	04
5.	Smithy shop.	02
6.	Sheet metal working.	02
7.	Plumbing shop.	02

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8.	Introduction to machine tools.	02
9.	Injection molding process.	02

Total hours (Lab): 30

Total hours: 30

C. Detailed Syllabus:

7. Introduction to workshop facility. 02 hours 07%

1.1 Familiarization with work shop facility.

1.2 Introduction to different shops of the workshop.

8. Carpentry Shop. 06 hours 20%

2.1 Introduction to different tools of carpentry shop.

2.2 Making of drawing of the job to be made.

2.3 Making of finished job as per drawing out of the given raw material of wood. Identification on the job for traceability.

9. Fitting Shop. 08 hours 27%

3.1 Introduction to different tools of fitting shop.

3.2 Making of drawing of the job to be made.

3.3 Making of finished job as per drawing out of the given raw material. Identification on the job for traceability.

10. Different Metal Joining Processes. **04 hours 14%**

4.1 Introduction to different tools of welding shop.

4.2 Making of drawing of the job to be made.

4.3 Making or demonstration of finished job as per drawing.

4.4 Introduction to Soldering and brazing of metal joining process.

4.5 Joining of two metal sheet or plate by Riveting.

4.6 Making of drawing of the job to be made by riveting.

4.7 Making or demonstration of finished job as per drawing.

11. Smithy Shop. 02 hours 07%

5.1 Introduction to different tools of smithy shop.

5.2 Making of drawing of the job to be made for Cold smithy.

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5.3 Making or demonstration of finished job as per drawing.

5.4 Making of drawing of the job to be made for Hot smithy.

5.5 Making or demonstration of finished job as per drawing.

12. Sheet Metal Working. **02 hours** **06%**

6.1 Introduction to different tools of sheet metal working shop.

6.2 Making of drawing of the job to be made from sheet metal.

6.3 Making or demonstration of finished job as per drawing.

13. Plumbing Shop. **02 hours** **06%**

7.1 Introduction to all plumbing tools.

7.2 Demonstration of plumbing on the piping model.

14. Introduction to Machine Tools. **02 hours** **07%**

8.1 Detailed introduction to Lathe machine, Shaping machine, Drilling machine, Grinding machine, Milling machine, Bending machine, Mechanical press.

15. Injection molding process. **02 hours** **06%**

9.1 Introduction and demonstration to Injection Molding Process for making job out of plastic material.

D. Instructional Method and Pedagogy:

- Attendance is compulsory in laboratory session.
- Journal writing based on above course content and practical work in form of performance practical's by preparing job at the workshop floor.
- In the laboratory discipline and behavior will be observed strictly.
- All the students must follow code of conduct during working at the shop floor.
- Journal should be submitted to the respective course teacher within the given time limit.

E. Student Learning Outcomes:

On the completion of the course one should be able to:

1. Recognize essential tools and process of carpentry.
2. Understand the joining process like welding, soldering and brazing.
3. Recognize essential tools and process of fitting.

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4. Recognize various forging and forming processes with the aid of smithy process.
5. Understand different types of sheet metal joints which are useful in working.
6. Recognize different types of fittings and plumbing tools.
7. Identify different machines in workshops along with use.
8. Recognize plastic molding processes.

F. Recommended Study Material:

Text Books:

1. Anderson, James, and Earl E. Tatro. "Shop Theory. 5th ed." (1968).

2. Bawa, H. S. Workshop Technology. India: Tata McGraw-Hill, (1995).

3. Choudhury, Hajra. "Elements of Workshop Technology, Vol. I & II." Media Promotors Pvt Ltd (2009).

4. Raghuwanshi, B. S. Course in Workshop Technology. Dhanpat Rai and Company (P) Limited, (2009).

Reference Books:

1. Chapman, W. A. J. "Workshop Technology Part 1-3." (1998).

2. Tejwani V.K., “Basic Machine Shop Practic e Vol. I, II”, Tata McGraw Hill Pub. Co., New Delhi, (1989).

3. Arora B.D., “Workshop Technology Vol. I, II”, Satya Prakashan, New Delhi, (1981).

Other materials:

Workshop book and manual.

Web sites: http://nptel.ac.in/courses/112107145/

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B.Tech.(Civil/Electrical/Mechanical) Engineering Programme

SYLLABI

(Semester – 2)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

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FACULTY OF MANAGEMENT STUDIES

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

HS121 A: STUDY OF ENGLISH LANGUAGE & LITERATURE

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2		2	2
Marks	50	50	100	

A. Objective of the Course:

To help learners to

- Develop familiarity with and proficiency in English language
- Learn the use of language at personal, academic and professional fronts
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Gain a knowledge of the major traditions of literatures, and an appreciation for the diversity of literary, cultural and social voices within

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Communicative English • Introduction to Communicative Grammar and Usage • Parts of Speech • Tenses and Moods • Reading Literature for English Language	08
2	Functional English • Introduction to Functional English • English for Personal and Social Use • English for Career and Professional Use	08
3	Literature Text and Appreciation	

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	• Introduction to Literature and Appreciation • Appreciation of Prose or Fiction • Appreciation of Poetry	08
4	Language, Literature and Contemporary Issues • Language, Culture and Society • Literature and contemporary issues	06

Total hours: 30

C. Instructional Method and Pedagogy:

Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations, etc.

- Out of 100 marks, 50 marks are for internal evaluation and 50 marks would be external evaluation.

D. Evaluation:

Internal Evaluation

The students' performance in the course will be evaluated (25 marks for theory and 25 marks for practical) on a continuous basis through the following components:

Theory

Sr. No.	Component	Number	Marks per Incidence	Total Marks
1	Assignment	02	10	20
2			Attendance	5
			Total	25

Practical

Sr. No	Component	Number	Marks per Incidence	Total Marks
1	Project	01	10	20
2	Term-work	-	10	10
			Attendance	5
			Total	25

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External Evaluation

The University examination will be for 50 marks (25 marks for theory and 25 marks for practical). The examination will avoid, as far as possible, direct questions on usage, grammar, errors, etc. and will focus on applications.

Theory

Sr. No.	Component	Number	Marks per Incidence	Total Marks
1	Theory Paper	01	25	25
			Total	25

Practical

Sr. No.	Component	Number	Marks per Incidence	Total Marks
1	Viva	01	25	25
			Total	25

E. Student Learning Outcomes:

At the end of the course, the students should have developed the ability to communicate effectively, they should be able to communicate message accurately, handle intercultural situation that require thoughtful communication, to use appropriate words and tones and so on. They should be able to understand and demonstrate communicative and functional use of English language. They should be able to appreciate literature and understand socio-cultural context.

F. Recommended Study Material:

❖ **Reference Books:**

1. Hurd Stella (2005), Success with Languages , Routledge
2. John Eastwood (2002) Oxford Practice Grammar, Oxford
3. Loiuse Mullany & Peter Stockwell (2010),Introduction to English Language, Routledge
4. Peter Brooker, Raman Saledan& Peter Widowson (2005), Reader's Guide to Contemporary literary theory, Pearson

❖ **Web Materials:**

1. http://www.ocr.org.uk/Images/72885-level-2-functional-skills-english-underpinning-skills-support-material-for-learners.pd

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FACULTY OF APPLIED SCIENCES

DEPARTMENT OF MATHEMATICAL SCIENCES

MA142: ENGINEERING MATHEMATICS –II

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	-	1	5	4
Marks	100	-	-	100	

A. Objective of the Course:

To study the fundamental concepts of Engineering Mathematics, so that students get a sound knowledge and important aspects of the subject.. The objectives of the course are to:

- Understand differential equations, partial differential equations and its solutions
- Understand Multiple Integration and solution techniques.
- Understand different types of Special Functions and its use in Engineering problems

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Ordinary Differential Equations	09
2	Linear Differential Equations	10
3	Partial Differential Equations	11
4	Applications of Ordinary Differential Equations and Partial Differential Equations	10
5	Multiple Integrals	10
6	Special Functions	10

Total hours (Theory): 60

Total hours (Lab): 00

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Total hours: 60

C. Detailed Syllabus:

1.	**First order and First degree Ordinary Differential Equations**	**09 Hours**	**14%**
1.1	Modelling of real world problems in terms of first order ODE		
1.2	Initial Value problems		
1.3	Concept of general and particular solutions		
1.4	Existence and Uniqueness solutions by illustrations		
1.5	linear, Bernoulli and Exact differential equations		
1.6	Solutions of First order First degree Differential Equations		
2.	**Higher Order Ordinary Linear Differential Equations**	**11 Hours**	**18%**
2.1	Model of real world problems of higher order LDE		
2.2	General Solution of Higher Order Ordinary Linear Differential Equations with Constant coefficients		
2.3	Methods for finding particular integrals viz. variation of parameters and undetermined coefficients		
2.4	LDE of higher order with variable coefficients viz Cauchy-Euler and Legendre's Equations		
2.5	System of Simultaneous first order linear differential equations		
3	**Partial Differential Equations**	**10 Hours**	**17%**
3.1	Modeling of real world problem in terms of first order PDE		
3.2	Initial and Boundary valued conditions		
3.3	Methods of solutions of first order PDE viz.		
3.4	Langrange's Linear Partial Differential Equations		
3.5	Special types of Nonlinear PDE of the first order		
4	**Applications of Differential Equations**	**10 Hours**	**17%**
4.1	Applications of ODE: Orthogonal Trajectories, Mechanical vibration system, Electrical circuit system, deflection of beams.		
4.2	Application of PDE: Heat, wave, Laplace equations and their solution by method of separation of variables and Fourier series.		
5	**Multiple Integrals**	**10 Hours**	**17%**
5.1	Evaluation of double and triple integrals		
5.2	Change of order of integration		

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5.3 Transformation to polar, spherical and cylindrical coordinates

5.4 applications of double and triple integrals: area, volume and mass

6. Special Functions **10 Hours 17%**

6.1 Improper integrals and their convergence

6.2 Definitions, properties and examples of Beta, Gamma and error functions

6.3 Bessel functions and their Properties

6.4 Legendre's polynomials and their Properties

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weighting of 5%.
- Two Quizzes (surprise test) will be conducted which carries 5% component of the overall evaluation.

E. Student Learning Outcomes:

- At the end of the course the students will be able to understand the fundamental concepts of Engineering Mathematics. Students will be able to apply these concepts to Mathematics for higher semesters in courses other than Mathematics.

F. Recommended Study Material:

❖ **Text Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Ed., Jhon Wiley & Sons, India, 1999.

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❖ **Reference Books:**

1. M.D. Weir, et. al., Thomas' Calculus, 11th Ed., Pearson Education, 2008
2. Stewart James, Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. Wylie & Barrett, Advanced Engineering Mathematics, Mc graw Hill pub.
4. Greenberg, M. D., Advanced Engineering Mathematics, 2nd ed., Pearson

❖ **Web Materials:**

1. http://mathworld.wolfram.com/
2. http://en.wikipedia.org/wiki/Math

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FACULTY OF TECHNOLOGY & ENGINEERING

MANUBHAI SHIVABHAI PATEL DEPARTMENT OF CIVIL ENGINEERING

CL142: ENVIRONMENTAL SCIENCES

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	0	-	2	2
Marks	100	0	-	100	

A. Objective of the Course:

- To impart basic knowledge about environment and thereby developing an attitude of concern towards environment.
- To inculcate alertness towards environment.
- To make awareness on delineating on various environmental pollution and their effects on environment.
- To deliver a comprehensive insight into natural resources, ecosystem and biodiversity.
- To develop the curiosity and visionary of student in relation to environment.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction	05
2	Environmental Pollution	12
3	Ecology & Ecosystems	10
4	Natural Resources	03

Total hours (Theory): 30

Total hours (Lab): 00

Total hours: 30

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C. Detailed Syllabus:

1	**Introduction**	**05 Hours**	**24%**
1.1	Basic definitions		
1.2	Objectives and guiding principles of environmental studies		
1.3	Components of environment		
1.4	Structures of atmosphere		
1.5	Man-Environment relationship		
1.6	Impact of technology on the environment		
2	**Environmental Pollution**	**12 Hours**	**33%**
2.1	Environmental degradation		
2.2	Pollution, sources of pollution, types of environmental pollution		
2.3	Air pollution: Definition, sources of air pollution, pollutants, classifications of air pollutants (common like SO_X & NO_X), sources & effects of common air pollutants		
2.4	Water pollution: Definition, sources water pollution, pollutants & classification of water pollutants, effects of water pollution, eutrophication		
2.5	Noise pollution: Sources of noise pollution, effects of noise pollution		
2.6	Ill Effects of Fireworks: Severity of toxicity, environmental effects and health hazards.		
2.7	Current environmental global issues, global warming & green houses, effects, acid rain, depletion of Ozone layer		
3	**Ecology & Ecosystems**	**10 Hours**	**33%**
3.1	Ecology: Objectives and classification		
3.2	Concept of an ecosystem: Structure & function		
3.3	Components of ecosystem: Producers, consumers, decomposers		
3.4	Bio-Geo-Chemical cycles & its environmental significance		
3.5	Energy flow in ecosystem		
3.6	Food Chains: Types & food webs		
3.7	Ecological pyramids		
3.8	Major ecosystems		

4	**Natural Resources**	**03 Hours**	**10%**
4.1	Natural ressources: Renewable resources, non-renewable resources, destruction versus conservation		
4.2	Energy resources: Conventional energy sources & its problems, non-conventional energy sources-advantages & its limitations , problems due to overexploitation of energy resources		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures which carries 10 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.

E. Student Learning Outcomes:

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

- To perceive the elementary knowledge about natural environment and its relation with science.
- To identify and analyze human impacts on the environment.
- To understand the facts and concepts of natural and energy resources thereby applying them to lessen the environmental degradation.
- To communicate on recent environmental problems thereby creating awareness among society

F. Recommended Study Material:

❖ **Text Books:**

1. Varandani, N.S., Basics of Environmental Studies
2. Sharma, J. P., Basics of Environmental Studies

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❖ **Reference Books:**

1. Shah Shefali & Goyal Rupali, Basics of Environmental Studies
2. Agrawal, K.C., Environmental Pollution : Causes, Effects & Control
3. Dameja, S. K., Environmental Engineering & Management
4. Rajagopalan, R., Environmental Studies, Oxford University Press
5. Wright Richard T. & Nebel Bernard J., Environmental Science
6. Botkin Daniel B. & Edward A. Keller, Environmental Science
7. Shah, S.G., Shah, S.G. & Shah, G. N., Basics of Environmental Studies, Superior Publications, Vadodara

❖ **Web Materials:**

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Environmental%20Air%20Pollution/index.htm
2. http://nptel.iitm.ac.in/video.php?subjectId=105104099
3. http://apollo.lsc.vsc.edu/classes/met130/notes/chapter1/vert_temp_all.html
4. http://www.epa.gov
5. http://www.globalwarming.org.in
6. http://nopr.niscair.res.in
7. http://www.indiaenvironmentportal.org.in

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FACULTY OF TECHNOLOGY & ENGINEERING

DEPARTMENT OF INFORMATION TECHNOLOGY

IT141: FUNDAMENTALS OF COMPUTER PROGRAMMING

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the course:

The main objectives for offering the course fundamental of computer programming are:

1. To understand basic working of computer and relation of various numerical systems
2. To solve various mathematical problems using algorithms and flowcharts by analyzing and explaining the behavior of simple programs.
3. To study structural programming concepts using various control statements and implement them in C programming language.
4. To study about different concepts, methods of programming and data structures available in C language.
5. To develop programming paradigms through implementing basic mathematical andreal worldproblems.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Computation	03
2	Algorithms for Problem Solving	03
3	Introduction to Programming	02
4	Introduction to ‘C’ language	02
5	Constants, Variables & Data Types in ‘C’	03
6	Operators and Expression in ‘C’	03

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7	Managing Input & Output Operations	03
8	Conditional Statements & Branching	04
9	Looping	04
10	Arrays	04
11	Character Arrays	03
12	User-Defined Functions in 'C'	05
13	Structures and Basics of pointer	06

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed syllabus

Following contents will be delivered to the students during laboratory sessions.

1 Introduction to Computation 03Hours 6%

1.1 Various number systems: Decimal, Binary, Octal, Hexadecimal, conversion from one number system to another

1.2 The basic model of Computation

1.3 What is computer, Algorithms, Flow-charts

2 Algorithms for Problem Solving 03 Hours 6%

2.1 Solve Various types of algorithms like Exchanging values oftwo variables, (using 3 variables & 2 variables), Arrangenumbers in ascending order, Evaluate various series e.g.: sin x, 1^2-2^2+3^2-…, 1+2/2!+3/3!+…,

3 Introduction to Programming 02 Hours 4%

3.1 What is program & programming, programming languages, types of languages, compiler, and interpreter

4 Introduction to 'C' language 02 Hours 4%

4.1 History of C, Characteristics of C, Basic structure of a program, Compilingprocess of C a Program

5 Constants, Variables & Data Types in 'C' 03 Hours 6%

5.1 Character set, C tokens, Keyword, Constants, and Variables

5.2 Data types – declaration & initialization, User-defined typedeclaration - typedef, enum, Basic input and outputoperations, Symbolic constant (#define)

6 Operators and Expression in 'C' 03 Hours 6%

6.1 Classification of operators: arithmetic, relational, logical, assignment, increment / decrement, bitwise, special operators. Unary, binary and ternary operators

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6.2 Arithmetic expression, evaluation, type conversion: implicit& explicit, precedence and associativity, use of math.h file

7 Managing Input & Output Operations 03 Hours 6%

7.1 Input a character, introduction to ASCII code, various libraryfunctions from ctype.h

7.2 Formatted input using scanf( ), formatted output of integerand real data using printf ( )

8 Conditional Statements & Branching 04 Hours 10%

8.1 Decision making using if, if…else statement, nesting of if…else,else…if Ladder

8.2 *switch*, use of if…else instead of conditional operator, *goto*statement

9 Looping 04 Hours 10%

9.1 Need of looping, entry-controlled loop: while, for, exit-controlledloop: do…while, difference

9.2 Nesting of looping statements, use of break and continue, useof if, if…else in loop

10 Arrays 04 Hours 10%

10.1 Need of array, declaration & initialization 1D array, variousprograms of 1D

10.2 2D array and their memory allocation, 2D array basicprograms and matrix operations

11 Character Arrays 03 Hours 6%

11.1 Difference of character array with numeric array andimportance of NULL character

11.2 Declaration, initialization and various input and outputmethods of string, formatted output of string, arithmeticoperations on characters

12 User-Defined Functions in 'C' 05 Hours 12%

12.1 Need of modularization, advantages, introduction to user-definedfunction, form of C functions, function prototype, function call, function body

12.2 Call by value, actual & formal arguments, use of return,nesting of functions,recursion

12.3 Array as function arguments, storage classes: scope, life of avariable in C

13 Structures and Basics of pointer 06 Hour 14%

13.1 Need of user-defined data type, structure definition,declaration and initialization of variables, array of structurevariables

13.2 Background of memory, variable, value, address of variable,introduction to pointer,declaration & initialization, accessvalue using pointer, indirection (*) operator

D. Instructional method and pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject willbe discussed.Lectures will be conducted with the aid of multi-media projector, black board,OHP etc.

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- Two internal exams will be conducted and average of the same will be convertedto equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment/Surprise tests/Quizzes/Seminar will be conducted which carries 5Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build anappreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in thelaboratory and tutorial session respectively.

E. Student learning outcome:

Upon completion of this course,

1. A student will be able to study, analyze and understand logical structure of a computer program and different construct to develop a program in 'C' language.
2. He will be able to analyze the complexity of problems, modularize the problems into small modules and then convert them into programs.
3. He will be able todevelop efficient programs related to scientific & machine simulationsfor their future projects.
4. He will be able to apply and practice logical ability to solve the real world problems.

F. Recommended study material:

Text books:

1. Programming in ANSI C, E.Balagurusamy, Tata McGraw Hill.

Reference books:

1. C Programming Language (2nd Edition), Brian W. Kernighan, Dennis M. Ritchie, Prentice-Hall (PHI)
2. C: The Complete Reference, Herbert Schildt, McGrawHill
3. Let us C: Yashwant Kanetkar, BPB publications new delhi
4. Computer programming and utilization: M.T.Savaliya, Atul Prakashan
5. Computer concepts and Programming , Vikas Gupta, DreamTech
6. Computer fundamentals and Programming in C, Pradip dey and Manas Ghosh, Oxford.

URL Links:

1. http://www.tutorials4u.com/c/
2. http://www.cprogramming.com/tutorial.html
3. http://www.howstuffworks.com/c.htm
4. http://www.programmingtutorials.com/c.aspx
5. http://www.physics.drexel.edu/courses/Comp_Phys/General/C_basics/

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FACULTY OF TECHNOLOGY & ENGINEERING

CHAMOS MATRUSANSTHA DEPARTMENT OF MECHANICAL ENGINEERING

ME 143: BASICS OF CIVIL AND MECHANICAL ENGINEERING

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

This course covers the basics of mechanical and civil engineering. The objectives of the course are to:

1. Introduce the important aspects and applications of mechanical engineering
2. Explain the working of different mechanical systems.
3. Understand the scope and basic elements of civil engineering.
4. Understand the concepts of building planning, surveying and properties of different building materials.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Introduction of Mechanical Engineering	07
2.	Steam and Steam Generator	04
3.	Internal Combustion Engines	06
4.	Pumps and Compressors	03
5.	Refrigeration and Air Conditioning Systems	05
6.	Power and Motion Transmission	05
7.	Scope of Civil Engineering	02
8.	Introduction to Surveying	06

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9.	Linear Measurements	07
10.	Elements of building Construction	13
11.	Construction Materials	02

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

PART A:

1. Introduction of Mechanical Engineering 07 Hours 12%

1.1 Prime movers and its types, Sources of energy

1.2 Basic terminology: Force and mass, Pressure, Work, Power, Energy, Heat, Temperature, Units of heat, Specific heat capacity, Interchange of heat, Change of state, Internal energy, Enthalpy, Entropy, Efficiency

1.3 Zeroth Law and First Law of Thermodynamic, Boyle's law, Charle's law and Combined gas law, Relation between Cp and Cv

1.4 Constant volume process, Constant pressure process, Isothermal process, poly-tropic process, adiabatic process

1.5 Numerical

2. Steam and Steam Generator 04 Hours 08%

2.1 Introduction to steam formation and its types

2.2 Introduction to steam table

2.3 Calorimeter and its types

2.4 Boiler definition and its classification

2.5 Cochran boiler, Babcock and Wilcox boiler and its mountings and accessories

2.6 Efficiencies of boiler

3. Internal Combustion Engines 06 Hours 12%

3.1 Introduction

3.2 Basic terminology of I.C. engine

3.3 Types of I. C. engines

3.4 Efficiencies of an engine

3.5 Numerical

4. Pumps and Compressors 03 Hours 5%

4.1 Introduction

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4.2	Classification and application of pumps and compressors,		
4.3	Working of Reciprocating and Centrifugal Pump		
5.	**Refrigeration and Air Conditioning Systems**	**05 Hours**	**6%**
5.1	Introduction to refrigeration and air conditioning		
5.2	Basic terminology, Principal and application of refrigeration		
5.3	Vapour compression refrigeration system		
5.4	Domestic refrigerator		
5.5	Window and split air conditioning systems		
6.	**Power and Motion Transmission**	**05 Hours**	**6%**
6.1	Introduction		
6.2	Types of couplings, brakes and clutches.		
6.3	Belt drive and its types		
6.4	Gear drives and its types, Gear trains, Chain drives		

PART B:

7.	**Scope of Civil Engineering**	**02 Hours**	**04%**
7.1	Scope of Civil Engineering, Branches of civil engineering, Role of civil engineer		
8.	**Introduction to Surveying**	**06 Hours**	**10%**
8.1	Definition of surveying, Objects of surveying, Uses of surveying,		
8.2	Primary divisions of surveying, Principles of surveying,		
8.3	List of classification of surveying, Definition: Plan and Map, Scales : Plain scale and Diagonal scale, Conventional Symbols		
9.	**Linear and Angular Measurements**	**07 Hours**	**12%**
9.1	Instruments used in chaining, Principle of Chain surveying and terms used in chain surveying, Ranging, Errors in chaining,		
9.2	Examples on errors in chaining		
9.3	Introduction to angular measurements, Concepts of land profiling		
10.	**Elements of building Construction**	**13Hours**	**20%**
10.1	Types of building, Design loads, Building components (super structure and substructure), Principles of Planning, Basics Requirements of a building Planning, Types of Residential Building, Line Diagram, site plan, layout plan and key plan.		

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10.2 Basic architectural plan development from line diagram for residential building

11. Construction Materials 02 Hours 04%

11.1 Types , Uses and Properties of Brick, Cement, Concrete & Timber

D Instructional Methods and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.
- Industrial visits will be organized for students to explore industrial facilities. Students are required to prepare a report on industrial visit and submit as a part of the assignment.

E Student Learning Outcomes:

On the completion of the course one should be able to:

1. Understand fundamental principles, theory and applications of mechanical engineering which plays an important role in industries.
2. Learn the formation of different types of steam and utilize it for the boiler.
3. Understand the basics of internal combustion engine, refrigeration and air conditioning system.
4. Learn different power and motion transmission systems and their applications.
5. Understand importance and application of civil engineering.
6. Understand the fundamentals of surveying and be able to carry out simple survey exercise.
7. Learn about different building components, building planning and design of residential building.
8. Recognize properties of different building materials.

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F Recommended Study Material:

Text Books:

1. S.M.Bhatt, H.G.Katariya, J.P.Hadiya, "Elements of Mechanical Engineering", Books India Publication, Ahmedabad.
2. P.S.Desai, S.B.Soni, "Elements of Mechanical Engineering", Atul Prakashan, Ahmedabad

Reference Book:

1. Dr. Sadhu Singh, "Elements of Mechanical Engineering", S.CHAND Publication, New Delhi
2. V.K.Manglik, "Elements of Mechanical Engineering", PHI Learning, Delhi.
3. Khasia R.B. and Shukla R.N., "Elements of Civil Engineering", Mahajan Publication.
4. Kandya Anurag, "Elements of Civil Engineering", Charotar Publishing House Pvt. Ltd.
5. Punamia B.C., "Surveying", Vol. I & II.

Reading Materials, web materials with full citations:

1. http://nptel.ac.in/downloads/112105125/
2. http://www.slideshare.net/allsaintsscience/7th-grade-ch-2-sec-3-behavior-of-gases?qid=75b08741-fb53-4413-b434-5982afe602bf&v=&b=&from_search=12
3. http://www.slideshare.net/Arjun_Dedaniya/properties-of-steam-62226458?qid=fa8777fd-b543-4128-813c-cf3af3b86579&v=&b=&from_search=2
4. http://www.slideshare.net/shanus1/i-c-engines-a-study?qid=69826356-b9ed-4618-9c77-b2d5a3eac2e3&v=&b=&from_search=8
5. http://nptel.ac.in/syllabus/syllabus.php?subjectId=105104101
6. http://nptel.ac.in/courses/105107122/

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FACULTY OF TECHNOLOGY & ENGINEERING

M & V PATEL DEPARTMENT OF ELECTRICAL ENGINEERING

EE141: BASICS OF ELECTRONICS & ELECTRICAL ENGINEERING

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objectives of the Course:

This course covers the basic principles and laws of electrical and electronics engineering with emphasis on the analysis and application to simple practical engineering problems.

The course objectives (CO) are to:

1. Introduce basic terms and units related to electrical engineering
2. Understand the basic concepts in the field of electrical and electronics engineering
3. Focus on the fundamentals of electrostatic and electromagnetism
4. Analyze the series and parallel AC systems
5. Solve single phase and polyphase circuits
6. Comprehend electronic devices, digital numbers, logic gates and communication systems.

B. Outline of the course:

Sr. No.	Title of Units	Minimum Number of Hours
1.	Basic Electrical Terms and Units	06
2.	Electrical Circuit Analysis	08
3.	Electrostatic	08
4.	Electromagnetism	08
5.	AC and DC Fundamentals	06
6.	Single Phase AC Series and Parallel Circuits	07
7.	Polyphase Circuits	05
8.	Basic of Electronics	12

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Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Basic Electrical Terms and Units**	**06 Hrs**	**10%**
1.1	Basic terms related to electrical engineering, their definition, units and symbols, equations		
1.2	Ohm's law, resistor and its coding, properties, temperature co-efficient of resistance, resistance variation with temperature, examples		
2	**Electrical Circuit Analysis**	**08 Hrs**	**13%**
2.1	Kirchoff's current and voltage law, mesh and nodal analysis, Examples		
2.2	Series-parallel network, Star-Delta transformations, potential divider		
3	**Electrostatic**	**08 Hrs**	**13%**
3.1	Capacitors, charge and voltage, capacitance, electric fields, electric field strength and electric flux density, relative permittivity, dielectric strength, Examples		
3.2	Capacitors in parallel and series, Calculation of capacitance of parallel plate and multi plate capacitor, examples		
3.3	Energy stored in capacitors, types of capacitor, charging and discharging of capacitors on DC, examples		
4	**Electromagnetism**	**08 Hrs**	**13%**
4.1	Magnetic field, its direction and characteristics, magnetic flux and flux density, magneto motive force and magnetic field strength, examples		
4.2	Faraday's law of electromagnetic induction, Fleming's left hand and right hand rule, Lenz law, force on a current carrying conductor, examples		
4.3	Self and mutual inductance, coefficient of coupling, series and parallel combination of inductances, rise and decay of current in an inductive circuit in DC, examples		
4.4	Comparison between electrical & magnetic circuits		
5	**AC and DC Fundamentals**	**06 Hrs**	**10%**
5.1	Generation of AC and DC voltage, Waveform and definition of its terms, relation between speed, frequency and pole		
5.2	Average and RMS value and its determination for sinusoidal and non-sinusoidal wave shapes, examples		

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5.3	Phasor representation of alternating quantities		
6	**Single Phase AC Series and Parallel Circuits**	**07 Hrs**	**13%**
6.1	R –L and R-C series circuit, power in ac circuits, examples		
6.2	R-L-C series circuit, resonance in R-L-C series and parallel circuit, Q – factor and bandwidth, examples		
6.3	Solution of series and parallel circuits, phasor method, admittance method, complex algebra method, examples.		
7	**Polyphase Circuits**	**05 Hrs**	**08%**
7.1	Generation of three phase emf, phase sequence, Definitions		
7.2	Star and delta connection of three phase system, voltage and current relations in star and delta connected system, Examples		
8	**Basics of Electronics**	**12 Hrs**	**20%**
8.1	Electronic Systems: Basic amplifier, voltage, current and power gain, Basic attenuators, CRO		
8.2	Transmission and Signals: Analog and digital signals, bandwidth, modulation and demodulation, Filters		
8.3	Forward and reverse bias of PN junction diode, zener diode, Rectifiers: Half wave, full wave – bridge and centre tap, L and C filters for smoothing		
8.4	Transistor: Bipolar junction transistor, construction and biasing, configuration, transistor as a switch and amplifier		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

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- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcomes:

On the completion of the course one should be able to:

- Identify resistors, capacitors and inductors reating
- Understand the basic electrical laws and apply these laws to solve electrical network
- Identify the property of magnetic materials and understand the laws of emf generation
- Solve the series and parallel AC and DC circuits for single and polyphase networks.
- Define different terms of alternating quantities
- Design AC-DC rectification circuits, operate basic electrical and electronics instruments
- Operate the circuits with logical gates and transistors

F. Recommended Study Material:

Text Books:

1. Elements of Electrical Engineering and Electronics by U.A. Patel and R.P. Ajwalia
2. A Text Book of Electrical Technology by B. L. Thareja, S. Chand
3. Principles of Electrical Engineering and Electronics by V.K. Mehta, S. Chand

Reference Books:

1. Hughes, Electrical Technology, Pearson Education
2. Electrical Engineering by Del Toro

Web Material:

1. Exploring Electrical Engineering

https://www.facstaff.bucknell.edu/mastascu/eLessonsHTML/EEIndex.html

2. Video lectures by Prof. Umanand, IISc Banglore on Basic Electrical Technology

http://nptel.ac.in/courses/108108076/#

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CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CHANDUBHAI S. PATEL INSTITUTE OF TECHNOLOGY

TIME TABLE **SEMESTER-I** **AY-2017-18**

FY B.TECH DIV 1 **CLASS: CL-I** **ROOM NO: 707**

DAY/TIME	MON			TUE			WED	THU			FRI	SAT
09:10 : 10:10	CL 141 (B) PCP (628-B)	SC/SS (C)	PY 141 (A) SDK (724)	CL 141 (B) VSS (628-B)	SC/SS (B)	PY 141 (C) MNS (724)	ME 141 (A/B/C) SVD/KKP/NG (726/727)	CL 141 (C) MK (628-B)	SC/SS (A)	PY 141 (B) MNS (724)	CL 141 FMS (707)	SC/SS (A/B/C)
10:10 : 11:10											MA 141 RVS (707)	
11:10 : 12:10	**BREAK**											
12:10 : 01:10	MA 141 B1 RVS (707)	MA 141 B2 NCP (708)		ME 141 SVD (707)			MA 141 MHC (707)	MA 141 MHC (707)			ME 141 SVD (707)	SC/SS (A/B/C)
01:10 : 02:10	CL 141 PCP (707)			PY 141 USS (707)			PY 141 MNS (707)	CL 141 PCP (707)			PY 141 SDK (707)	
02:10 : 2:20	**SHORT BREAK**											
02:20 : 03:20	MA 141 RVS (707)			ME 142 (A/B/C) HB/AS/MO (126)			SC/SS (A/B/C)	HS 101/(Extra lectures/Tutorial/library) (A/B/C)			ME 141 (A/B/C) RP/KKP/NG (726/727)	SC/SS (A/B/C)
03:20 : 04:20	CL 141 FMS (707)											

MA141	ENGINEERING MATHEMATICS-I	**RVS**	Mr. RAJESH V SAVALIA	**MHC**	Dr. MEERA CHUDASAMA	**NCP**	NIRU PATEL
CL141	ENGINEERING MECHANICS	**PCP**	PINAL PATEL	**FMS**	FARHANA SAIYAD	**MK**	MEHUL KATAKIYA
ME141	ENGINEERING GRAPHICS	**SVD**	SUJAL DADHANIYA	**KKP**	KHUSHBU PURANI	**NG**	NIPUN GOSAI
PY141	ENGINEERING PHYSICS	**MNS**	Dr. MANAN SHAH	**SDK**	SANNI KAPATEL	**USS**	URVESH SONI
ME142	WORKSHOP PRACTICES	**HB**	HARMISH BHATT	**AS**	ABHISHEK SWARNKAR	**MO**	MADHAV OZA
SC/SS	ASSIGNMENT PRACTICES/STUDUENT COUNSELLING /REMEDIAL CLASSES						
HS101A	A COURSE FROM LIBERAL ARTS						

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CHANDUBHAI S. PATEL INSTITUTE OF TECHNOLOGY

TIME TABLE **SEMESTER-I** **AY-2017-18**

FY B.TECH DIV 2 **CLASS: CL-II** **ROOM NO: 708**

DAY/TIME	MON	TUE	WED	THU	FRI	SAT
09:10 : 10:10	MA 141 MHC (708)	CL 141 PCP (708)	MA 141 RVS (708)	CL 141 MJ (708)	CL 141 (B) HKS (628-B) / SC/SS (C) / PY 141 (A) USS (724)	SC/SS (A/B/C)
10:10 : 11:10	PY 141 MNS (708)	MA 141 MHC (708)	ME 141 VP (708)	MA 141 RVS (708)		
11:10 : 12:10	**BREAK**					
12:10 : 01:10	ME 141 (A/B/C) VP/ZS/RP (726/727)	ME 141 VP (708)	CL 141 PCP (708)	ME 141 (A/B/C) VP/ZS/RP (726/727)	CL 141 MJ (708)	SC/SS (A/B/C)
01:10 : 02:10		PY 141 SDK (708)	PY 141 USS (708)		SC/SS (A/B/C)	
02:10 : 2:20	**SHORT BREAK**					
02:20 : 03:20	CL 141 (C) SCP (628-B) / SC/SS (A) / PY 141 (B) SDK (724)	HS 101/(Extra lectures/Tutorial/library) (A/B/C)	CL 141 (A) PMS (628-B) / SC/SS (B) / PY 141 (C) USS (724)	MA 141 B1 MHC (707) / MA 141 B2 RSU (708)	ME 142 (A/B/C) AS/AV/YP (126)	SC/SS (A/B/C)
03:20 : 04:20				SC/SS (A/B/C)		

MA141	ENGINEERING MATHEMATICS-I	**RVS**	Mr. RAJESH V SAVALIA	**MHC**	Dr. MEERA CHUDASAMA	**RSU**	Mr. RAKSHIT UPADHYAY
CL141	ENGINEERING MECHANICS	**PCP**	PINAL PATEL	**MJ**	MOHAMMAD JINYAWALA	**HKS**	HITESHREE SHASTRI
ME141	ENGINEERING GRAPHICS	**VP**	VIRAL PANARA	**ZS**	ZANKHAN SONARA	**RP**	RUGNESH PATEL
PY141	ENGINEERING PHYSICS	**MNS**	Dr. MANAN SHAH	**SDK**	SANNI KAPATEL	**USS**	URVESH SONI
ME142	WORKSHOP PRACTICES	**AS**	ABHISHEK SWARNKAR	**AV**	AKASH VYASS	**YP**	YOGIN PATEL
SC/SS	ASSIGNMENT PRACTICES/STUDUENT COUNSELLING /REMEDIAL CLASSES						
HS101A	A COURSE FROM LIBERAL ARTS						

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CHANDUBHAI S. PATEL INSTITUTE OF TECHNOLOGY

TIME TABLE **SEMESTER-I** **AY-2017-18**

FY B.TECH DIV 3 **CLASS: ME-I** **ROOM NO: 709**

DAY/TIME	MON	TUE	WED			THU	FRI	SAT		
09:10 : 10:10	ME 141 (A/B/C) SC/KKP/ST (726/727)	ME 141 SC (709)	CL 141 (B) MK (628-B)	SC/SS (C)	PY 141 (A) USS (724)	CL 141 FMS (709)	ME 141 SC (709)	SC/SS (A/B/C)		
10:10 : 11:10		MA 141 RVS (709)				MA 141 RRS (709)	PY 141 SDK (709)			
11:10 : 12:10	**BREAK**									
12:10 : 01:10	CL 141 FMS (709)	ME 141 (A/B/C) SC/KKP/ST (726/727)	MA 141 B2 JRP (709)	MA 141 B1 RSU (709)		CL 141 (A) KD (628-B)	SC/SS (B)	PY 141 (C) MNS (724)	MA 141 RRS (709)	CL 141 (C) SCP (627-A)	SC/SS (A)	PY 141 (B) MNS (724)
01:10 : 02:10	MA 141 RVS (709)		SC/SS (A/B/C)						CL 141 PMS (709)			
02:10 : 2:20	**SHORT BREAK**									
02:20 : 03:20	PY 141 MNS (709)	PY 141 USS (709)	ME 142 (A/B/C) KAP/AS/AV (126)			HS 101A/(Extra lectures/Tutorial/library) (A/B/C)	SC/SS (A/B/C)	CL 141 (C) SCP (628-B)	SC/SS (A)	PY 141 (B) MNS (724)
03:20 : 04:20	SC/SS (A/B/C)	CL 141 PMS (709)								

MA141	ENGINEERING MATHEMATICS-I	**RRS**	MRS. RESHMA SANJHIRA	**RVS**	Mr. RAJESH V SAVALIA	**JRP**	Dr. JIMIT R PATEL
CL141	ENGINEERING MECHANICS	**PMS**	PINKY SHARMA	**FMS**	FARHANA SAIYAD	**KD**	KANCHAL DAVE
ME141	ENGINEERING GRAPHICS	**SC**	SAGAR CHOKSHI	**KKP**	KHUSHBU PURANI	**ST**	SATAYU TRAVADI
PY141	ENGINEERING PHYSICS	**MNS**	Dr. MANAN SHAH	**SDK**	SANNI KAPATEL	**USS**	URVESH SONI
ME142	WORKSHOP PRACTICES	**KAP**	KEVAL PATEL	**AS**	ABHISHEK SWARNKAR	**AV**	AKASH VYAS
SC/SS	ASSIGNMENT PRACTICES/STUDUENT COUNSELLING /REMEDIAL CLASSES						
HS101A	A COURSE FROM LIBERAL ARTS						

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CHANDUBHAI S. PATEL INSTITUTE OF TECHNOLOGY

TIME TABLE **SEMESTER-I** **AY-2017-18**

FY B.TECH DIV 4 **CLASS: ME-II** **ROOM NO: 710**

DAY/TIME	MON	TUE	WED	THU	FRI	SAT
09:10 : 10:10	MA 141 RRS (710)	ME 141 ST (710)	PY 141 MNS (710)	MA 141 B1 RSU (710) / MA 141 B2 JRP (710)	ME 141 (A/B/C) ST/SVD/KKP (726/727)	CL 141 (C) MK (628-B) / SC/SS (A) / PY 141 (B) MNS (724)
10:10 : 11:10	CL 141 AJW (710)	CL 141 PMS (710)	CL 141 AJW (710)	PY 141 USS (710)		
11:10 : 12:10	**BREAK**					
12:10 : 01:10	SC/SS (A/B/C)	PY 141 SDK (710)	ME 141 (A/B/C) ST/SVD/KKP (726/727)	CL 141 PMS (710)	ME 142 ST (710)	SC/SS (A/B/C)
01:10 : 02:10		MA 141 RVS (710)		MA 141 RVS (710)	MA 141 RRS (710)	
02:10 : 2:20	**SHORT BREAK**					
02:20 : 03:20	ME 142 (A/B/C) KAP/MO/YP (126)	CL 141 (B) FMS (628-B) / SC/SS (C) / PY 141 (A) MNS (724)	HS 101/(Extra lectures/Tutorial/library) (A/B/C)	CL 141 (A) FMA (628-B) / SC/SS (B) / PY 141 (C) USS (724)	SC/SS (A/B/C)	CL 141 (C) MK (627-A) / SC/SS (A) / PY 141 (B) SDK (724)
03:20 : 04:20						

MA141	ENGINEERING MATHEMATICS-I	**RRS**	MRS. RESHMA SANJHIRA	**RVS**	Mr. RAJESH V SAVALIA	**JRP**	Dr. JIMIT PATEL
CL141	ENGINEERING MECHANICS	**PMS**	PINKY SHARMA	**AJW**	ANKIT WANAKAWALA	**MK**	MEHUL KATAKIYA
ME141	ENGINEERING GRAPHICS	**ST**	SATAYU TRAVADI	**SVD**	SUJAL DADHANIYA	**KKP**	KHUSHBU PURANI
PY141	ENGINEERING PHYSICS	**MNS**	Dr. MANAN SHAH	**SDK**	SANNI KAPATEL	**USS**	URVESH SONI
ME142	WORKSHOP PRACTICES	**KAP**	KEVAL PATEL	**MO**	MADHAV OZA	**YP**	YOGIN PATEL
SC/SS	ASSIGNMENT PRACTICES/STUDUENT COUNSELLING /REMEDIAL CLASSES						
HS101A	A COURSE FROM LIBERAL ARTS						

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CHANDUBHAI S. PATEL INSTITUTE OF TECHNOLOGY

TIME TABLE **SEMESTER-I** **AY-2017-18**

FY B.TECH DIV 5 **CLASS: EE-I** **ROOM NO: 707/708/709/710**

DAY/TIM	MON	TUE	WED	THU	FRI	SAT
09:10 : 10:10	MA 141 RVS (707)	MA 141 MHC (707)	HS 101A/(Extra lectures/Tutorial/library) (A/B/C)	ME 141 SC (707)	CL 141 MJ (708)	SC/SS (A/B/C)
10:10 : 11:10	PY 141 USS (707)	PY 141 SDK (707)		CL 141 PMS (707)	MA 141 MHC (708)	
11:10 : 12:10	**BREAK**					
12:10 : 01:10	ME 142 (A/B/C) KAP/AS/YP (126)	CL 141 (B) MK (628-B)	SC/SS (C)	PY 141 MNS (710)	SC/SS (A/B/C)	CL 141 (A) VSS (628-B)	SC/SS (B)	PY 141 (A) MNS (724)	SC/SS (A/B/C)
01:10 : 02:10				ME 141 SC (710)				PY 141 (C) USS (724)	
02:10 : 2:20	**SHORT BREAK**					
02:20 : 03:20	CL 141 PMS (708)	ME 141 (A/B/C) SC/ST/VHP (726/727)	MA 141 RVS (707)	ME 141 (A/B/C) SC/ST/SVD (726/727)	CL 141 (C) MJ (628-B)	SC/SS (A)	PY 141 (B) USS (724)	SC/SS (A/B/C)
03:20 : 04:20	MA 141 B1 NCP (709) / MA 141 B1 RSU (710)		CL 141 MJ (707)					

MA141	ENGINEERING MATHEMATICS-I	**RVS**	Mr. RAJESH V SAVALIA	**MHC**	Dr. MEERA CHUDASAMA	**RSU**	Mr. RAKSHIT UPADHYAY
CL141	ENGINEERING MECHANICS	**PMS**	PINKY SHARMA	**MJ**	MOHAMMAD JINYAWALA	**VSS**	VIRAG SHAH
ME141	ENGINEERING GRAPHICS	**SC**	SAGAR CHOKSHI	**ST**	SATAYU TRAVADI	**VHP**	VIKAS PANCHAL
PY141	ENGINEERING PHYSICS	**MNS**	Dr. MANAN SHAH	**SDK**	SANNI KAPATEL	**USS**	URVESH SONI
ME142	WORKSHOP PRACTICES	**KAP**	KEVAL PATEL	**AS**	ABHISHEK SWARNKAR	**YP**	YOGIN PATEL
SC/SS	ASSIGNMENT PRACTICES/STUDUENT COUNSELLING /REMEDIAL CLASSES						
HS101A	A COURSE FROM LIBERAL ARTS						

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
CHANDUBHAI S. PATEL INSTITUTE OF TECHNOLOGY

TIME TABLE **SEMESTER-I** **AY-2017-18**

FY B.TECH DIV 6 **CLASS: EE-II** **ROOM NO: 707/708/709/710**

DAY/TIME	MON	TUE	WED	THU	FRI	SAT
09:10 : 10:10	PY 141 MNS (709)	ME 141 (A/B/C) VP/NG/KKP (726/727)	ME 141 VP (709)	ME 141 (A/B/C) VP/VHP/KKP (726/727)	MA 141 JRP (710)	CL 141 (A) GK (627-A) / SC/SS (B) / PY 141 (C) SDK (724)
10:10 : 11:10	MA 141 MHC (709)		CL 141 PCP (709)		CL 141 AJW (710)	
11:10 : 12:10	**BREAK**					
12:10 : 01:10	CL 141 (C) KD (628-B) / SC/SS (A) / PY 141 (B) SDK (724)	CL 141 PCP (709)	CL 141 (B) GK (628-B) / SC/SS (C) / PY 141 (A) SDK (724)	PY 141 USS (709)	SC/SS (A/B/C)	CL 141 (A) GK (628-B) / SC/SS (B) / PY 141 (C) SDK (724)
01:10 : 02:10		MA 141 MHC (709)		MA 141 JRP (709)		
02:10 : 2:20	**SHORT BREAK**					
02:20 : 03:20	HS 101A/(Extra lectures/Tutorial/library) (A/B/C)	MA 141 B2 JRP (707) / MA 141 B1 NCP (708)	ME 141 VP (709)	ME 142 (A/B/C) HB/AS/AV (126)	SC/SS (A/B/C)	SC/SS (A/B/C)
03:20 : 04:20		PY 141 SDK (707)	CL 141 AJW (709)			

MA141	ENGINEERING MATHEMATICS-I	**MHC**	Dr. MEERA CHUDASAMA	**JRP**	Dr. JIMIT R PATEL	**NCP**	NIRU PATEL
CL141	ENGINEERING MECHANICS	**PCP**	PINAL PATEL	**AJW**	ANKIT WANKAWALA	**GK**	GAURAV KAPSE
ME141	ENGINEERING GRAPHICS	**VP**	VIRAL PANARA	**KKP**	KHUSHBU PURANI	**NG**	NIPUN GOSAI
PY141	ENGINEERING PHYSICS	**MNS**	Dr. MANAN SHAH	**SDK**	SANNI KAPATEL	**USS**	URVESH SONI
ME142	WORKSHOP PRACTICES	**HB**	HARMISH BHATT	**AS**	ABHISHEK SWRNKAR	**AV**	AKASH VYASS
SC/SS	ASSIGNMENT PRACTICES/STUDUENT COUNSELLING /REMEDIAL CLASSES						
HS101A	A COURSE FROM LIBERAL ARTS						

Chandubhai S Patel Institute of Technology
(Faculty of Technology & Engineering)

Division Allocation

Division	Group	Branch	Abbreviation	ID No.
1.	1	Civil Engineering	CL 1	17CL001 to 17CL060
2.			CL 2	17CL061 to 17CL120
3.		Mechanical Engineering	ME 1	17ME001 to 17ME060
4.			ME 2	17ME061to 17ME120
5.		Electrical Engineering	EE 1	17EE001 to 17EE060
6.			EE 2	17EE061to 17EE120
7.	2	Computer Engineering	CE 1	17CE001 to 17CE060
8.			CE 2	17CE061to 17CE120
9.		Information Technology	IT 1	17IT001 to 17IT060
10.			IT 2	17IT061to 17IT120
11.		Electronics & Communication	EC 1	17EC001 to 17EC060
12.			EC 2	17EC061to 17EC120

Bach Allocation

Division	Batch	ID NO.	Division	Batch	ID NO.
1	A1	17CL001 to 17CL020	7	A1	17CE001 to 17CE020
	B1	17CL021 to 17CL040		B1	17CE021 to 17CE040
	C1	17CL041 to 17CL060		C1	17CE041 to 17CE060
2	A2	17CL061 to 17CL080	8	A2	17CE061 to 17CE080
	B2	17CL081 to 17CL100		B2	17CE081 to 17CE100
	C2	17CL101 to 17CL120		C2	17CE101 to 17CE120
3	A1	17ME001 to 17ME020	9	A1	17IT001 to 17IT020
	B1	17ME021 to 17ME040		B1	17IT021 to 17IT040
	C1	17ME041 to 17ME060		C1	17IT041 to 17IT060
4	A2	17ME061 to 17ME080	10	A2	17IT061 to 17IT080
	B2	17ME081 to 17ME100		B2	17IT081 to 17IT 100
	C2	17ME101 to 17ME120		C2	17IT101 to 17IT120
5	A1	17EE001 to 17EE020	11	A1	17EC001 to 17EC020
	B1	17EE021 to 17EE040		B1	17EC021 to 17EC040
	C1	17EE041 to 17EE060		C1	17EC041 to 17EC060
6	A2	17EE061 to 17EE080	12	A2	17EC061 to 17EC080
	B2	17EE081 to 17EE100		B2	17EC081 to 17EC100
	C2	17EE101 to 17EE120		C2	17EC101 to 17EC120

Charotar University of Science and Technology
Faculty of Technology and Engineering
Chandubhai S Patel Institute of Technology

List of First Year Student Counselors

Student No.	Faculty Name	Seating Room No.	Intercom Number	Mobile Number
FY B TECH Civil Engineering				
A1 Batch: 17CL001 to 17CL020	VipulVyas	503	5085	9727767541
B1 Batch: 17CL021 to 17CL040	Megha Desai	612	5089	9429032853
C1 Batch: 17CL041 to 17CL060	NehaChauhan	513	5087	9099027974
A2 Batch: 17CL061 to 17CL080	Dipali Patel	501	5084	9924999774
B2 Batch: 17CL081 to 17CL100	SaraswatiPathariya	615	5236	9408352554
C2 Batch: 17CL101 to 17CL120	GauravKapse	613	5082	9730229304
FY B TECH Electrical Engineering				
A1 Batch: 17EE001 to 17EE020	Ankur Patel	101	5048	9978782503
B1 Batch: 17EE021 to 17EE040	Krishna Kant Kamble	116B	5046	9408156441
C1 Batch: 17EE041 to 17EE060	Bhinal Mehta	224	5042	9427045058
A2 Batch: 17EE061 to 17EE080	JilSutaria	116B	5049	9527906897
B2 Batch: 17EE081 to 17EE100	Pratik Panchal	118B	5052	9429773777
C2 Batch: 17EE101 to 17EE120	Pratik Panchal	118B	5052	9429773777
FY B TECH Computer Engineering				
A1 Batch: 17CE001 to 17CE020	MayuriPopat	452	5286	9737465560
B1 Batch: 17CE021 to 17CE040	VinayViradiya	306A	5116	9724407892
C1 Batch: 17CE041 to 17CE060	Sagar Patel	306B	5116	8200035455
A2 Batch: 17CE061 to 17CE080	KrutiDhyani	305A	5115	9925183284
B2 Batch: 17CE081 to 17CE100	Padmavathi B	452	5286	7600969390
C2 Batch: 17CE101 to 17CE120	Kamini Parekh	452	5286	9033494500
FY B TECH Mechanical Engineering				
A1 Batch: 17ME001 to 17ME020	Punit Patel	622	5234	9712593982
B1 Batch: 17ME021 to 17ME040	Hardik Patel	624	5326	9978946109
C1 Batch: 17ME041 to 17ME060	VikasPanchal	620	5232	8866286233
A2 Batch: 17ME061 to 17ME080	AbhishekSwarnkar	518	5229	8347557122
B2 Batch: 17ME081 to 17ME100	KawaljitRandhawa	623	5325	8000125001
C2 Batch: 17ME101 to 17ME120	Vishal Mehta	519	5228	9328134443
FY B TECH Information Technology				
A1 Batch: 17IT001 to 17IT020	Sagar Patel	407	5120	8866493361
B1 Batch: 17IT021 to 17IT040	Priyanka Patel	452	5286	8758711128
C1 Batch: 17IT041 to 17IT060	HardikJayswal	406	5119	9825961830
A2 Batch: 17IT061 to 17IT080	Dr.AmitThakkar	411-B	5122	9601290990
B2 Batch: 17IT081 to 17IT 100	KamleshMakwana	406	5119	9408893572
C2 Batch: 17IT101 to 17IT120	SanketSuthar	407	5120	9909147190
FY B TECH Electronics & Communication				
A1 Batch: 17EC001 to 17EC020	DharmendraChauhan	235	5063	9909454907
B1 Batch: 17EC021 to 17EC040	Bhavesh G. Gopani	205	5068	9979728096
C1 Batch: 17EC041 to 17EC060	Miral M. Desai	205	5068	9825838325
A2 Batch: 17EC061 to 17EC080	Arpan H. Desai	205	5068	9909980477
B2 Batch: 17EC081 to 17EC100	Brijesh L. Kundaliya	229	5069	9429667783
C2 Batch: 17EC101 to 17EC120	KillolPandya	234	5072	7600004093

20/07/2017

Attendance Criteria and Leave Application

This is to inform all the students of **First Year B.Tech.**

- **Students should be regular and punctual to all the classes (Theory, Practical & Tutorials) and secure attendance of not less than 80% in each course. Student should be fully aware that attendance less than 80% in any of the course will make me ineligible to appear for the examination of that course.**
- Students should be fully aware that he/she shall not be allowed to enter the class if he/sheis late.
- He/she will conduct himself/herself in a highly **disciplined** and decent manner both inside the classroom and in the campus, failing which suitable action may be taken against the student as per the rules and regulations of the College and University.
- Maximum duration of Leave during the semester is 15 Days only.
- Only Medical leaves in case of Major Surgery/Injury will be granted.
- In case of Major Surgery/Injury, immediate reporting to respective counselor is required.
- Students availing medical leaves need to submit Leave Report along with necessary documents to the **Attendance Coordinator of the respective class**within a week time. After that no leaves will be sanctioned.
- Students Leave Form is available at PA to Principal Office.
- Further, 100% Attendance is compulsory in Lab Sessions.

Dean
Faculty of Technology Engineering

Charotar University of Science and Technology
Chandubhai S Patel Institute of Technology

*(Note: In order to make the students aware of the Academic re**gulations** and **attend** the classes regularly from the first day of starting of classes the following Undertaking Form is introduced which should be signed by both **student and parent**. The same should be submitted to the concerned HOD through Counselor on the day of starting of semester classes)*

Undertaking by Students/Parents for Attendance/Academic Discipline

I, Mr/Ms----------bearing ID No.----------joining for I/II / IV / VI / VII/ VIII Semester BTech/MTech (CL/ME/CE/IT/EC/EE) for the academic year ……. in **Chandubhai S Patel Institute of Technology, Changa** do hereby undertake and abide by the following terms.

1. I will **attend** all the classes as per the timetablefrom the **re-opening day** of the College on …….. I also understand that ifI do not turn up even after two week of starting of classes, I shall be **ineligible** to continue for the current academic year.
2. **I will be regular and punctual to all the classes (Theory, Practical&Tutorials) and secure attendance of not less than 80% in each subject. I am fully aware that attendance less than 80% in any of the subjects will make me ineligible to appear for the examination of that subject and overall attendance less than 80% will make me ineligible to appear for the whole examinations.**
3. I am aware that the mere production of medical certificate will not exempt me from the minimum attendance criteria and all medical leaves are included in the overall 20% relaxation.
4. I am fully aware that I shall not be allowed to enter the class if I am late.
5. I will conduct myself in a highly **disciplined** and decent manner both inside theclassroom and in the campus, failing which suitable action may be taken against me asper the rules and regulations of the College and University
6. I will **pay** tuition fees, examination fees and any other **dues** within the stipulated time asrequired by the University Authorities failing which I will not be permitted to attend theclasses and examinations.
7. Violation of any of the undertakinggiven above will result to my **parents** meeting the concerned HOD/Principal.

Signature of Student: Date:

ACKNOWLEDGEMENT BY PARENT

I have gone through carefully the terms of the above undertaking given by my ward and understand thatfollowing these are for his/her own benefits. I also understand that ifhe/she fails to comply with these terms, will be liable to suitable action as per College/University rules and law. I undertake that he/she will strictly follow the aboveterms.

Signature of Parent: Date:

Signature of Counselor Signature of HOD/Principal

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY, CHANGA

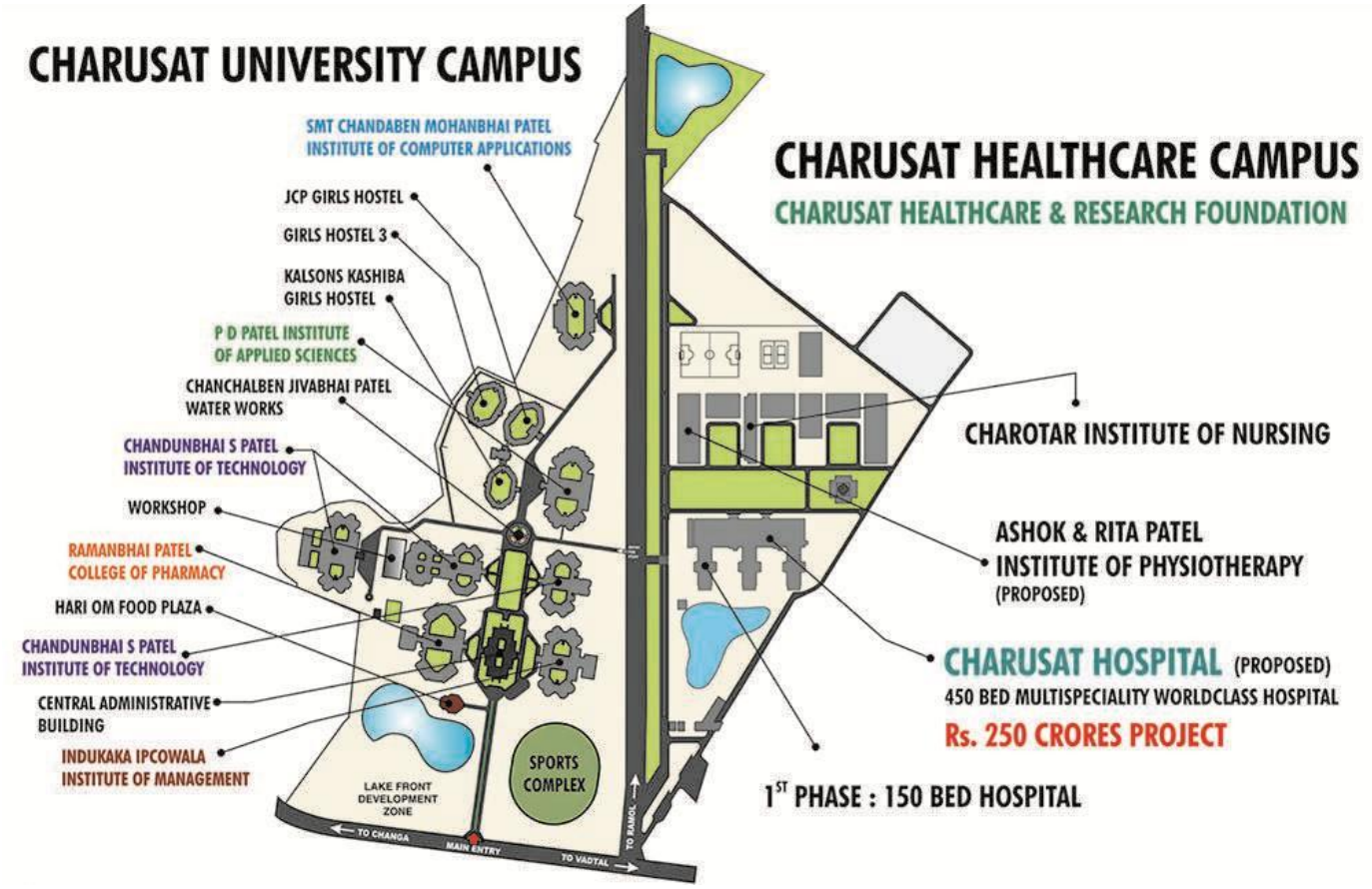
FACULTY OF TECHNOLOGY AND ENGINEERING

Academic Calender (2017) - ODD Semester

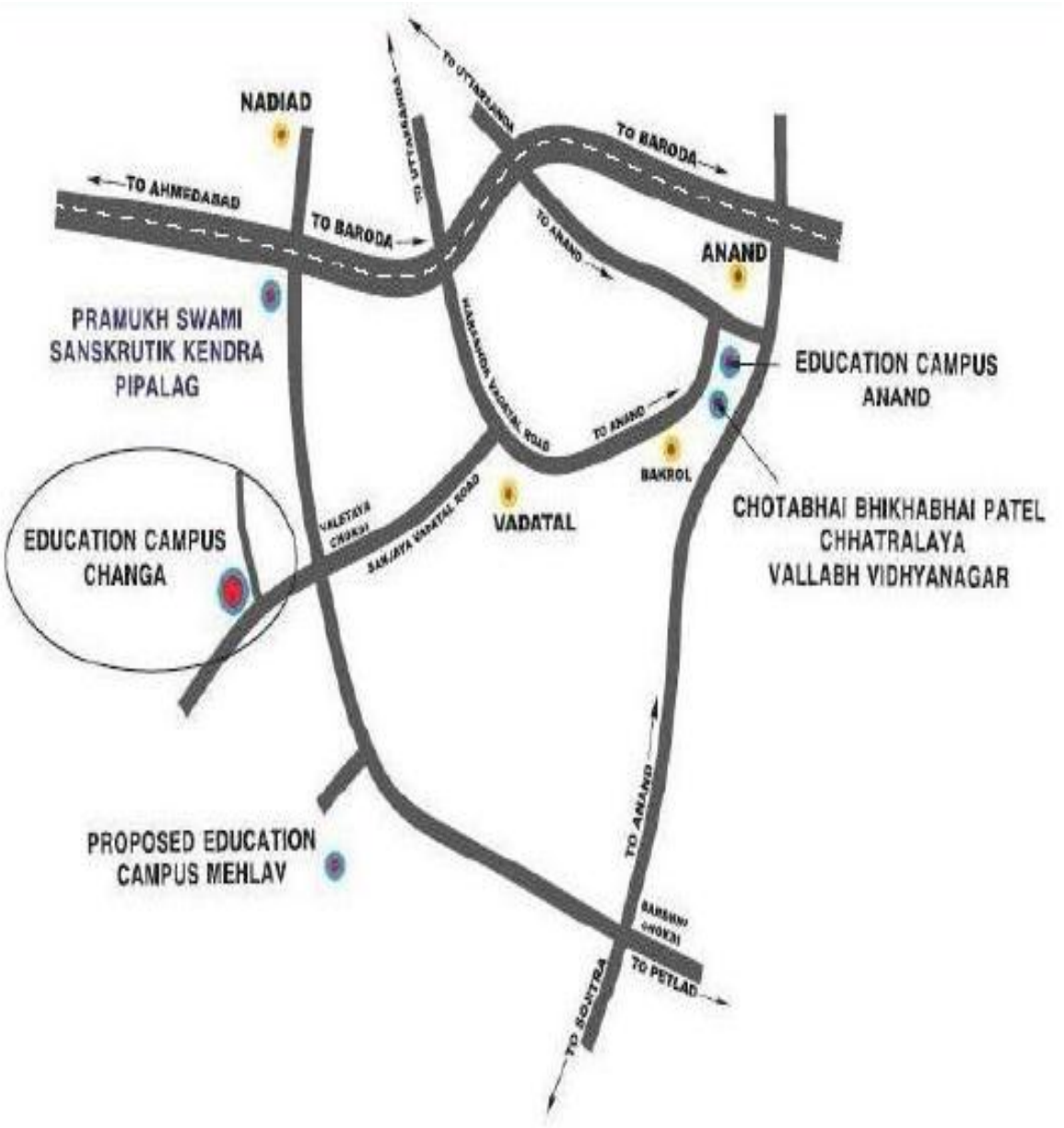
Week No	Month	M	T	W	T	F	S	S	Activity
1	July	17	18	19	20	21	22	23	B Tech 1st Sem starts (20/07/2017 to 26/07/2017) (Orientation Program & Bridge Course)
2		24	25	26	27	28	29	30	B Tech 1st Sem Academic Session starts (27/07/2017)
3	August- Sep	31	1	2	3	4	H	6	
4		DH	8	9	10	11	12	13	
5		14	15	16	17	18	H*	20	
6		21	22	23	24	25	26	27	
7		28	29	30	31	1	H	3	1st Notification of B Tech 1st Sem Attendance Report (01/09/2017)
8	Septmber-Oct	4	5	6	7	8	9	10	B Tech 1st Sem 1st Sessional Exam (04/09/2017)
9		11	12	13	14	15	H*	17	Result of B Tech 1st Sem 1st Sessional Exam (15/09/2017)
10		18	19	20	21	22	23	24	Workshop: Courses on Liberal Arts (20/09/2017 to 23/09/2017)
11		25	26	27	28	29	DH	1	Expert Lecture / Industry Visit /Parents Teacher Meeting
12	October	2	3	4	5	6	H	8	
13		9	10	11	12	13	14	15	
14		16	17	18	DH	DH	H*	22	**Diwali Break**
15		23	24	25	26	27	28	29	**Diwali Break**
16	Oct - November	30	31	1	2	3	H	5	2nd Notification of B Tech 1st Sem Attendance Report (03/11/17)
17		6	7	8	9	10	11	12	B Tech 1st sem 2nd Sessional Exam (06/11/2017)
18		13	14	15	16	17	H*	19	**B Tech 1st/2nd Sem Practical Exam (Tentative) (13/11/2017)**
19		20	21	22	23	24	25	26	**B Tech 1st/2nd Sem (Regular/Backlog) Theory Exam (20/11/2017)**
20	Nov.-Dec.	27	28	29	30	1	H	3	**B Tech 1st/2nd Sem (Regular/Backlog) Theory Exam (cont..)**
21	December	4	5	6	7	8	9	10	
22		11	12	13	14	15	H*	17	Vacation only for Students (11/12/2017 to 16/12/2017)
23		18	19	20	21	22	23	24	B Tech 2nd sem starts (18/12/2017)

DH - Declared Holiday, H - off for students/remedial class, H*- off for staff and students

CHARUSAT MAP



Reach to CHARUSAT



CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

ACADEMIC REGULATIONS & SYLLABUS

(Choice Based Credit System)

Faculty of Technology & Engineering

Bachelor of Technology Programme

(Second Year Civil Engineering)
Effective From 2017-18

Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the choicest destinations by students. It has been transformed into **Charotar University of Science and Technology (CHARUSAT)** through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. of India.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmes, one Institute and an investment of about Rs. 3 Crores (INR 30 million). At present there are seven different institutes falling under ambit of six different faculties. The programmes offered by these faculties range from undergraduate (UG) to Ph.D degrees including M.Phil. These faculties, in all offer 64 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Charotar Institute of Technology	B. Tech M. Tech MTM Ph. D
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm M. Pharm MPM PGDCT/ PGDPT Ph. D
Faculty of Management Studies	IndukakaIpcowala Institute of Management	M.B.A PGDM Dual Degree BBA+MBA Ph.D

Faculty of Computer Applications	Smt. ChandabenMohanbhai Patel Institute of Computer Applications	M.C.A/MCAL M.Sc (IT) Dual Degree BCA+MCA Ph. D
Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc Dual Degree B.Sc+M.Sc Ph.D
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy ManikakaTopawala Institute of Nursing Charotar Institute of Paramedical Sciences	B.PT M.PT Ph.D B.Sc (Nursing) M.Sc PGDHA PGDMLT GNM Ph.D

The development and growth of the institutes have already led to an investment of over Rs.125 Crores (INR 1250 Million). The future outlay is planned with an estimate of Rs.250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 105 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 360 core faculty members, educated and trained in IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, **CHARUSAT** has the vision of entering the club of premier Universities initially in the country and then globally. **High Moral Values like Honesty, Integrity and Transparency** which has been the foundation of ECC continues to anchor the functioning of **CHARUSAT**. Banking on the world class infrastructure and highly qualified and competent faculty, the University is expected to be catapulted into top 20 Universities in the coming five years. In order to

align with the global requirements, the University has collaborated with internationally reputed organizations like Pennsylvania State University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute –UK, ISRO, BARC, etc.

CHARUSAT has designed curricula for all its programmes in line with the current international practices and emerging requirements. Industrial Visits, Study Tours, Expert Lectures and Interactive IT enabled Teaching Practice form an integral part of the unique **CHARUSAT** pedagogy.

The programmes are credit-based and have continuous evaluation as an important feature. The pedagogy is student-centred, augurs well for self-learning and motivation for enquiry and research, and contains innumerable unique features like:

- Participatory and interactive discussion-based classes.
- Sessions by visiting faculty members drawn from leading academic institutions and industry.
- Regular weekly seminars.
- Distinguished lecture series.
- Practical, field-based projects and assignments.
- Summer training in leading organizations under faculty supervision in relevant programmes.
- Industrial tours and visits.
- Extensive use of technology for learning.
- Final Placement through campus interviews.

Exploration in the field of knowledge through research and development and comprehensive industrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

CHARUSAT welcomes you for a Bright Future

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
Accredited with Grade A by NAAC,
Accredited with Grade A by KCG

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (Civil Engineering) Programme

(Choice Based Credit System)

Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

Academic Year – 2017-18

CHARUSAT

FACULTY OF TECHNOLOGY AND ENGINEERING
ACADEMIC REGULATIONS
Bachelor of Technology Programmes

To ensure uniform system of education, duration of undergraduate and post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

System of Education

The Semester system of education should be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate and Master's levels. 2.3.2 An Academic year shall consist of two semesters, each of 26 weeks, having a minimum of 90 days for the direct class room teaching. Every enrolled student will be required to take a specified load of course work in the chosen subject of specialization and also complete a project/dissertation if any.

Duration of Programme

Undergraduate programme (B. Tech.)

Minimum	8 semesters (4 academic years)
Maximum	12 semesters (6 academic years)

Eligibility for Admissions

As enacted by Govt. of Gujarat from time to time.

Mode of Admissions

As enacted by Govt. of Gujarat from time to time.

Programme Structure and Credits

As per Annexure – 1 attached

Attendance

All activities prescribed under these regulations and enlisted by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student regarding attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Principal.

Student's attendance in a course should be 80%.

Course Evaluation

1. ***The performance of every student in each course will be evaluated as follows:***
   - i) A student shall be evaluated through Continuous Evaluation and Semester End Examination.
   - ii) The weight of continuous assessment and End-semester examination shall be varying from UG to PG and from Faculty to Faculty as approved by Academic Council.
   - iii) During the semester, a student shall be going through continuous assessment. The continuous assessment will be conducted by the respective Department / Institute. At the end of semester a student shall be evaluated through semester end examination comprising of theory and/ or practical, viva-voce, term work components as decided by Academic Council.
   - iv) The performance of candidate in continuous assessment and in end-semester examination together shall be considered for deciding the final grade in a course.
   - v) External examiners shall be involved for the evaluation of at least 50% of the total credits in the end semester university examination.
   - vi) A candidate who has cleared all the courses under different components meeting the minimum number of credits required will be considered as passed and eligible for the award of respective degree in the relevant class.

2. ***Grading Methodology and Results***
   - i) Performance of the student in all the components shall be graded using relative grading system
   - ii) At the end of a semester, a histogram shall be prepared for results of each course. A committee mentioned hereunder shall finalize the histogram based on which results will be prepared.

3. ***Result Preparation committee***

   A committee chaired by Provost and comprising of Dean of Faculty, One Dean other than the faculty and one teacher having expertise of relative grading shall deliberate upon different scenarios of results based on histograms of all the

courses. Thereafter, the committee shall finalize the results. The histogram shall be prepared for each course. After the finalization by the committee, the results shall be declared within 3 weeks duration.

4. Post Result Mechanism

The Dean shall discuss the result of each course with the convener and the teacher who has taught the course along with the statistical distribution evident from histogram so as to bring out any anomalies, skewness, left-out topics etc. Its only after this discussion is over the results shall be declared.

Grade Point System

1. Grades

A grade point system, as given in the following table, shall be followed for evaluating a candidate in every course.

Grade Points

Grade	AA	AB	BB	BC	CC	CD	DD	FF
Grade Point	10	09	08	07	06	05	04	00

As a general guideline, a class average of around 6.50 for theory component & around 8.00 for practical component may be maintained while applying relative grading.

In case, a student, of undergraduate programme or diploma, gets less than 30% marks in end-semester examination and less than 35% marks overall (combining continuous evaluation and end-semester examination) in a particular course, he / she will not be graded in that course till he / she reappears in said course and obtains specified minimum marks .

In case, a student, of postgraduate programme or postgraduate diploma, gets less than 40% marks in end-semester examination and less than 45% marks overall (combining continuous evaluation and end-semester examination) in a particular course, he / she will not be graded in that course till he / she reappears in said course and obtains specified minimum marks.

2. Requirements for the Award of a Degree

To be eligible for award of the degree, a student must complete all courses with requisite credits as prescribed under his / her programme of studies without "FF" grade in any course in any of the semesters of the entire programme.

3. Semester Grade Point Average (SGPA)

The following mechanism may be used in order to arrive at a grade point for the candidate:

SGPA obtained by a student in any degree programme is a weighted average of the grade points in various courses taken by the student.

For example:

If student has taken following courses, then the SGPA is computed as explained below:

Courses	Course – 1	Course – 2	.....	Course – j	.....	Course – n
Credit	C_1	C_2	.....	C_j	.....	C_n
Grade Points	G_1	G_2	.....	G_j	.....	G_n

SGPA = Semester Grade Point Average = Σ {Credits X Grade Point} / Total Credits; for the courses offered in particular semester.

4. Award of Class

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Award of Class	CGPA Range
First Class with Distinction	CGPA ≥ 7.50
First class	7.50 > CGPA ≥ 6.50
Second Class	6.50> CGPA ≥ 5.50
Pass Class	5.50 > CGPA ≥ 4.00

Where Cumulative Grade Point Average (CGPA) is computed as:

$$CGPA = \sum_{k=1}^{n} \{ \text{Credits x Grade Point} \} / \text{Total Semester Credits}$$

Here the sum is taken over from 1st Semester to nth Semester of the Programme.

Grade sheets of only the final semester shall indicate the class. In case of all the other semesters, it will simply indicate as Pass / Fail.

Indicative percentage of marks equivalent to Cumulative Grade Point Average (CGPA) shall be calculated as (CGPA – 0.5) X 10.

5. Gracing Criteria / Detention Criteria

As relative grading is being adopted gracing of marks shall be redundant. Detention of a student shall be as per prevailing university norms.

6. Maximum Time allowed for Completion of a programme

Maximum time allowed for completion of a particular programme shall not be more than twice the normal duration of the respective programme. For example, a 6-Semester programme should be completed within not more than 12 semesters.

7. Transcript

A transcript issued to the student at the time of leaving the university will contain a consolidated record of all the courses taken by him / her, grades obtained and the final CGPA.

Annexure – I

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)											
TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN CIVIL ENGINEERING											
Semester	**Course Code**	**Course Title**	Teaching Scheme				Examination Scheme				
			Contact Hours			Credit	Theory		Practical		Total
			Theory	Practical	Total		Internal	External	Internal	External	
SY Sem-3	MA241	Engineering Mathematics III	4	0	4	4	30	70			100
	CL241	Geology for Civil Engineers	4	2	6	5	30	70	25	25	150
	CL242	Surveying	4	2	6	5	30	70	25	25	150
	CL243	Mechanics of Solids	4	2	6	5	30	70	25	25	150
	CL281	Environmental Sustainability And Climate Change (Elective)	2	0	2	2	30	70			100
	HS122A/ HS131A	Values and Ethics/Philosophy	2		2	2	30	70			100
		Remedial Classes			10						
					36	**23**					**750**
SY Sem-4	CL244	Fluid Mechanics-I	4	2	6	5	30	70	25	25	150
	CL245	Building Construction Technology	4	2	6	5	30	70	25	25	150
	CL246	Structural Analysis I	4	2	6	5	30	70	25	25	150
	ME241	Material Science & Technology	3	2	5	4	30	70	25	25	150
	CL282	Basics of Environmental Impact Assessment (Elective)	2	0	2	2	30	70			100
	HS133A/ HS123.01 A/ HS127.01 A	Creativity, Problem Solving and Innovation/ Critical Thinking and Logic/ Communication Skills - II	2		2	2	50	50			100
		Remedial Classes			9						
					36	**23**					**800**

CONTENT

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 3)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	-	4	4
Marks	100	-	100	

A. Objective of the Course:

This course is an important course to understand courses viz.

(i) Electromagnetism for EE

(ii) Fluid mechanics for CL/ME

(iii) Structure engineering for CL

(iv) Control theory for EE and other engineering courses.

The objectives of the course are to:

- Understand the concepts of Fourier coefficients and Fourier series for the function of different periods.
- Understand the concepts of Laplace transforms to solve differential equations
- Understand the concepts of Matrix algebra
- Understand differentiation, integration of vector fields, determining gradient, curl, directional derivative and their applications.
- Understand role of differential in engineering systems.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Fourier series	10
2.	Laplace Transforms	12
3.	Applications of Differential Equations	10
4.	Matrix Algebra- II	10
5.	Vector Differential Calculus	08
6.	Vector Integral Calculus	10

Total Hours (Theory): 60

Total Hours (Lab): 00

Total Hours: 60

C. **Detailed Syllabus:**

1.	**Fourier series**	**10 Hours**	**16%**
1.1	Periodic functions, Dirichlet's conditions, Trigonometric series		
1.2	Euler formulae, Fourier series of periodic function of period 2π		
1.3	Discontinuous functions, Even and odd functions, Half range series		
1.4	Fourier series of functions of arbitrary period		
2.	**Laplace Transforms**	**12 Hours**	**22%**
2.1	Laplace transforms as an improper integral and its existence. Laplace transforms of elementary functions.		
2.2	Inverse Laplace transforms, Linearity property.		
2.3	First and second shifting theorems, Laplace transforms of derivatives and integrals.		
2.4	Convolution theorem and its application to obtain inverse Laplace transform		
2.5	Laplace transform of periodic functions, Unit step function, Unit impulse function (Dirac delta function)		
2.6	Solving Differential equations using Laplace transforms		
3	**Applications of Differential Equations**	**10 Hours**	**16%**
3.1	Applications of ODE: Mechanical vibration system, Electrical circuit system, deflection of beams.		
3.2	Application of PDE: Heat, wave, Laplace equations and their solution by method of separation of variables and Fourier series.		
4	**Matrix Algebra -II**	**10 Hours**	**16%**
4.1	Revision of Determinant and Matrix		
4.2	Eigen values and Eigen vectors of Matrices		
4.3	Eigen values and Eigen vectors of Special Matrices		
4.4	Applications of Cayley - Hamilton Theorem		
5	**Vector Differential Calculus**	**08 Hours**	**14%**
5.1	Revision of concepts of Vector algebra, Scalar and Vector fields.		
5.2	Gradient of a scalar functions, Directional derivatives.		
5.3	Divergence and Curl of a vector field and their properties.		

5.4 Physical interpretations of gradient, divergence and curl. Irrotational, solenoidal and conservative vector fields.

6 Vector Integral Calculus 10 Hours 16%

6.1 Line integrals, Surface integrals, Volume integrals

6.2 Statement and examples of Green's theorem, Stokes' and Divergence theorem

6.3 Applications of vector calculus in engineering systems.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Two Quizzes (surprise tests) will be conducted which carries 5% component of the overall evaluation.

E. Student Learning Outcomes:

At the end of the course, the students will able to know the various applications of Engineering Mathematics in their respective field e.g.

- Vector calculus mainly useful for Electromagnetism.
- Fourier series,
- Laplace transforms and
- Applications of differential equations widely applicable in Control theory, Structure engineering and Fluid mechanics.

F. Recommended Study Material:

Text Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons, India, 1999.
2) Thomas, G. B., and R. L. Finney, Calculus with Analytic Geometry, 9th Edition, Addison Wesley Publishing, 1996.

Reference Books:

1) Ahsaan Zafar, Differential equations and their applications, PHI Learning Pvt. Ltd., 2004.
2) Stewart James, Calculus Early Transcendental, 5th Edition, Thomson India, 2007
3) Wylie & Barrett, Advanced Engineering Mathematics, McGraw Hill publications.
4) Greenberg M D, Advanced Engineering Mathematics, 2nd Edition, Pearson.
5) Anton Howard, Elementary Linear Algebra, John Wiley & Sons, 2010.
6) Grewal, B. S., Higher Engineering Mathematics, Khanna Publisher, New Delhi, 1996.
7) Dass, H. K., Advanced Engineering Mathematics, S. Chand, 2008.
8) Debnath, Lokenath, and Dambaru Bhatta, Integral Transforms and their Applications, CRC press, 2014.
9) Stroud, Kenneth Arthur, and Dexter J. Booth, Advanced Engineering Mathematics, Palgrave Macmillan, 2011.

Web Materials

1) http://mathworld.wolfram.com ,
2) http://en.wikipedia.org/wiki/math

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The objectives of the course are:

- To understand basics of geology
- To study and identify different types natural materials like rocks & minerals.
- To understand the various natural dynamic processes their influence on the surficial features, natural material and their consequences.
- To know the importance of geological maps and language helpful for Civil Engineering projects.
- Critically analyze and scientifically understand the geological setups while selecting site for civil projects.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Physical Geology	15
2	Natural Materials	11
3	Structural Geology	10
4	Engineering Geology	16
5	Geoinformatics	08

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Physical Geology**	**15 Hours**	**25%**
1.1	Earth: Origin, internal structure.		
1.2	Work of natural agencies: Lakes, Oceans, Atmosphere, wind, streams, sea, glacier, mass movements		
1.3	Plate tectonics: Concepts and plate boundaries		
1.4	Earthquakes: Basics of earthquake, intensity and magnitude, causes, Earthquake zones of India		
2	**Natural Materials**	**11 Hours**	**18%**
2.1	**Minerals:** Formation, Identification and Use Physical properties of minerals; basics of optical mineralogy, SEM, XRD		
2.2	**Rocks:** Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic Igneous Rock: Agents, structure, texture, IUGS classification of intrusive and extrusive rocks Metamorphic Rock: Causes of metamorphism (stress, temperature, tectonism, pore fluid), structure and texture Sedimentary Rock: Sedimentation environments, structure, textural classification of siliciclastic and carbonate rock		
3	**Structural Geology**	**10 Hours**	**17%**
3.1	Introduction: Outcrop, stratification, dip and strike relation		
3.2	Study of Structural Features: Fold, Fault, Joints and Unconformities; Classification, formation and Identification		
4	**Engineering Geology**	**16 Hours**	**27%**
4.1	Geologic Mapping: **Various methods of geological investigations, mapping,** preparation of geologic sections **Interpretation of reports.**		
4.2	Indian geology: Geological framework of India, Geology of Gujarat		
4.3	Ground water: Basics and engineering difficulties		
4.4	**Geology for Site selection:** Dam, Tunnel, Reservoir and Highways		

4.5 **Case studies:** Important international and Indian examples of failures of civil structures due to geological constrains.

5 Geoinformatics **08 Hours** **13%**

5.1 GIS and Remote Sensing Applications

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Theoretical concepts will be made clearer by showing different specimens of rocks, minerals, models, frames and charts.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment work will be given based on various geological issues related to civil projects and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- Minimum 7 experiments which include detailed drawing of minimum 5 maps will be carried out in the laboratory related to course contents.

E. Students Learning Outcomes:

On the successful completion of this course:

- The students will have basic understanding of Geology, natural materials such as minerals and rocks, use of rocks and minerals and availability of rocks and minerals

- To have a Basic Understanding of Geological framework of India and Gujarat
- To make the students acquainted with natural dynamic processes and their actions.
- Influence of natural processes and geological factors on civil structures
- Process of considering natural processes and geological factors while taking decision during planning, design and execution stage of the structures.
- Students will know the Significance of geological investigations for civil engineering projects during selection of site and preparation of feasibility reports.
- Students will understand geological maps, language for the discussion on geological reports, the process resolving geological issues in civil engineering projects.
- Students will understand the application of geological knowledge for civil projects.

F. Recommended Study Material:

Text Books:

1) Prabin Singh, Engineering & General Geology, S.K. Kataria & Sons, Katson Books, 1999, New Delhi
2) Kesavulu, C., Textbook of Engineering Geology, Macmillan India Ltd, 1993, New Delhi

Reference Books:

1) Bangar, K.M., Principles of Engineering Geology, Standard Publishers Distributors, 1995, New Delhi
2) Billings, M.P., Structural Geology, Prentice-Hall India, 1974, New Delhi
3) Blyth, F.G.H. and De'Freits, M.H. Geology for Engineers. ELBS, 1974, London
4) Gokhale, K.V.G.K. and Rao, D.M., Experiments in Engineering Geology, Tata McGraw Hill, 1981, New Delhi
5) Reddy, V., Engineering Geology for Civil Engineers, Oxford & IBH, 1997, New Delhi
6) Parthasarathy, A., Panchapakesan, V. and Nagarajan, R. "Engineering Geology", Wiley India Pvt Ltd., 2013. ISBN-13: 9788126541829
7) Reddy, D. V. "Engineering Geology", Vikas Publishing House, 2010. ISBN13: 9788125919032

8) Krynine, D.P. and Judd, W.R. "Principles of Engineering Geology and Geotechnics", CBS Publishers & Distributors, New Delhi, 1957. ISBN-10: 812390603X.

Web Materials:

1) http://nptel.ac.in/courses/105105106/
2) http://freevideolectures.com/Course/87/Engineering-Geology
3) http://www.cosmolearning.com/courses/engineering-geology/video-lectures/
4) http://geology.about.com/

G. List of Experiments

Sr. No.	Name of Experiment
1	**Fundamentals of Geology**
2	**Study of Minerals**
	Study of Physical Properties of Minerals
	Identification Rock Forming Minerals by Studying Physical Properties
	Identification Ore Minerals by Studying Physical Properties
3	**Study of Rocks**
	Study of Igneous Rocks
	Study of Sedimentary Rocks
	Study of Metamorphic Rocks
4	**Geological Mapping**
	Map of layered horizontal beds
	Map of layered inclined beds
	Map of layered inclined beds
	Map of Unconformity with Inclined and Horizontal Bed Series
	Map of Faulted Sequence
	Map of Folded Sequence
	Various Combination Maps for General Practice

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objective of the Course:

This course covers the basics of surveying. The principles and application of the core civil engineering activity of ground measurement is covered with the fundamentals of the subject:

- To understand concepts and methods for measurement of elevation and contouring.
- Understand the concept of theodolite traversing.
- Learn the terminology, concepts & applications of plane table surveying.
- To introduce the working out of various engineering curves on ground.
- Understand the scope and basics of computation of areas and volume.
- Understand the basic principles of hydrographic surveying.
- Understand the concepts of setting out a building on ground.
- Understand functioning of modern surveying instruments.

B. Out Line of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Measurement of Elevation, Contouring	5
2	Theodolite Traversing	10
3	Plane Table Surveying	10
4	Engineering Curves	10
5	Computation of Areas and Volumes	10
6	Hydrography	5
7	Setting Out Works	5
8	Modern Surveying Instruments	5

Total hours (Theory): 60 Hours

Total hours (Lab): 30 Hours

Total hours: 90 Hours

C. Detailed Syllabus:

1	**Measurement of Elevation, Contouring**	**05 Hours**	**08%**
1.1	Profile levelling and cross sectioning & contouring		
1.2	Errors in levelling		
1.3	Permanent adjustment of level.		
2	**Theodolite Surveying**	**10 Hours**	**17%**
2.1	Introduction to vernier transit theodolite		
2.2	Temporary and permanent adjustment of theodolite		
2.3	Measuring horizontal and vertical angles		
2.4	Computation of latitudes and departure & gale's table		
2.5	Methods of traversing, closing error		
2.6	Check in closed and open traverse, balancing of traverse		
2.7	Area of traverse, omitted measurement, co-ordinate method		
3	**Plane Table Surveying**	**10 Hours**	**17%**
3.1	Introduction		
3.2	Principle		
3.3	Advantages & limitation		
3.4	Accessories of plane tabling		
3.5	Setting up the plane table		
3.6	Methods of plane table surveying		
3.7	Sources of errors		
4	**Engineering Curves**	**10 Hours**	**17%**
4.1	Introduction to engineering curves		
4.2	Classification & elements of simple circular curve		
4.3	Methods of setting out a simple circular curve		
4.4	Elements of compound curve & reverse curve		
4.5	Transition curve & vertical curve		
5	**Computation of Areas and Volumes**	**10 Hours**	**17%**
5.1	Different methods to compute area of traverse		
5.2	Determining areas from plans, trapezoidal rule- Simpson's rule		
5.3	Planimeter, digital planimeter		

5.4	Computation of volumes, volume from cross sections		
5.5	Trapezoidal and prismoidal formulae		
5.6	Prismoidal correction, curvature correction		
5.7	Determination of capacity of reservoir and volume of borrow pits		
6	**Hydrography**	**05 Hours**	**08%**
6.1	Introduction		
6.2	Purposes, control points		
6.3	Soundings		
6.4	Instruments and methods of locating soundings		
7	**Setting Out Works**	**05 Hours**	**08%**
7.1	Introduction		
7.2	Setting out the buildings		
7.3	Setting out the sewer grades		
7.4	Setting out the bridge & culvert		
8	**Modern Survey Instruments**	**05 Hours**	**08%**
8.1	Introduction		
8.2	Electromagnetic distance measurement		
8.3	Electronic theodolite		
8.4	Total station		

D. Instructional Methods and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Field survey Experiments/Tutorials related to course content will be carried out in the laboratory.

- In the lectures and laboratory discipline and behavior will be observed strictly.
- Industrial visits will be organized for students to explore industrial facilities. Students are required to prepare a report on industrial visit and submit as a part of the assignment.

E. **Student Learning Outcomes:**

On the completion of the course one should be able to:

- Carry out elevation measurement and prepare contour maps.
- Plan theodolite survey applications
- Measure and Plot maps with plane table.
- Set out curves, buildings, culverts and tunnels
- Compute ground areas and earthwork volumes
- Carry out basic hydrographic survey.
- Invoke application of modern surveying instruments over conventional instruments

F. Recommended Study Material:

Text Books

1) Duggal, S. K., Surveying Vol. I & II, Tata Mcgraw Hill, New Delhi
2) Subramanian, R., Surveying & Levelling, Oxford University Press, New Delhi

Reference Books:

1) Punamia, B.C., Surveying Vol. I, II & III, Laxmi Publications
2) Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling Vol. I & II, Pune Vidhyarthi Gruh
3) Arora, K.R., Surveying Vol. I, II & III, Standard Book House. New Delhi
4) Basak, N.N., Surveying and Levelling, Tata Mcgraw Hill, New Delhi
5) Agor, R., Surveying and Levelling, Khanna Publishers, New Delhi

Web Materials:

1) http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-ROORKEE/SURVEYING
2) http://nptel.iitm.ac.in/courses/Webcourse-contents/IITROORKEE/SURVEYING/home.htm
3) http://nptel.iitm.ac.in/courses.php?branch=Civil

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

This subject is intended to provide students with a thorough understanding of the theory and application of structural mechanics of deformable bodies. Particular emphasis is on understanding the relationships between loads, member forces and deformations and resulting stresses and strains in a structural member. The objectives of the course are to:

- Learn the fundamental concepts of deformation and the relationship of stress and strain of solids.
- Understand the bending moment, shear force and the corresponding bending and shear stress distribution for different types of statically determinate beam elements with homogeneous and composite structures.
- Understand the concept of moment of inertia of various areas.
- Know the concepts of principal stress and principal planes
- Know the concept of transformation of stresses and strain energy.

B. Out Line of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	3
2	Simple Stresses and Strains	15
3	Principal Stresses and Strains	10
4	Shear Force and Bending Moment	10
5	Moment of Inertia	6
6	Bending and Shear Stresses in Homogeneous and Composite Beam Sections	10
7	Strain Energy	6

Total hours (Theory): 60 Hours

Total hours (Lab): 30 Hours

Total hours: 90 Hours

C. **Detailed Syllabus:**

1	**Introduction**	**03 Hours**	**05%**
1.1	Introduction to mechanics of deformable bodies		
1.2	Principle of superposition		
1.3	Classification of loaded bar		
1.4	Gradual, sudden, impact and shock loading		
1.5	Mechanical properties of materials		
2	**Simple Stresses and Strains**	**15 Hours**	**22%**
2.1	Stress and types of stress, Strain and types of strain		
2.2	Stress strain Characteristics for ductile and brittle materials		
2.3	Shear stresses and strains, Elasticity, Hook's law		
2.4	Axial and shear deformations, Axial force diagram		
2.5	Bars of varying section, Bars of uniformly varying cross section		
2.6	Analysis of stress for statically determinate structures and indeterminate structures		
2.7	Poisson's ratio, Volumetric strain, Biaxial and tri-axial deformations		
2.8	Elastic constant and relation between three elastic constants		
2.9	Stresses due to thermal effect		
3	**Principal Stresses and Strains**	**10 Hours**	**18%**
3.1	Introduction, Sign convention		
3.2	Transformation of stresses for a state of stresses under axial loading		
3.3	Transformation of stresses for plate under biaxial loading		
3.4	Principal plane and principal stresses		
3.5	Maximum shear stress, Element subjected to principal stresses		
3.6	Mohr's circle for stresses on an oblique section of a body subjected to direct stress in one plane and two plane with or without shear stress,		
3.7	Pure shear		

4	**Shear Force and Bending Moment**	**10 Hours**	**22%**
4.1	Concept of shear force and bending moment		
4.2	Sign conventions		
4.3	Relation between bending moment, shear force and rate of loading		
4.4	Bending moment and shear force diagrams for statically determinate beams subjected to all different types of loading		
4.5	Important points for shear force and bending moment diagram.		
5	**Moment of Inertia**	**6 Hours**	**12%**
5.1	Introduction, Radius of gyration		
5.2	Parallel axis theorem and perpendicular axis theorem		
5.3	Polar moment of inertia		
5.4	Moment of inertia by integration		
5.5	Moment of inertia of composite areas		
6	**Bending and Shear Stresses in Homogeneous and composite beam sections**	**10 Hours**	**14%**
6.1	Pure bending, Theory of pure bending		
6.2	Assumptions and derivation of theory of simple bending		
6.3	Neutral axis, moment resistance, section modulus		
6.4	Strength of section		
6.5	Bending stress in symmetrical, unsymmetrical and composite sections		
6.6	Shear stresses, Shear flow		
6.7	Shear stress distribution for various cross section		
7	**Strain Energy**	**06 Hours**	**07%**
7.1	Elastic strain energy due to gradual loading, sudden loading, impact loading, shear and bending, Resilience		

G. Instructional Methods and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.

- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

D. Students Learning Outcomes:

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

- Classify and determine the strength parameters of materials and compute stresses & strains for structural elements due to normal, shear loads and temperature changes.
- Calculate bending moment and shear force for statically determinate beams and draw the distributions.
- Calculate the cross sectional moment of inertia using the parallel axis theorem.
- Use Mohr's circle to determine stresses in a beam under combined loadings.
- Calculate bending stress, shear stress and their distribution at any desired location along the beam elements.
- Calculate strain energy due to different loadings.
- Show expertise in problem identification, formulation and solution for strength of materials problems.
- Evaluate the different mechanical properties of materials.

E. Recommended Study Material:

Text Books:

1) Junarkar, S.B. & Shah, H.J., Mechanics of Structures Vol-I, Charotar Publishing House
2) Shah, H. J., Mechanics of Solids, Charotar Publishing House
3) Khurmi R. S., Strength of Materials, S. Chand Publications
4) S. S. Bhavikatti, Strength of Materials, Vikas Publishing House Pvt. Ltd
5) Hibbeler, R.C., "Mechanics of Materials", 6th SI edition

Reference Books:

1) Beer and Johnston, Mechanics of Materials
2) Gere & Timoshenko, Mechanics of Materials, CBS Publishers & Distributors, Delhi
3) S. Timoshenko, Strength of Materials (Part -1), D. Van Nostrand Company, Inc.
4) R. Subramanian, Strength of Materials, Oxford University Press
5) S. S. Rattan, Strength of Materials, Tata McGraw Hill Education Pvt. Ltd.
6) R. K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd.

E Books:

1) Barry Dupen, Applied Strength of Materials for Engineering Technology
2) S. Timoshenko, Strength of Materials (Part -1), D. Van Nostrand Company, Inc

Web Materials:

1) http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Mechanics%20Of%20Solids/index.htm
2) http://nptel.ac.in/video.php?subjectId=112107147
3) https://www.youtube.com/watch?v=GkFgysZC4Vc
4) http://nptel.ac.in/syllabus/112106141/
5) http://nptel.ac.in/courses/Webcourse-contents/IIT-Delhi/Mechanics%20Of%20Solids/index.htm

CL281: ENVIRONMENTAL SUSTAINABILITY AND CLIMATE CHANGE
B TECH 3RD SEMESTER (UNIVERSITY ELECTIVE)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

The main objectives of the course are:

- To provide a basic understanding of the major environmental problems that need to be addressed to ensure sustainable development
- To provide a basic understanding about various management approaches towards a sustainable development
- To introduce students to the environmental aspects of specific industrial sectors, such as energy, transport, land and water use, and the built environment
- To provide basic understanding about climate changes, their causative factors and the possible mitigation

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introducing Sustainability Basics and Environmental Management	03
2	Environmental Challenges	03
3	Principles of Environmental Management	08
4	Environmental Sustainability	04
5	Introduction to Climate Change	07
6	Climate Change-Mitigation	05

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

C. **Detailed Syllabus:**

1	**Introducing Sustainability Basics and Environmental Management**	**03 Hours**	**10%**
1.1	What is Unsustainable?		
1.2	What is Sustainability? Defining the Terms		
1.3	Development & Environment		
1.4	Environmental Strategy: The New Business Playing Field		
1.5	Environmental Management		
2	**Environmental Challenges**	**03 Hours**	**10%**
2.1	Depletion of Water Resources		
2.2	Population		
2.3	Agriculture		
2.4	Land Degradation		
2.5	Energy Security		
3	**Principles of Environmental Management**	**08 Hours**	**26%**
3.1	Environmental Concerns in India		
3.2	International Environmental Movement		
3.3	Definition, Goals, Need, Tools of Environmental Management		
3.4	Participants in EM		
3.5	Ethics and the Environment		
3.6	Ecology and the Environment		
3.7	Environmental Management Systems & Standards		
4	**Environmental Sustainability**	**04 Hours**	**14%**
4.1	Strategies for Sustainability		
4.2	Land Use and Urban Planning		
4.3	Energy and Climate Change		
4.4	Transportation		
4.5	Balancing Population with Food and Water Resources		

5	**Introduction to Climate Change**	**07 Hours**	**23%**
5.1	Climate Change-Way & Means		
5.2	What Do We Know and Don't Know?		
5.3	The Physical Science of Climate Change		
5.4	Causes of Climate Change		
5.5	Global Atmospheric Composition		
5.6	Greenhouse Gases and Aerosols		
5.7	Extreme Weather Events & Sea Level Rise		
5.8	Climate Projections and their Uncertainties		
6	**Climate Change-Mitigation**	**05 Hours**	**17%**
6.1	Global Carbon Cycle		
6.2	Concept of Carbon Sequestration		
6.3	Carbon Credits and Carbon Footprints		
6.4	Policy Perspective: UNFCC, IPCC, Kyoto Protocol, MoEFCC		

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.

E. Students Learning Outcomes:

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

- Understand & appreciate for the value of quantitative, systems and transdisciplinary thinking of Environmental Sustainability

- Expand their awareness about the environment as an increasing part of the core business model and day-to-day operations of many organizations
- Develop an environmental blueprint for action
- Think strategically and act entrepreneurially to create sustainable future
- Review on Climate Change and related strategies

F. Recommended Study Materials:

Text Books:

1) Environmental Management, T. V. Ramchandra & Vijay Kulkarni, Teri Press, New Delhi, 2009.
2) Handbook of Environmental Laws, Acts, Guidelines, Compliances & Standard Policy, R. K. Trivedy, B.S. Publishers, 2010.
3) Climate Change & India, Vulnerability Assessment and Adaption, P. R. Shukla, University Press, Hyderabad, 2003.

Reference Books:

1) Environmental Management, Principles and Practice, C. J. Barrow, Psychology Press, 1999.
2) Environmental Management in Practice, Nath B., Hens, L., Compton, P. and Devuyst, D, Vol I, Routledge, London and New York, 1998.
3) Handbook of Environmental Management and Technology: Gwendolyn Holmes, Ben Ramnarine Singh, and Louis Theodore, Wiley, 2004.
4) Corporate Environmental Management: Welford R, University Press, Hyderabad, 1999.

Web Materials:

1) http://nptel.ac.in/courses/122102006/7
2) http://envfor.nic.in/
3) http://cpcb.nic.in/
4) http://gpcb.gov.in/
5) http://nptel.ac.in/courses/119106008/40
6) https://unccelearn.org/course/
7) http://www.open.edu/openlearn/nature-environment/the-environment/climate-change/content-section-0
8) http://www.openlearningworld.com/

HS122 A: VALUES AND ETHICS
B TECH 3RD SEMESTER (UNIVERSITY ELECTIVE)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

To facilitate learners to:

- Develop a familiarity with the mechanics of values and ethics
- Understand basic concepts of values and ethics
- Explore and understand values, ethics in context of professional, social and personal spectrum
- Explore and understand values, ethics in context of globalization and global issues
- Explore an application of values and ethics in personal, social, academic, global and profession life.
- Facilitate the learners to understand harmony at all the levels of human living, and live accordingly.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Values and Ethics	06
2	Elements and Principles of Values	08
3	Applied Ethics	08
4	Value, Ethics & Global Issues	08

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

C. Detailed Syllabus:

1	**Introduction to Values and Ethics**	**06 Hours**
1.1	Need, Relevance and Significance of Values and Ethics : General	
1.2	Concept and Meaning of Values and Ethics	
2	**Elements and Principles of Values**	**08 Hours**
2.1	Universal & Personal Values	
2.2	Social, Civic & Democratic Values	
2.3	Adaptation Models & Methods of Values	
3	**Applied Ethics**	**08 Hours**
3.1	Universal Code of Ethics	
3.2	Professional Ethics	
3.3	Organizational Ethics	
3.4	Ethical Leadership	
3.5	Domain Specific Ethics	
4	**Value, Ethics & Global Issues**	**08 Hours**
4.1	Cross-Cultural Issues	
4.2	Role of Ethics & Values in Sustainability	
4.3	Case Studies	

D. Instructional Method and Pedagogy:

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

E. Evaluation

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 30 marks for internal evaluation and 70 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sr. No.	Component	Number	Marks per incidence	Total Marks
3	Assignment / Project Work	2	25	25
4	Attendance and Class Participation			05
			Total	30

External Evaluation

The University Theory examination will be of 70 marks and will test the reasoning, logic and critical thinking skills of the students by asking them theoretical as well as application based questions. The examination will avoid, as far as possible, grammatical errors and will focus on applications. There will be at least one question on case analysis relevant to the components of the course.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

F. Student Learning Outcomes:

At the end of the course, learners will be able to:

- Understand the concepts and mechanics of values and ethics.
- Understand the significance of value and ethical inputs in and get motivated to apply them in their life and profession.
- Understand the significance of value and ethical inputs in and get motivated to apply them in social, global and civic issues.

G. Recommended Study Material

- Human Values and Ethics in Workplace, United Nations Settlement Program, 2006. (http://www.unwac.org/new_unwac/pdf/HVWSHE/Human%20Values%20&%20Ethics%20-%20Individual%20Guide.pdf).
- Ethics for Everyone, Arthur Dorbin, 2009. (http://arthurdobrin.files.wordpress.com/2008/08/ethics-for-everyone.pdf) .
- Values and Ethics for 21st Century, BBVA. (https://www.bbvaopenmind.com/wp-content/uploads/2013/10/Values-and-Ethics-for-the-21st-Century_BBVA.pdf)
- www.ethics.org

HS131 A: PHILOSOPHY
B TECH 3RD SEMESTER (UNIVERSITY ELECTIVE)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

To help learners to be able to:

- Develop horizons of their thinking and belief systems and have a holistic view of life.
- Adapt reflective, critical attitude towards their own beliefs and assumptions.
- Acquire reasoning and analytical tools needed to engage in intelligent discussions of philosophical issues.
- Adopt a constructively critical attitude towards society.
- Develop a sense of appreciation for all sorts of philosophical viewpoints.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Philosophy	05
2	Ancient Indian Philosophy	05
3	Socio-political Philosophy	05
4	God, Religion and Philosophy	05
5	Western Philosophy	05
6	Contemporary Issues in Philosophy	05

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

C. Detailed Syllabus:

1	**Introduction to Philosophy**	**05 Hours**
1.1	Philosophy: Concept and Meaning	
1.2	Fundamentals and Nature of Philosophy	
1.3	History and Problems of Philosophy	
1.4	Human Race and Philosophy	
1.5	Philosophy of Life	
2	**Ancient Indian Philosophy**	**05 Hours**
2.1	History of Indian Philosophy	
2.2	Divisions in Indian Philosophical Schools: Astika and Nastika	
2.3	Cārvāka School—Epistemology, Metaphysics, Ethics	
2.4	In-depth Study of Indian Philosophers: Swami Vivekananda, Mahatma Gandhi, Sri Aurobindo, Chanakya, Kabir, and Ramanuj	
3	**Socio-political Philosophy**	**05 Hours**
3.1	Social and Political Ideals: Equality, Justice, Liberty	
3.2	Individual and State: Rights and Duties	
3.3	Sovereignty: Austin, Bodin, Laski, Kautilya	
3.4	Political Ideologies: Anarchism; Marxism and Socialism	
3.5	Humanism; Secularism; Multiculturalism	
4	**God, Religion and Philosophy**	**05 Hours**
4.1	Nature and Value of Religious Experiences; from Social Conformity to Personal Commitment	
4.2	Existence of God and their Critique	
4.3	Problems of Evil, Soul, and Immorality	
4.4	Pluralism and Absolute Truth	
5	**Western Philosophy**	**05 Hours**
5.1	Origin and Development of Western Philosophy	
5.2	In-depth Study of Western Philosophies and Philosophers: Plato, Aristotle, Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, Kant, Machiavelli	
6	**Contemporary Issues in Philosophy**	**05 Hours**
6.1	Contemporary Issues in Philosophy	
6.2	Contemporary Indian v/s Western Philosophers	

D. Instructional Method and Pedagogy:

Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, video and reflective discussions, critical reading, group work, independent and collaborative research, presentations etc.

E. Evaluation

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 30 marks for internal evaluation and 70 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sr. No.	Component	Number	Marks per incidence	Total Marks
3	Assignment / Project Work	2	5	25
4	Attendance and Class Participation			05
			Total	30

External Evaluation

The University Theory examination will be of 70 marks and will test the practical applications of philosophical aspects of different theories and schools by asking theoretical as well as application based questions. There will be at least one question on case analysis relevant to the components of the course.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

F. Student Learning Outcomes:

At the end of the course, learners will be able to:

- Have broadened horizons with an in-depth thinking and varied belief systems to live holistic life.
- Adapt reflective, critical attitude towards their own beliefs and assumptions.

- Use reasoning and analytical tools needed to engage in intelligent discussions of philosophical issues.
- Adopt a constructively critical attitude towards society.
- Develop a sense of appreciation for all sorts of philosophical viewpoints.

G. Recommended Study Material

- M. Hiriyanna: Outlines of Indian Philosophy, Allen &Unwin, London, 1951
- Dasgupta, S.N.: An Historical Introduction to Indian Philosophy, Volume 1
- Indian Philosophy: The Path Finders and System-Builders by NilimaChakrabarty. Allied Publishers, New Delhi 1992
- Early Greek Philosophy by J. Barnes, London; penguin Books
- The Presocratic Philosophers by Kirk Raven and Schofield
- Greek Philosophy: Thales to Plato by J. Burnet
- History of Greek Philosophy by W.C.K. Guthrie, Vols. I &2 Karl Popper
- How to be a Philosopher by Gary Cox, Bloomsbury India
- Pleasures of Philosophy by Will Durant, Pocket Books, New York
- The Story of Philosophy by Will Durant, Pocket Books, New York

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

This course covers the principles and application of Fluid Mechanics to the branch of civil engineering. The objectives of the course are to:

- To understand the properties of fluids and fluid statics.
- To derive the equations of conservation of mass and their applications in civil engineering.
- To understand important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to flow measurement problems.
- To provide insights to the open channel hydraulics.
- To study various types of hydraulic machinery.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Properties of Fluid	4
2	Fluid Statics	10
3	Fluid Kinematics	9
4	Fluid Dynamics	8
5	Measurement of Flow	8
6	Flow Through Pipes	9
7	Open Channel Flow	10
8	Introduction to the Hydraulic machinery	2

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Properties of Fluid**	**04 Hours**	**7%**
1.1	Types of Fluid		
1.2	Fluid properties		
1.3	Fluids as a continuum		
1.4	Control volume concept		
1.5	Viscometers		
2	**Fluid Statics**	**10 Hours**	**17%**
2.1	Pressure and it's measurement		
2.2	Pascal's law, hydrostatic pressure, atmospheric, absolute, gauge and vacuum pressure		
2.3	Pessure measurement through piezometer and manometer		
2.4	Total pressure, intensity of pressure, centre of pressure, Pressure on horizontal, vertical, inclined and curved surface		
2.5	Floating Bodies, Buoyancy and centre of buoyancy, meta centre and meta centre height		
2.6	Condition of equilibrium of floating and submerged body, determination of meta-centric height by experimental and analytical method, stable and unstable equilibrium, pressure in case of accelerated rigid body motion		
3	**Fluid Kinematics**	**09 Hours**	**15%**
3.1	Types of fluid motion, methods of describing fluid flow - Langrangian and Eulerian method		
3.2	Inviscid flows, velocity and acceleration, flow rate		
3.3	Continuity equation		
3.4	Potential flows, flow lines, velocity potential and stream function		
3.5	Flownet its characteristic and utility, circulation and vorticity		
4	**Fluid Dynamics**	**08 Hours**	**13%**
4.1	Energy processed by a fluid body, Types of forces, Forces influencing fluid motion, head-energy correction factor		
4.2	Euler and Bernoulli's equations, application of Bernoulli's equation		

4.3	Flow measurement, momentum of fluid in motion, momentum equation and momentum correction factor		
4.4	Application of momentum equation, forces on a pipe bend, free jets		
5	**Measurement of Flow**	**08 Hours**	**13%**
5.1	Orifice & Mouth piece Classification, hydraulic coefficients, experimental determination of hydraulic coefficient, discharge through all types of office & mouthpiece, time of emptying the tank through orifice and mouthpiece		
5.2	Notches and Weirs Classification, discharge through various types of Notches and weirs, time of emptying a reservoir or a tank with notches & weirs		
5.3	Venturimeter		
5.4	Nozzles and Bendmeter		
6	**Flow Through Pipes**	**09 Hours**	**15%**
6.1	Introduction		
6.2	Major and minor losses of energy in pipes, hydraulic gradient, total energy line		
6.3	Pipes in series and parallel, flow through branched pipes		
6.4	Hydraulic transmission of power		
6.5	Water hammer and its effects		
7	**Open Channel flow**	**10 Hours**	**17%**
7.1	Comparison between pipe flow and open channel flow		
7.2	Classification of open channel flow		
7.3	Uniform flow – Chezy's formula		
7.4	Manning's formula- numerical		
7.5	Hydraulically efficient channel cross section		
7.6	Rectangular section		
7.7	Trapezoidal section and circular section		
8	**Introduction to the Hydraulic machinery**	**2 Hours**	**3%**
8.1	Introduction to various types of Turbines and hydraulic pumps, Hydraulic press - hydraulic accumulator - Hydraulic ram		

8.2	Working principle, discharge calculations and use of and machines Centrifugal pumps

D. Instructional Method and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.
- Industrial visits will be organized for students to explore industrial facilities. Students are required to prepare a report on industrial visit and submit as a part of the assignment.

E. Students Learning Outcomes:

On the successful completion of this course

- Determine the properties of fluid and pressure and their measurement.
- Apply continuity equation and energy equation in solving problems on flow through conduits.
- Compute the frictional loss in laminar and turbulent flows.
- Design open channels for most economical sections like rectangular, trapezoidal and circular sections.
- Select the type of pumps and turbine required with reference to available head of water and discharge.

F. Recommended Study Material:

Text Books:

1) Jain, A.K., Fluid Mechanics, Khanna Publishers, New Delhi
2) Bansal, R.K., Fluid Mechanics, Laxmi Publications

Reference Books:

1) Streeter, V.L. and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1985, New York
2) Subramanya, K., Theory and Applications of Fluid Mechanics, Tata-McGraw Hill Publishing Co., 1993, New Delhi
3) Shaughnessy, E.J., Katz, I.M. and Schaffer, J.P., Introduction to Fluid Mechanics, SI edition, 2005, Oxford University Press, New Delhi
4) White, F.M. Fluid Mechanics, McGraw Hill, New York
5) Kumar, D.S., Fluid Mechanics, S.K.Kataria & Sons
6) Rajput, R.K., Fluid Mechanics, S. Chand & Co. publications
7) Modi, P.N. and Sheth, Fluid Mechanics & Hydraulic Machines, Standard Book House
8) Ramamurtham, S., Hydraulic Fluid Mechanics & Fluid Machines, Dhanpatrai Publishing Co.
9) Garde, R.J. and Mirajgaoker, A.C., Engineering Fluid Mechanics, New Chand & Sons

Web materials:

1) http://www.msubbu.in/ln/fm/
2) http://nptel.ac.in/courses/105103095/

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are

- To identify various factors to be considered for planning and construction of buildings.
- To understand various building elements in terms of their functions, requirements, and planning and design principles.
- To understand performance of materials, components and assemblies used for building elements and their construction.
- To familiarize with various methods and sequence involved in building construction including temporary works.
- To understand the material and construction techniques used for damp proofing and other insulations of building.
- To familiarize with various green technology concepts used in building construction.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Masonry Works	09
2	Foundations	05
3	Doors, Windows & Ventilators	07
4	Stairs and Staircases	05
5	Floors and Floorings	05
6	Roofs and Roof Coverings	05
7	Wall Finishes	04
8	Temporary Works	05

9	Insulation	05
10	Damp Proofing	05
11	Green Building Technology	05

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1 Masonry Works **09 Hours 15%**

1.1 Stone masonry:
Technical terms; materials used; classification – random rubble, square rubble, Ashlar fine tooled, Ashlar chamfered; joints

1.2 Brick masonry: Technical terms; bonds in brick work – stretcher, header, English, Flemish, Raking; pointing – method and types

1.3 Composite masonry: Brick-stone composite masonry - properties and uses; Concrete masonry – hollow concrete blocks, Autoclaved aerated concrete (AAC), Advantages and Disadvantages over other cement construction materials; Reinforced brick masonry

2 Foundations **05 Hours 10%**

2.1 Classification, Necessity, essential requirements, methods of site exploration, settlement, causes of failures of foundation and remedial measures; Bearing capacity of soils

2.2 Shallow foundations: Depth of footing, types and construction ,design of strip footing

3 Doors, Windows & Ventilators **07 Hours 11%**

3.1 Doors: Location, technical terms, door frames, types of doors– construction, suitability - panelled, glazed, flushed doors, collapsible steel doors

3.2 Windows: Types of windows–construction, suitability - Casement, Sash, and Skylight windows

3.3 Ventilators: Ventilators combined with window; fan light

	fixtures and fastenings		
4	**Stairs, Staircase and Escalators**	**05 Hours**	**10%**
4.1	Technical terms, requirements of good stair		
4.2	Dimensions of a step, types of steps, classification of stairs		
4.3	Design of stair, example – stair planning, elevators, escalators		
5	**Floors and Floorings**	**05 Hours**	**08%**
5.1	Components of a floor		
5.2	Flooring material and factors affecting selection of flooring material		
5.3	Types of ground floors –cement concrete, tiles, marble, timber etc., Recent Developments in Flooring Technology		
5.4	Types of upper floors –Conventional floors (timber, steel joist), reinforced cement concrete &pre-cast concrete floors		
6	**Roofs and Roof Coverings**	**05 Hours**	**08%**
6.1	Requirements of a good roof, technical terms		
6.2	Types of roofs – single, trussed, steel roof trusses		
6.3	Types of roof covering –G.I. Sheets, light weight roofing, Flat terraced roof–advantages, disadvantages, types, Water proofing techniques in flat roofs, Recent Developments in Roofing Materials & Technology		
7	**Wall Finishes**	**04 Hours**	**06%**
7.1	Plastering: Objectives, requirements, terms, tools, cement plaster, special materials used in plastering, defects		
7.2	Painting: Painting on different surfaces, defects, Recent Developments in painting technology		
8	**Temporary Works**	**05 Hours**	**08%**
8.1	Timbering in trenches		
8.2	Component and types of scaffolding		
8.3	Formwork		
9	**Insulation**	**05 Hours**	**08%**
9.1	Introduction, Definitions		
9.2	Thermal Insulation– Materials and Methods		
9.3	Acoustic Insulation – Materials and Methods		

9.4	Fire Insulation – Materials and Methods		
10	**Damp proofing**	**05 Hours**	**08%**
10.1	Introduction, causes of dampness		
10.2	Effects of dampness		
10.3	Methods of damp proofing		
10.4	Materials used for damp proofing course		
10.5	D.P.C. treatments in building (walls, floors, roofs)		
11	**Green Technology Application in Buildings**	**05 Hours**	**08%**
11.1	Introduction		
11.2	LEED rating, GRIHA rating systems		
11.3	Advanced construction materials and procedures used in green construction		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Theoretical concepts will supported by different models and charts in the laboratory.
- Sketches shall be prepared by the students in a sketch book in the laboratory related to course contents.
- Field Visits to Building construction sites.

E. Students Learning Outcomes:

On the successful completion of this course, student will be able to

- Utilise basic principle of planning in construction of building elements.
- Know the types, dimensions and method of construction of various building components.
- Understand the various engineering checks required for construction of different building elements.
- Design strip footing type of shallow foundation.
- Identify and select appropriate type of building elements suitable for particular situation.
- Identify and suggest appropriate temporary structures suitable for various building components.
- Identify and suggest suitable construction materials and procedures used in building insulation and damp proofing.
- Select appropriate mode of vertical movements and design of staircase.
- Identify and suggest suitable construction materials and procedures used in green building construction.

F. Recommended Study Material:

Text Books:

1) Varghese, P.C., Building Construction, Prentice-Hall of India (PHI) Learning Pvt. Ltd., New Delhi
2) Sushil Kumar, Building Construction, Standard Publishers Distributors, NewDelhi
3) Rangwala, S.C., Building Construction, Charotar Publishing House Pvt. Ltd., Anand

Reference Books:

1) Punamia, B.C., Building Construction, Laxmi Publication, New Delhi
2) Roy Chudley & Roger Greeno, Construction Technology, Prentice Hall
3) Roy Chudley& Roger Greeno, Building Construction Handbook, Routledge Publications
4) Francis D. K. Ching, Building Construction Illustrated, Wiley Publications

5) Edward Allen& Joseph Iano, Fundamentals of Building Construction: Materials and Methods, Wiley Publications
6) Clarke Snell &Tim Callahan, Building Green: A Complete How-To Guide to Alternative Building Methods, Sterling Publications
7) National Building Code of India, Indian Standard Institution (ISI), 2005, New Delhi

Web Materials:

1) http://nptel.ac.in/courses/105102088/
2) https://www.youtube.com/watch?v=Jfli-RdNo_w
3) https://www.youtube.com/watch?v=fDUD36VPD_U
4) https://www.youtube.com/watch?v=wmRYKrfQjuk
5) https://www.youtube.com/watch?v=O5lnAA_iDCM
6) https://www.youtube.com/watch?v=DRO_rIkywxQ

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The course is developed to give an understanding on the importance of structural analysis and the tools available to determine the response of a structural system to external loads.

- Introduce the student to the fundamentals of analysis of statically determinate planar structures.
- To understand the concept of analysis of determinate structures by various classical methods.
- To study the different methods of analysing deflection of beams.
- To study the behaviour of structure under combination of stresses.
- To analyse the column and struts with different end conditions.
- To study the use of ILD for moving loads and its effect on structures.
- To understand the theory of torsion and stresses in shaft and springs.
- To study the behaviour and analysis of thin wall pressure vessels.
- To study the behaviour and analysis of arches.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	04
2	Slope and Deflection of Statically Determinate Beams	10
3	Combined Direct and Bending Stresses	08
4	Columns and Struts	08
5	Influence Line for Determinate Beams	10
6	Torsion in Circular Shafts and Springs	06
7	Pressure Vessels and Stress Concentrations	06

8	Arches	08

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1.	**Introduction**	**04 Hours**	**07%**
1.1	Concepts of Structural Analysis		
1.2	Idealization of structures		
1.3	Static indeterminacy and kinematic indeterminacy		
2	**Slope and Deflection of Statically Determinate Beams**	**10 Hours**	**17%**
2.1	Differential Equation of the Elastic Curve, Relationship of slope deflection with radius of curvature, bending moment, shear force and load intensity		
2.2	Relation between Moment, Slope and Deflection using fundamental Double Integration Method, Macualay's Method (Method of Singularity Function), Moment Area Method, Conjugate Beam Method		
3	**Combined Direct and Bending Stresses**	**08 Hours**	**13%**
3.1	Eccentric Loading along One Principle Axis		
3.2	Middle Third Rule, Kernal (Core) of Section		
3.3	Column Subjected to Biaxial Bending		
3.4	Structures Subjected to Lateral Pressure		
4	**Columns and Struts**	**08 Hours**	**13%**
4.1	Buckling of Columns, different end conditions		
4.2	Euler's Theory, Equivalent Length		
4.3	Applicability and limitations of Euler's Formula		
4.4	Rankine's Formula		
4.5	Column as per I.S. 800 - 1984.		
4.6	Strut with Eccentric Load (Secant Formula)		
4.7	Strut with Initial Curvature		
5	**Influence Line for Determinate Beams**	**10 Hours**	**17%**
5.1	Uses of influence lines, Various Types of Loading		

5.2	Influence lines for statically determinate beams under moving loads		
5.3	Influence lines for support reactions, shear force & bending moment for uniformly distributed load and several point loads		
5.4	Criteria for maximum effects		
6	**Torsion in Circular Shafts**	**06 Hours**	**10%**
6.1	Assumption for shear stress in a circular shaft subjected to torsion		
6.2	Torsion Stress and Strain, Torsion Formula		
6.3	Power Transmitted by Shaft		
6.4	Design of Shaft: Shafts of Uniform Section, Shaft of Varying Section, Shaft Mounted on Different Pulleys, Coupling and Keys		
6.5	Composite Shafts		
6.6	Introduction to strength of spring, stiffness of a spring, type of springs, helical spring, closed-coiled helical springs subjected to an axial twist		
7	**Pressure Vessels and Stress Concentrations**	**06 Hours**	**10%**
7.1	Thin-Walled Pressure Vessels		
7.2	Stress Concentration in Tension		
8	**Arches**	**08 Hours**	**13%**
8.1	Arches as structural forms – Examples of arch structures, Types of arches		
8.2	Analysis of three hinged and two hinged, parabolic and circular arches – Settlement and temperature effects		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.

- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

E. Students Learning Outcomes:

On the successful completion of this course

- Identify the stability and determinacy of planar structures.
- Calculate deflections for statically determinate beams using different methods of analysis.
- Analyses the columns with different end conditions and understand the effect of same.
- Construct influence lines for statically determinate beams and to use influence lines to find maximum load effects in beams.
- Calculate the combined stresses and also stresses induced on pressure vessels.
- To analyze the arches and shaft.

F. Recommended Study Material:

Text Books:

1) Junarkar, S.B. and Shah, H.J., Mechanics of Structures Vol. I, Charotar Publishing House
2) Negi, L.S. and Jangid, R.S., Structural Analysis, Tata McGraw Hill
3) Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill

Reference Books:

1) Dupen Barry, Applied Strength of Materials for Engineering Technology
2) Gere and Timoshenko, Mechanics of Materials, CBS Publishers
3) Hibbler, R.C., Mechanics of Materials, Pearson Education
4) Wang, C.K., Intermediate Structural Analysis, Tata McGraw Hill

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The course is developed with an objective of making the students to understand the basic structure and structure property relation of engineering materials and there by developing or selecting most suitable material for various civil engineering applications. The specific objectives of the course are

- To give an overview on engineering requirements of materials and the importance of structure property relations of engineering materials on their selections and use.
- To make the student familiarize with various crystal structure, geometry and associated crystal defects.
- To understand the fundamentals of mechanism of crystallization and development of single and polycrystalline materials.
- To make the student familiarize with iron –carbon diagrams and their phase transformations.
- To understand the structure and properties of various engineering steels/metals and their corrosion and degradation behaviors.
- To understand the structure, properties and application of various fiber reinforced composites.
- To understand the process, structure, properties and application of engineered wood products.
- To understand the testing/ evaluation of strength and other properties of engineering materials.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Material Science	04
2	Crystal Structure and Properties	10
3	Mechanism of crystallization & Phase Transformation	06
4	Engineering Steels and Alloys	07
5	Corrosion and degradation of metals	04
6	Fiber Reinforced Composites	08
7	Engineered Wood & Wood Products	06

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1.0 Introduction to Material Science **04 Hours 9%**

1.1 Classification of Engineering Materials

1.2 Engineering requirements of materials

1.3 Properties of engineering materials

1.4 Criteria for selection of materials for engineering applications

1.5 Structure property relationship

2.0 Crystal Structure and Properties **10 Hours 22%**

2.1 Atomic structure & bonding in solids

2.2 Bravais lattices &Crystal Structure, Crystal planes & directions, Atomic packing

2.3 Bragg Law &Diffraction

2.4 Imperfection in solids, Linear defects, Slip, Dislocation &Plastic deformation, Planar defects, Volume defects

2.5 Mechanical properties of metals, Strain hardening,Thermal, Magnetic , Electrical p & Optical properties of materials

3.0	**Mechanism of crystallization & Phase Transformation**	**06 Hours**	**13%**
3.1	Nucleation-Homogeneous and Heterogeneous Nucleation-Growth -Single crystal -Polycrystalline Materials - Basic principles of solidification of metals and alloys		
3.2	Phase diagram & phase transformation		
4.0	**Engineering Steels and Alloys**	**07 Hours**	**15%**
4.1	Iron carbon diagram and phase diagrams		
4.2	Grades of CI, Alloyed Cast Iron, Malleable Iron and S. G. Iron		
4.3	Classification, Properties and Use of Structural Steels, High Carbon and Mild Steels, TMT Steel		
4.4	Effects of different alloying metals		
5.0	**Corrosion and degradation of metals**	**04 Hours**	**9%**
5.1	Causes and nature of corrosion		
5.2	Inter-granular corrosion (IGC), Hydrogen embrittlement		
5.3	Measures of counteracting corrosion,		
5.4	Metal coatings, Organic coatings, Lining and cladding, Use of Corrosion inhibitors, Cathodic protection against corrosion		
6.0	**Fiber Reinforced Composites**	**08 Hours**	**18%**
6.1	Types and application of composites		
6.2	Particle reinforced composites, Influence of fiber orientation and concentration		
6.3	Fiber phase and the matrix phase, Polymer matrix composite		
6.4	Metal matrix composite, Ceramic matrix composite and carbon-carbon composites		
7.0	**Engineered Wood and Wood Products**	**06 Hours**	**13%**
7.1	Laminated veneer lumber (LVL): Laminated strand lumber (LSL), Parallel strand lumber (PSL), Wood I-joists, Glue-laminated beams		
7.2	Reconstituted products: Particle boards, Medium Density Fibre Board (MDF), Hardboard and Block Board		

D. Instructional Method and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black board, OHP etc.
- Surprise tests/Quizzes/Seminar/ Assignments will be conducted which carries 5 marks as a part of internal.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures theory evaluation.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the completion of the course the student

- Familiar with various atomic bonding and crystal structure, and also their characteristics and influence on engineering properties.
- Understand basic engineering properties of materials and the underlying structural features which are governing such properties.
- Know the mechanism of crystallization and phase transformation in major engineering materials.
- Be able to understand fundamentals of various engineering steels and alloys and should have ability to select suitable materials based on their structure-property relations.
- Be able to understand the corrosion and other degradation in metals and suggest suitable remedial measures.
- Know the structure, properties and application of various fiber reinforced composites used in engineering.
- Know process, structure, properties and application of various processed wood products used in engineering.

F. **Recommended Study Material:**

Text Books:

1) Materials Science and Engineering: A First Course, Raghvan V, Prentice Hall of India
2) Callister W. D. Jr, "Materials science and engineering : An Introduction", Edition:-2006, Wiley India, New Delhi, India
3) Dharmendra Kumar and Jain S. K., "Material science and manufacturing process", Vikas Pub House, New Delhi, India
4) Van Vlack, Elements of Materials Science and Engineering, 1989

Reference Books:

1) Narula & Gupta, Material Science, Tata McGraw-Hill Education
2) Avner Sidney H., "Physical Metallurgy", Tata McGraw Hill Education
3) Khanna O. P., "Material Science - A Text Book of Material Science & Metallurgy", DhanpatRai Pub
4) Narang G. B. S. and Manchanedy K., "Materials and Metallurgy", Khanna Pub New Delhi, India
5) Thomas G. Williamson, APA Engineered Wood Handbook, McGraw Hill Professional, 2002

Web Materials

1) http://ocw.mit.edu/OcwWeb/web/courses/courses/index.htm#MaterialsScienceandEngineering
2) http://nptel.iitm.ac.in/courses/Webcoursecontents/IIScBANG/Material%20Science/New_index1.html

CL282: BASICS OF ENVIRONMENTAL IMPACT ASSESSMENT
B TECH 4TH SEMESTER (UNIVERSITY ELECTIVE)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

The main objectives of the course are:

- To provide a basic understanding of the need, objective and the parameters considered for Environmental Impact Assessment (EIA) studies.
- To provide an awareness on impact on resources and environment from development projects.
- To introduce students to the legal, economic, administrative and technical process of preparing and/or evaluating environmental impact documents.
- To learn laws related to EIA and auditing in India.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to EIA	05
2	Considerations for Environmental Assessment	07
3	Process of Impact Assessment	07
4	Tools for Assessing Environmental Impact	07
5	EIA in Indian Scenario	04

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

C. Detailed Syllabus:

1	**Introduction to Environmental Impact Assessment**	**05 Hours**	**17%**
1.1	What is EIA?		
1.2	Objectives of EIA		
1.3	Brief History of Environmental Impact Analysis		
1.4	EIA as research		
1.5	EIA as decision making process		
1.6	EIA in Global Affairs		
2	**Considerations for Environmental Assessment**	**07 Hours**	**23%**
2.1	Assessment Methodology		
2.2	Socioeconomic Impact Assessment		
2.3	Air Quality Impact Analysis		
2.4	Noise Impact Analysis		
2.5	Energy Impact Analysis		
2.6	Water Quality Impact Analysis		
2.7	Vegetation And Wild Life Impact Analysis		
2.8	Cumulative Impact Assessment		
2.9	Ecological Impact Assessment		
2.10	Risk Assessment		
3	**Process of Impact Assessment**	**07 Hours**	**23%**
3.1	Process for Environmental Impact Study		
3.2	Terms of Reference		
3.3	Stages in EIS Production: Screening, Scoping, Prediction, Evaluation, Reducing Impact, Monitoring, Conclusions		
3.4	Components of EIA Reports		
4	**Tools for Assessing Environmental Impact**	**07 Hours**	**23%**
4.1	Impact Assessment Methodologies-various Methods-Their Applicability		
4.2	Rapid EIA		
4.3	Strategic Impact Assessment=		
4.4	Cumulative Impact Assessment		

5 EIA in Indian Scenario 04 Hours 14%

5.1 Provisions in the EIA Notification by MoEFCC

5.2 Categorization of Industries for Seeking Environmental Clearance

5.3 Procedure for Environmental Clearance

5.4 Environmental Management Plan

5.5 Case Study: Sardar Sarovar Dam, Narmada Project

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.

E. Students Learning Outcomes:

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

- Decide on the typical parameters to be considered in a EIA study of a developmental project.
- Fully participate in interdisciplinary environmental report preparation teams.
- Review and understand an EIA document for completeness and adequacy.
- Review a typical development project plan and identify possible environmental effects and prepare appropriate initial studies.
- Utilize EIA documents for policy development, project planning or for legal or political action planning.

F. **Recommended Study Material:**

Text Books:

1) Environmental Impact Assessment, Larry W Canter(2nd Edition), McGraw Inc., Singapore, 1996.
2) Environmental Impact Assessment – Handbook: John G Rau and D C Wooren, Mc-GrawHill.
3) Environmental Impact Assessment, A. K. Shrivastava, APH Publishing, New Delhi, 2003.

Reference Books:

1) Eccleston, H.C. Environmental Impact Statements. John Wiley & Sons, Inc. Canada, 2000.
2) World Bank, Environmental Assessment Sourcebook. Volume 1. World Bank Technical Paper No. 139, Washington, D.C, 1991.
3) Environmental Impact Analysis - a Decision Making Tool: By R K Jain, L. V. Urban and G.S. Stacey Publishers:Van Nostrand Reinhold New York.

Web Materials:

1) http://eia.unu.edu/course/index.html%3Fpage_id=173.html
2) http://envfor.nic.in/legis/eia/eia-2006.htm
3) http://envfor.nic.in/
4) http://nptel.ac.in/Clarify_doubts.php?subjectId=120108004&lectureId=5
5) http://cpcb.nic.in/
6) http://gpcb.gov.in/

HS123.01 A: CRITICAL THINKING AND LOGIC
B TECH 4TH SEMESTER (UNIVERSITY ELECTIVE)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

To facilitate learners to:

- Develop a familiarity with the mechanics of critical thinking and logic.
- Understand basic concepts of critical thinking and logic
- Explore and understand critical thinking and logic in context of professional, social and personal spectrum
- Explore an application critical thinking and logic in personal, social, academic, global and profession life.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Critical Thinking and Logic	06
2	Elements and Principles of Critical Thinking	06
3	Logic & Arguments	06
4	Applied Critical Thinking & Logic	06
5	Practicing Critical Thinking & Logic	06

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

C. Detailed Syllabus:

1	**Introduction to Critical Thinking and Logic**	**06 Hours**
1.1	Need, Relevance and Significance of Critical Thinking and Logic	
1.2	Concept and Meaning of Critical Thinking and Logic	
2	**Elements and Principles of Critical Thinking**	**06 Hours**
2.1	Models of Critical Thinking	
2.2	Critical Thinking and Higher Order Thinking Skill	
3	**Logic & Arguments**	**06 Hours**
3.1	Nature & Significance of Logical Arguments	
3.2	Structure and Types of Logical Arguments	
3.3	Application of Logical Arguments	
4	**Applied Critical Thinking & Logic**	**06 Hours**
4.1	Critical Thinking, Logic in Problem Solving & Decision-Making	
4.2	Critical Thinking & Creativity	
4.3	Moral Reasoning	
5	**Practicing Critical Thinking & Logic**	**06 Hours**
5.1	Case Study	
5.2	Tasks	
5.3	Quiz	

D. Instructional Method and Pedagogy:

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

E. Evaluation

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 50 marks for internal evaluation and 50 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sr. No.	Component	Number	Marks per incidence	Total Marks
1	Assignment / Project Work	2	20	40
2	Attendance and Class Participation			10
			Total	**50**

External Evaluation

The University Theory examination will be of 70 marks and will test the reasoning, logic and critical thinking skills of the students by asking them theoretical as well as application based questions. The examination will avoid, as far as possible, grammatical errors and will focus on applications. There will be at least one question on case analysis relevant to the components of the course.

Sr. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	50	50
			Total	50

F. Student Learning Outcomes:

At the end of the course, learners will be able to:

- Understand the mechanics and concept of critical thinking and logic.
- Understand the application of critical thinking and logic in context of creativity, logical arguments, moral reasoning and creativity
- Understand the application of critical thinking and logic in personal, social, academic, global and profession life.

G. Recommended Study Material

- Introduction to Logic and Critical Thinking, Marrilee Salmon, 6th Ed. Wadsworth Ceneage Learning. 2013.
  (http://www.cengagebrain.com.au/content/9781133966982.pdf)
- http://www.arn.org/realscience/kog1asample/kog-ct-chem-1a-sample.pdf
- http://cw.routledge.com/textbooks/mcadoo/
- www.criticalthinking.org

HS 127.01: COMMUNICATION SKILLS II
B TECH 4TH SEMESTER (UNIVERSITY ELECTIVE)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	2	-	2	2
Marks	100	-	100	

A. Objectives of the Course:

To facilitate learners to:

- Develop communication skills required in business organization, namely: listening, speaking reading and writing
- Improvise comprehensional and expressional skills required for the day to day; and classroom, academic and cultural situation
- Sharpen communication skills with reference to organizational structure
- Improve their vocabulary of English

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Interpersonal Communication	06
2	Major Communication Techniques and Styles	05
3	Group Communication and Group Dynamics	05
4	Communicating in Work Teams	05
5	Presentation Skills	06
6	Vocabulary	03

Total Hours (Theory): 30

Total Hours (Lab): 00

Total Hours: 30

C. Detailed Syllabus:

1	**Interpersonal Communication**	**06 Hours**
1.1	Introduction to Interpersonal Communication , Group and Organizational Communication	
1.2	Communication Styles or Modes	
1.3	Principals of Interpersonal Communication	
1.4	Importance and functions of Interpersonal Communication	
1.5	Levels of Communication	
1.6	Nonverbal Communication	
1.7	Communicating in Diverse Environment	
2	**Major Communication Techniques and Styles**	**05 Hours**
2.1	Introduction to Communication styles & techniques	
2.2	Assertive Communication	
2.3	Aggressive Communication	
2.4	Passive Communication	
2.5	Passive and Aggressive Communication	
2.6	Working with different styles	
3	**Group Communication and Group Dynamics**	**05 Hours**
3.1	Introduction to Group Dynamics	
3.2	Introduction to Group Communication	
3.3	Communication networks within and outside the group	
3.4	Social and Behavioral Sciences and Group Communication	
4	**Communicating in Work Teams**	**05 Hours**
4.1	Productive Meeting Management	
4.2	Making Formal Presentation	
5	**Presentation Skills**	**06 Hours**
5.1	Introduction to presentation and its importance	
5.2	Modes, Means And Purpose Of Presentation	
5.3	Defining purpose, Audience Analysis and Organizing the content	
5.4	Presentation Mechanics and Presentation Process	
5.5	Managing yourself during question and answers	

6 **Vocabulary** **03 Hours**

6.1 Idioms, Confusables

6.2 One-word Substitutes

6.3 Synonyms, Antonyms

6.4 Homophones and Homonym

D. Instructional Method and Pedagogy:

The course is based on pragmatic learning. Teaching will be facilitated by Reading Material, Discussion, Task-based learning, Projects, Assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations, etc.

E. Evaluation

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation (Theory) is schemed as 30 marks for internal evaluation and 70 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sr. No.	Component	Number	Marks per incidence	Total Marks
1	Assignment / Project Work	2	25	25
2	Attendance and Class Participation			05
			Total	**30**

External Evaluation

The University Theory examination will be of 70 marks and will test the reasoning, logic and critical thinking skills of the students by asking them theoretical as well as application based questions. The examination will avoid, as far as possible, grammatical errors and will focus on applications. There will be at least one question on case analysis relevant to the components of the course.

Sr. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

F. Student Learning Outcomes

The students will be able to perform well during Presentations. The students should have developed the ability to communicate effectively, they should be able to communicate message accurately, handle intercultural situation that require thoughtful communication, to use appropriate words and tones and so on. The course, in particular, will enable the students to be effective language user with reference to communication in group and group behavior.

G. Recommended Study Material

- Communication Skills by Sanjay Kumar and Pushplata (2011)
- Developing Communication Skills by Krishna Mohan and Meena Banerji (2010)
- Effective Business Communication by M V Rodriques (2013)
- Basic Technical Communication by Kavita Tyagi and Padma Mishra (2011)
- http://www.communicationskills.co.in/index.html
- http://www.hodu.com/default.htm
- http://www.bbc.co.uk/worldservice/learningenglish
- http://www.englishlearner.com/tests/test.html
- http://www.englishclub.com/vocabulary/idioms-body.htm
  http://dictionary.cambridge.org

CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

ACADEMIC REGULATIONS & SYLLABUS

(Choice Based Credit System)

Faculty of Technology & Engineering

Bachelor of Technology Programme

(Third Year Civil Engineering)

Effective From 2018-19

Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the choicest destinations by students. It has been transformed into **Charotar University of Science and Technology (CHARUSAT)** through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. of India.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmes, one Institute and an investment of about Rs. 3 Crores (INR 30 million). At present there are seven different institutes falling under ambit of six different faculties. The programmes offered by these faculties range from undergraduate (UG) to Ph.D degrees including M.Phil. These faculties, in all offer 64 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Charotar Institute of Technology	B. Tech M. Tech MTM Ph.D.
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm M. Pharm MPM PGDCT/ PGDPT Ph.D.
Faculty of Management Studies	Indukaka Ipcowala Institute of Management	M.B.A PGDM Dual Degree BBA+MBA Ph.D.
Faculty of Computer Applications	Smt. Chandaben Mohanbhai Patel Institute of Computer Applications	M.C.A/MCAL M.Sc. (IT) Dual Degree BCA+MCA Ph. D

Faculty of Applied Sciences	P. D. Patel Institute of Applied Sciences	M.Sc. Dual Degree B.Sc. + M.Sc. Ph.D.
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy Manikaka Topawala Institute of Nursing Charotar Institute of Paramedical Sciences	B.PT M.PT Ph.D. B.Sc. (Nursing) M.Sc. PGDHA PGDMLT GNM Ph.D.

The development and growth of the institutes have already led to an investment of over Rs. 125 Crores (INR 1250 Million). The future outlay is planned with an estimate of Rs. 250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 105 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 360 core faculty members, educated and trained in IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, **CHARUSAT** has the vision of entering the club of premier Universities initially in the country and then globally. High Moral Values like **Honesty, Integrity and Transparency** which has been the foundation of ECC continues to anchor the functioning of **CHARUSAT**. Banking on the world class infrastructure and highly qualified and competent faculty, the University is expected to be catapulted into top 20 Universities in the coming five years. In order to align with the global requirements, the University has collaborated with internationally reputed organizations like Pennsylvania State University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute –UK, ISRO, BARC, etc.

CHARUSAT has designed curricula for all its Programmes in line with the current international practices and emerging requirements. Industrial Visits, Study Tours, Expert Lectures and Interactive IT enabled Teaching Practice form an integral part of the unique **CHARUSAT** pedagogy.

The Programmes are credit-based and have continuous evaluation as an important feature. The pedagogy is student-centered which augurs well for self-learning and motivation for enquiry and research, and contains innumerable unique features like:

- Participatory and interactive discussion-based classes.
- Sessions by visiting faculty members drawn from leading academic institutions and industry.
- Regular weekly seminars.
- Distinguished lecture series.
- Practical, field-based projects and assignments.
- Summer training in leading organizations under faculty supervision in relevant Programmes.
- Industrial tours and visits.
- Extensive use of technology for learning.
- Final Placement through campus interviews.

Exploration in the field of knowledge through research and development and comprehensive industrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her Programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

CHARUSAT welcomes you for a Bright Future

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY
Accredited with Grade A by NAAC,
Accredited with Grade A by KCG

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (Civil Engineering) Programme

(Choice Based Credit System)

Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

Academic Year – 2018-19

CHARUSAT

FACULTY OF TECHNOLOGY AND ENGINEERING
ACADEMIC REGULATIONS
Bachelor of Technology Programmes

To ensure uniform system of education, duration of undergraduate and post graduate Programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

System of Education

The Semester system of education should be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate and Master's levels. An Academic year shall consist of two semesters, each of 26 weeks, having a minimum of 90 days for the direct class room teaching. Every enrolled student will be required to take a specified load of course work in the chosen subject of specialization and also complete a project/dissertation if any.

Duration of Programme

Undergraduate Programme (B. Tech.)

Minimum	8 semesters (4 academic years)
Maximum	12 semesters (6 academic years)

Eligibility for Admissions

As enacted by Govt. of Gujarat from time to time.

Mode of Admissions

As enacted by Govt. of Gujarat from time to time.

Programme Structure and Credits

As per Annexure – 1 attached

Attendance

All activities prescribed under these regulations and enlisted by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student regarding attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Principal.

Student's attendance in a course should be 80%.

Course Evaluation

1. ***The performance of every student in each course will be evaluated as follows:***

   i) A student shall be evaluated through Continuous Evaluation and Semester End Examination.
   ii) The weight of continuous assessment and End-semester examination shall be varying from UG to PG and from Faculty to Faculty as approved by Academic Council.
   iii) During the semester, a student shall be going through continuous assessment. The continuous assessment will be conducted by the respective Department / Institute. At the end of semester a student shall be evaluated through semester end examination comprising of theory and/ or practical, viva-voce, term work components as decided by Academic Council.
   iv) The performance of candidate in continuous assessment and in end-semester examination together shall be considered for deciding the final grade in a course.
   v) External examiners shall be involved for the evaluation of at least 50% of the total credits in the end semester university examination.
   vi) A candidate who has cleared all the courses under different components meeting the minimum number of credits required will be considered as passed and eligible for the award of respective degree in the relevant class.

2. ***Grading Methodology and Results***

   i) Performance of the student in all the components shall be graded using relative grading system
   ii) At the end of a semester, a histogram shall be prepared for results of each course. A committee mentioned hereunder shall finalize the histogram based on which results will be prepared.

3. *Result Preparation committee*

A committee chaired by Provost and comprising of Dean of Faculty, One Dean other than the faculty and one teacher having expertise of relative grading shall deliberate upon different scenarios of results based on histograms of all the courses. Thereafter, the committee shall finalize the results. The histogram shall be prepared for each course. After the finalization by the committee, the results shall be declared within 3 weeks duration.

4. *Post Result Mechanism*

The Dean shall discuss the result of each course with the convener and the teacher who has taught the course along with the statistical distribution evident from histogram so as to bring out any anomalies, skewness, left-out topics etc. Its only after this discussion is over the results shall be declared.

Grade Point System

1. *Grades*

A grade point system, as given in the following table, shall be followed for evaluating a candidate in every course.

Grade Points

Grade	AA	AB	BB	BC	CC	CD	DD	FF
Grade Point	10	09	08	07	06	05	04	00

As a general guideline, a class average of around 6.50 for theory component & around 8.00 for practical component may be maintained while applying relative grading.

In case, a student, of undergraduate programme or diploma, gets less than 30% marks in end-semester examination and less than 35% marks overall (combining continuous evaluation and end-semester examination) in a particular course, he / she will not be graded in that course till he / she reappears in said course and obtains specified minimum marks .

In case, a student, of postgraduate programme or postgraduate diploma, gets less than 40% marks in end-semester examination and less than 45% marks overall (combining continuous evaluation and end-semester examination) in a particular course, he / she will not be graded in that course till he / she reappears in said course and obtains specified minimum marks.

2. *Requirements for the Award of a Degree*

To be eligible for award of the degree, a student must complete all courses with requisite credits as prescribed under his / her programme of studies without "FF" grade in any course in any of the semesters of the entire programme.

A *Semester Grade Point Average (SGPA)*

The following mechanism may be used in order to arrive at a grade point for the candidate:

SGPA obtained by a student in any degree programme is a weighted average of the grade points in various courses taken by the student. For example:

If student has taken following courses, then the SGPA is computed as explained below:

Courses	Course – 1	Course – 2	.....	Course – j	.....	Course – n
Credit	C_1	C_2	.....	C_j	.....	C_n
Grade Points	G_1	G_2	.....	G_j	.....	G_n

SGPA = Semester Grade Point Average = Σ {Credits X Grade Point} / Total Credits; for the courses offered in particular semester.

3. *Award of Class*

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Award of Class	CGPA Range
First Class with Distinction	CGPA ≥ 7.50
First class	7.50 > CGPA ≥ 6.50
Second Class	6.50> CGPA ≥ 5.50
Pass Class	5.50 > CGPA ≥ 4.00

Where Cumulative Grade Point Average (CGPA) is computed as:

$$CGPA = \sum_{k=1}^{n} \{ \text{Credits x Grade Point} \} / \text{Total Semester Credits}$$

Here the sum is taken over from 1st Semester to nth Semester of the Programme.

Grade sheets of only the final semester shall indicate the class. In case of all the other semesters, it will simply indicate as Pass / Fail.

Indicative percentage of marks equivalent to Cumulative Grade Point Average (CGPA) shall be calculated as (CGPA – 0.5) X 10.

4. Gracing Criteria / Detention Criteria

As relative grading is being adopted gracing of marks shall be redundant. Detention of a student shall be as per prevailing university norms.

5. Maximum Time allowed for Completion of a programme

Maximum time allowed for completion of a particular programme shall not be more than twice the normal duration of the respective programme. For example, a 6-Semester programme should be completed within not more than 12 semesters.

6. Transcript

A transcript issued to the student at the time of leaving the university will contain a consolidated record of all the courses taken by him / her, grades obtained and the final CGPA.

Annexure – 1

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)														
TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN CIVIL ENGINEERING (CBCS)														
Level	**Course Code**	**Course Title**	**Teaching Scheme**							**Examination Scheme**				
			Contact Hours			Credit				Theory		Practical		Total
			Theory	Practical	Total	Theory	Practical	Project	Total	Internal	External	Internal	External	
Level 3	HS124.01 A	Professional Communication	2		2				2			30	70	100
	MA341/342	Numerical Analysis/Probability & Statistics	3	2	5	3	1		4	30	70	25	25	150
	CL341	Structural Analysis-II	4	2	6	4	1		5	30	70	25	25	150
	CL342	Concrete Technology	4	2	6	4	1		5	30	70	25	25	150
	CL343	Building Planning	3	4	7	3	2		5	30	70	50	50	200
	CL344	Summer Internship - I	0	3	3	0	0	3	3			75	75	150
	CL371-CL375	Programme Elective-I	3	2	5	3	1		4	30	70	25	25	150
					34				**28**					**1050**
	HS125.01 A / HS130 A	Society, Governance and International Studies / Law & Justice	2		2				2	30	70			100
	OR													
	HS134 A	Contributor Personality Development										30	70	
	CL345	Environmental Engineering-I	4	2	6	4	1		5	30	70	25	25	150

	CL346	Geotechnical Engineering-I	3	2	5	3	1		4	30	70	25	25	150
	CL347	Water Resources Engineering-I	4	2	6	4	1		5	30	70	25	25	150
	CL348	Transportation Engineering-I	4	2	6	4	1		5	30	70	25	25	150
	CL376-CL379	Programme Elective-II	3	2	5	3	1		4	30	70	25	25	150
		Assignment Practices/Student counselling/Remedial classes/Library/Sports/Extra-curricular & co-curricular			3									
					33				**25**					**850**

Contents

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 5)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Credits and Hours:

Credits	Teaching Scheme	Evaluation Scheme				
	Contact Hours/Week	Theory		Practical		Total
		Internal	External	Internal	External	
02	02	_	_	30	70	100

A. Course Objectives

- To hone and sharpen Professional Communication Skills of students
- To prepare globally and multi-culturally competent communicators and professionally compatible cadre of future professionals
- To equip and empower students to qualify and successfully clear all the phases of selection procedure for on and off campus interviews

B. Course Outline

Module No.	Title/Topic	Classroom Contact Sessions
1	**An Introduction Professional Communication** • Concept & Applications of Professional Communication • Principles of Professional Communication • Communication networks: personal sanctum, professional sanctum, inner circle, and outer circle; managing the networks • Communication strategies: communicator, audience, message, channel choice, culture	04
2	**Professional Communication and Rhetorics** • Concepts of "Communication" and "Professional Communication" and "Rhetorics" • Orientation towards the Concepts of Professional Communication and Rhetorics (Speaking)	04

- Importance of Ethos, Logos, and Pathos in Professional Communication
- Principles of Professional Communication (visual, oral and non-verbal)

3	**Cross-cultural Communication and Globalization**	**04**

- Basic Concepts: Culture, Globalization and Cross-cultural Communication
- Communicating with People of Different Cultures
- Conflicts in Cross-cultural Communication and Tactics / techniques to resolve them

4	**Written Professional Communication**	**06**

- Importance of Written Professional Communication
- Letter Writing, E-mail Writing, Report Writing
- Resume Building

5	**Academic Writing**	**06**

- Importance of Academic Writing
- Research Paper Writing
- Article/ Review Writing
- Reference and Citation

6	**Effective Presentation Strategies**	**06**

- Why and How in Presentation
- Audience Analysis and Supporting Material
- Presentation Mechanics and Presentation Process
- Managing Yourself during Q and A Session
- Fundamentals of Persuasions

Total **30**

C. Pedagogy

Teaching will be facilitated by reading material, discussions, task-based learning, projects, assignments and interpersonal activities like group work, independent and collaborative study projects and presentations, etc.

D. Evaluation

Internal Evaluation

Students' performance in the course will be evaluated on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Assignment	02	05	10
2	Project	01	15	15
3			Attendance	05
			Total	30

External Evaluation

University Practical Examination will be for 70 marks to be conducted at the end of the semester. Details are:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Practical / Viva	01	70	70
			Total	70

E. Learning Outcomes

After successfully passing through this course, the students would have –

- Gained thorough understanding and proficiency in various Professional Communication Skills.
- Developed awareness and competence in cross-cultural communication in their personal, academic and professional environments.
- Been empowered and confident to prepare impressive RESUMEs, and crack further phases of interview successfully.

F. Reference Books

1) Eckhouse, B. E. (1999). Competitive Communication: A Rhetoric for Modern Business. Oxford University Press. (for Module - II)
2) Koneru, A. (2008). Professional Communication. New Delhi: Tata Mcgraw-Hill. (for ModuleI & III)
3) Meenakshi Raman, P. S. (2006). Business Communication. Meenakshi Raman, Prakash Singh. (for module I and IV)
4) Parul Popat, K. K. (2015). Communication Skills. New Delhi: Pearson. (for Module V & VI)
5) Sanjay Kumar, P. L. (2015). Communication Skills. Oxford University Press India. (for Module I, III and V)

MA341: NUMERICAL ANALYSIS
B TECH 5th SEMESTER (CIVIL ENGINEERING)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/Week	3	2	5	4
Marks	100	50	150	

A Objective of the Course:

- This course is the foundation courses for Finite Element Methods, Finite Volume Methods and related courses of higher semesters in Civil Engineering.
- To develop more efficient and fast convergence algorithms and find better ways to control the source of errors.

The objectives of the course are to:

1. Understand the concepts of number presentation in digital computer and related computations,
2. Understand the concepts of error in numerical computations, determine numerical solution of equation
3. Understand the concepts of numerical integration and differentiation.
4. Understand the concepts of numerical solution of differential equations.

B Outline of the Course:

Sr. No	Title of Unit	Minimum number of Hours
1	Numerical Analysis and Computers	05
2	Approximate solutions of nonlinear equations and system of linear equations	07
3	Numerical Integration and Differentiation	07
4	Interpolation and Polynomial Approximation	08
5	Numerical Solution of Ordinary Differential equations	08
6	Numerical Solution of Ordinary and Partial Differential equations	10

Total hours (Theory): 45

Total hours (Lab): 15

Total Hours: 60

C Detailed Syllabus:

1	**Numerical Analysis and Computers**	**05 Hours**	**12%**
1.1	Concepts and definitions		
1.2	Representation of numbers in computers, types of errors		
1.3	Basic sources of errors, significant digits		
1.4	Computer arithmetic, errors in computations with digital computers.		
2	**Approximate solutions of nonlinear equations and System of linear equations**	**07 Hours**	**16%**
2.1	Bisection method, Method of False position, Method of Iteration.		
2.2	Newton-Raphson method for single variable		
2.3	Convergence criteria and rate of convergence and error estimates for these methods.		
2.4	Direct Method: Gauss Jordan method, Crout's LU-factorization methods.		
2.5	Indirect methods: Gauss Seidel and Jacobi's methods.		
3	**Numerical Integration and Differentiation**	**07 Hours**	**16%**
3.1	Composite Quadrature (Newton-Cotes Quadrature)		
3.2	Romberg Integration and Gaussian Quadrature		
3.3	Remainder terms, error bounds and estimates of these rules		
3.4	Numerical Differentiation		
4	**Interpolation and Polynomial Approximation**	**08 Hours**	**18%**
4.1	Finite differences and associated operators		
4.2	Newton's difference interpolation		
4.3	Lagrange interpolation, Hermite interpolation		
4.4	Error estimates of these formulae		
5	**Numerical Solution of Ordinary Differential equations**	**08 Hours**	**18%**
5.1	Euler and Modified Euler Method, Runge -Kutta methods		
5.2	Wilson-Theta Method, Newmark Beta Method		

6	**Numerical Solution of Partial Differential equations**	**10 Hours**	**20%**
6.1	Finite difference approximations to derivatives		
6.2	Solution of Laplace Equation by Gauss Jacobi and Gauss Seidel Method		
6.3	Solution of Heat Equation in One dimension		
6.4	Solution of Wave Equation in One dimension		

D Methods and Pedagogy:

- At the starting of the course, delivery pattern and prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar/ Assignments will be conducted which carries 5 marks as a part of internal theory evaluation.
- Unit Test may be conducted which carries 15 marks as a part of internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures using MATLAB.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

E Student Learning Outcomes / Objectives:

- At the end of course students will be able to grasp, analyze, formulate and solve Numerical problems related to Civil Engineering.
- At the end of the course the students will be able to frame the fundamental algorithms/programming of Numerical analysis via programming language (MATLAB).

F Recommended Study Material:

Text Books:

1) Sastry, S. S. Introductory methods of numerical analysis. PHI Learning Pvt. Ltd., 2012.
2) Chowdhury, Indrajit, and Shambhu P. Dasgupta. Dynamics of Structure and Foundation-A Unified Approach: 1. Fundamentals. Vol. 1. CRC Press, 2008.
3) Dukkipati, Rao V., M. Ananda Rao, and Rama B. Bhat. Computer aided analysis and design of machine elements. New Age International, 2006.
4) Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. Vol. 2. New York: McGraw-Hill, 2012.

Reference Books:

1) Rajaraman, Vaidyeswaran. Computer oriented numerical methods. PHI Learning Pvt. Ltd., 1993.
2) Grewal, B. S., & Grewal, J. S. Numerical Methods in Engineering & Science: With Programs in C, C++ & MATLAB. Khanna, 2014.
3) Dukkipati, Rao V. MATLAB: An Introduction with Applications. New Age International, 2010.
4) Gilat, Amos. MATLAB: An introduction with Applications. John Wiley & Sons, 2009.
5) Fausett L V. Applied numerical analysis using MATLAB. Pearson; 2008.

Reading Materials, web materials with full citations:

1) http://numericalmethods.eng.usf.edu
2) http://mathworld.wolfram.com/
3) http://nptel.ac.in

MA342: PROBABILITY & STATISTICS
B TECH 5th SEMESTER (CIVIL ENGINEERING)

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/Week	3	2	5	4
Marks	100	50	150	

A Objective of the Course:

- This course is applied in nature and useful in courses like Structural Engineering, Hydrology and Water Resource Engineering, Hydrology, Geotechnical Engineering and other courses of higher semesters in Civil Engineering.
- The experimental data collection of above listed courses as real life applications involve uncertainties and variations which needs to be explained.

The objectives of the course are to:

1. Understand the concepts of uncertainty and solving probability problems ,
2. Understand the concepts of statistical inference
3. Understand the concepts of least squares method in regression.
4. Understand the concepts of stochastic time series.

B Outline of the Course:

Sr. No	Title of Unit	Minimum number of Hours
1	Basic Probability Concepts	06
2	Random Variables	07
3	Special Probability Distributions	08
4	Elementary Statistical Inference	06
5	Regression Analysis	08
6	Time Series Analysis	10

Total hours (Theory): 45

Total hours (Lab): 15

Total Hours: 60

C Detailed Syllabus:

1	**Basic Probability Concepts**	**06 Hours**	**14%**
1.1	Set Theory, Sample Space and Events		
1.2	Probability Set Function,		
1.3	Conditional Probability and Baye's Theorem		
1.4	Independence		
2	**Random Variables and Probability distribution**	**07 Hours**	**16%**
2.1	Discrete and Continuous random variables.		
2.2	Transformations		
2.3	Expectations of a random variable		
2.4	Distributions of two random variables and expectation		
2.5	Transformation and bivariate random variables, conditional distributions and expectation		
2.6	Independent random variable, Linear combinations of random variable		
3	**Special Probability Distributions**	**08 Hours**	**18%**
3.1	Discrete Probability distributions Binomial, Poisson, Geometric and Negative binomial		
3.2	Continuous Probability distribution Uniform, Exponential, Gamma and Normal distribution		
3.3	Sampling distributions: t F and Chi-square distribution		
4	**Elementary Statistical Inference**	**06 Hours**	**14%**
4.1	Confidence Intervals and Hypothesis Testing: Mean, Variance and Proportion		
4.2	Confidence Intervals and Hypothesis Testing: Difference of Two Means, Variances and Difference of Two Proportions		
5	**Regression Analysis**	**08 Hours**	**18%**
5.1	Simple Linear Regression: Fitting a straight line using least squares		
5.2	Tests of significance and confidence intervals		
5.3	Checking the straight line fit		

5.4 Multiple Regression: Formulation of the model

5.5 Linear least squares solutions using the matrix method.

5.6 Model diagnostics

6 Time Series Analysis **10 Hours** **20%**

6.1 Introduction to Stochastic and Deterministic Dynamic Mathematical Models

6.2 Stationary and Non-stationary Stochastic Models for Forecasting and Control

6.3 Autocorrelation Function and Spectrum of Stationary Processes

6.4 Estimation in the time-domain

6.5 Stationary processes in the frequency domain

D Methods and Pedagogy:

- At the starting of the course, delivery pattern and prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar/ Assignments will be conducted which carries 5 marks as a part of internal theory evaluation.
- Unit Test may be conducted which carries 15 marks as a part of internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures using MATLAB.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

E Student Learning Outcomes / Objectives:

- At the end of course students will be able to grasp, analyze, formulate and solve problems related to probability and probability distribution, regression and time series analysis as an application to various courses of Civil Engineering.
- At the end of the course the students will be able to frame the fundamental algorithms/programming of Statistical Techniques using programming language (MATLAB).

F Recommended Study Material:

Text Books:

1) Kottegoda, Nathabandu T., and Renzo Rosso. Applied statistics for civil and environmental engineers. Malden, MA: Blackwell, 2008.
2) Johnson, Richard A. Miller and Freund" s Probability and Statistics for Engineers. Prentice Hall, 1994.
3) Ang, Alfredo Hua-Sing, and Wilson H. Tang. Probability Concepts in Engineering Planning and Design: Emphasis on Application to Civil and Environmental Engineering. Wiley, 2007.
4) Chatfield, Chris. The analysis of time series: an introduction. CRC press, 2016.

Reference Books

1) Benjamin, Jack R., and C. Allin Cornell. Probability, statistics, and decision for civil engineers. Courier Corporation, 2014.
2) Hogg, Robert V., and Elliot A. Tanis. Probability and statistical inference. Vol. 993. New York: Macmillan, 1977.
3) Box, G.E., Jenkins, G.M., Reinsel, G.C. and Ljung, G.M., 2015. Time series analysis: forecasting and control. John Wiley & Sons.
4) Draper, Norman R., and Harry Smith. Applied regression analysis. John Wiley & Sons, 2014.
5) Walpole, Ronald E., et al. Probability and statistics for engineers and scientists. Vol. 5. New York: Macmillan, 1993.
6) Shaw, E.M., Beven, K.J., Chappell, N.A. and Lamb, R., 2010. Hydrology in practice. CRC Press.

7) Gilat, Amos. MATLAB: An introduction with Applications. John Wiley & Sons, 2009.

Reading Materials, web materials with full citations:

NPTEL Courses:

1) Stochastic Hydrology: nptel.ac.in/courses/105108079/
2) Probability Methods in Civil Engineering: nptel.ac.in/courses/105105045/

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are:

- To understand the concept of analysis of indeterminate structures by various classical methods
- To identify and formulate an engineering problem and to develop a solution
- To understand the influence line concepts for indeterminate structures
- To know about the concept of strain energy and principle of virtual work
- To provide basic knowledge of Matrix method

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Energy Principles	10
2	Fixed and Continuous Beam	08
3	Influence Line for Indeterminate Structures	10
4	Consistent Deformation	06
5	Slope-Deflection Method	10
6	Moment-Distribution Method	10
7	Introduction to Matrix- Beam Element	06

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. **Detailed Syllabus:**

1	**Energy Principles**	**10 Hours**	**17%**
1.1	Strain energy- Introduction		
1.2	Strain energy stored in linear elastic systems		
1.3	Castigliano's theorems		
1.4	Computation of displacements of statically determinate beams and frames by unit load method		
1.6	Analysis of statically indeterminate structures-beams and frames by unit load method		
2	**Fixed and Continuous Beam**	**08 Hours**	**13%**
2.1	Statically determinate and indeterminate structures		
2.2	Degree of static indeterminacy		
2.3	Advantages and disadvantages of indeterminate structures		
2.4	Analysis of fixed beams for various types of loads and secondary effects		
2.5	Claypeyron's three moment theorem and its application		
2.6	Analysis of continuous beams		
2.7	Analysis of propped cantilever beams		
3	**Influence Line for Indeterminate Structure**	**10 Hours**	**17%**
3.1	Muller-Breslau's principle		
3.2	Quantitative I.L. for reaction and internal forces in propped cantilever and continuous beams		
3.3	Qualitative I.L. for rigid jointed structures having higher degree of static indeterminacy		
4	**Consistent Deformation**	**06 Hours**	**10%**
4.1	Introduction		
4.2	Method of consistent deformation		
4.3	Analysis of Statically indeterminate beams		
5	**Slope-Deflection Method**	**10 Hours**	**17%**
5.1	Introduction		
5.2	Basic concepts, Definitions and Sign conventions		
5.3	Development of Slope-deflection equations		

5.4	Analysis of indeterminate beams		
5.5	Analysis of portal frames with no lateral translation of joints		
5.6	Analysis of frames with lateral translation of joints		
6	**Moment-Distribution Method**	**10 Hours**	**17%**
6.1	Introduction		
6.2	Absolute and relative stiffness of members, Carry over factor (COF), Distribution factor (DF)		
6.3	Sign conventions		
6.4	Applications of method		
6.5	Analysis of continuous beam with secondary effects		
6.6	Symmetrical frames		
6.7	Analysis of frames with no lateral translation of joints		
6.8	Analysis of frames with lateral translation of joints		
7	**Introduction to Matrix- Beam Element**	**06 Hours**	**09%**
7.1	Introduction to flexibility and stiffness method		
7.2	Application of stiffness method system approach to analysis of beam		

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcome:

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

- Identify the fundamentals of structure and various methods of Analysis
- Recognize the role of professional societies in developing new structural software and updating current knowledge
- Identify and formulate an engineering problem and to develop a solution
- Use various classical methods for analysis of indeterminate structures
- Demonstrate the concepts of qualitative influence line diagram for rigid jointed structures having higher degree of statically indeterminacy.
- Apply the basic concepts of matrix methods in structural analysis

F. Recommended Study Material:

Text Books:

1) Junarkar, S.B. & Shah, H.J., Mechanics of Structures Vol-I & II, Charotar Publishing House
2) Negi, L.S. and Jangid, R.S., Structural Analysis, Tata McGraw Hill
3) Vazirani, V.N. and Ratwani, N.M., Analysis of Structures, Khanna Publishers
4) Weaver William and Gere James, Matrix Analysis of Framed Structures, CBS Publishers
5) R.S. Khurmi and N. Khurmi, Theory of structures, S. Chand

Reference Books:

1) Gere & Timoshenko, Mechanics of Materials, CBS Publishers & Distributors, Delhi
2) Hibbler, R.C., Structural Analysis, Pearson Education
3) Wang, C.K., Intermediate Structural Analysis, Tata McGraw Hill
4) Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill
5) Jangid, R.S., Structural Analysis, Tata McGraw Hill
6) Devdas Menon., Structural Analysis, Alpha Science
7) William M.C. McKenzie, Examples in Structural Analysis, Second Edition, CRC Press

Web Materials:

1) http://nptel.ac.in/downloads/105101085/
2) http://nptel.ac.in/courses/105101086/
3) http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Structural%20Analysis/New_index1.html
4) http://www.nptelvideos.in/2012/11/structural-analysis-ii.html
5) http://nptel.ac.in/courses/105106050/2
6) http://nptel.iitg.ernet.in/Civil_Eng/IIT%20Delhi/Structural%20Analysis%201%20(Video).htm
7) http://freevideolectures.com/Subject/Civil-Engineering
8) http://freevideolectures.com/Course/97/Structural-Analysis-II

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Deflections of beams and cantilevers
2	Continuous and indeterminate beam
3	Pin jointed frameworks
4	Frame deflections and reactions
5	Bending moments in a portal frame

CL342: CONCRETE TECHNOLOGY
B TECH 5th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are

- To understand the properties of ingredients of concrete
- To study the behaviour of concrete at its fresh and hardened state
- To study about the concrete design mix
- To know about the procedures in concreting
- To understand special concrete and their use

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	02
2	Cement	08
3	Aggregate	08
4	Admixtures	08
5	Fresh Concrete	08
6	Harden Concrete	08
7	Selection of Concrete Mix Proportion (Mix Design)	08
8	Special Concrete	06
9	Non-Destructive testing of Concrete	04

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. **Detailed Syllabus:**

1	**Introduction**	**02 Hours**	**05%**
1.1	Ingredients of concrete		
1.2	Strength development		
1.3	Different types of concrete		
1.4	New developments and future trends		
2	**Cement**	**08 Hours**	**13%**
2.1	History of portland cement		
2.2	Manufacture of portland cement		
2.3	Chemical composition		
2.4	Hydration and heat of hydration		
2.5	Structure of hydrated cement and product of hydration		
2.6	Setting of cement		
2.7	Field testing of cement, standard consistency test, initial and final setting time, strength of cement, soundness test		
2.8	Storage of cement		
2.9	Types of cement		
3	**Aggregate**	**08 Hours**	**13%**
3.1	Source and classification of aggregates		
3.2	Shape, size and texture of aggregates		
3.3	Mechanical properties of aggregates, strength of aggregates, specific gravity, bulk density, porosity and absorption of aggregates, moisture content of aggregates, bulking of fine aggregate		
3.4	Deleterious substance in aggregate		
3.5	Soundness of aggregates		
3.6	Alkali aggregates reaction		
3.7	Grading of aggregates		
3.8	Test on aggregate: Aggregates crushing value, aggregates impact value, aggregates abrasion value, sieve analysis and fineness modulus.		
3.9	Quality of mixing water		

3.10 Use of Sea water in concrete

4 Admixtures **08 Hours 13%**

4.1 Advantages of admixture

4.2 Types of admixture: Accelerators, retarders, water reducing admixture, plasticizers and air entraining, super plasticizer, water proofing admixture, antibacterial admixture

4.3 Cementitious materials: Fly ash, silica fume, rice husk ash, ground granulated blast furnace slag, metakaolin

5 Fresh Concrete **08 Hours 13%**

5.1 Rheology of fresh concrete

5.2 Workability and factors affecting workability

5.3 Measurement of workability

5.4 Segregation

5.5 Bleeding

5.6 Process of manufacture of concrete: batching, mixing, transportation, placing, compaction, curing, re-tampering, finishing

6 Hardened Concrete **08 Hours 13%**

6.1 Gain of strength of concrete

6.2 Factors affecting strength of concrete: water cement ration, gel space ratio, age of concrete

6.3 Durability and permeability

6.4 Nature of strength of concrete

6.5 Microcraking , Creep and Shrinkage

6.6 Aggregate cement paste interface

6.7 Maturity of concrete

7 Selection of Concrete Mix Proportions (Mix Design) **08 Hours 13%**

7.1 Concept of concrete mix design: variables in proportioning, various methods of proportioning, statistical quality control of concrete, calculation of standard deviation, relation between average design strength and specified minimum strength

7.2 Principle of mix proportioning

7.3 Factors governing the selection of mix proportion

7.4 Mix proportions and quantities per batch

7.5 ACI, IS Method, concrete mix design using admixture, mix design for pumpable concrete

7.6 Variability of test result

7.7 Acceptance criteria and is code provisions

8 Special Concrete **06 Hours 10%**

8.1 High performance concrete

8.2 Lightweight aggregate

8.3 High strength concrete

8.4 Polymer concrete

8.5 Fiber reinforce concrete

8.6 Ready mix concrete

8.7 Mass concrete

8.8 Self-compacting concrete

9 Non-Destructive testing of Concrete **04 Hours 07%**

9.1 Introduction to Destructive, Semi destructive and Non-destructive testing,

9.2 Problem faced during Non-destructive evaluation.

9.3 Rebound Hammer test,

9.4 Ultrasonic Pulse Velocity test

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments will be conducted in the laboratory related to course contents.

E. Students Learning Outcome:

On the completion of the course

- The students will be able to: test all the concrete materials as per IS code.
- The students will understand concrete mix design using ACI and IS code methods.
- The students able to determine the properties of fresh and hardened of concrete.
- The students have knowledge of special concretes and their specific applications.
- The students can ensure quality control while testing/ sampling and acceptance criteria

F. Recommended Study Material:

Text books:

1) Neville, A.M., Concrete Technology, Pearson Education.
2) Santakumar, A.R., Concrete Technology, Oxford University Press.
3) Shetty, M.S., Concrete Technology, S. Chand Publication.
4) Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publication.

Reference books:

1) Paulo, Mehta P. Kumar and Monteiro, J.M., Concrete Micro-structure, Properties and Materials, Prentica Hall INC and McGraw Hill, USA.
2) IS: 10262- 2009 Recommended guidelines for Concrete Mix Design.
3) IS: 456- 2000, Indian Standard Plain and Reinforced Concrete Code of Practice.

Web Materials:

1) http://nptel.iitm.ac.in/video.php?courseId=1059
2) http://www.aboutcivil.com/concrete-technology.html
3) www.understanding-cement.com
4) http://www.engineeringcivil.com/theory/concrete-engineering/

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Determination of Standard Consistency of Cement Paste
2	Determination of Initial and Final Setting Time of Ordinary Portland cement
3	Determination of Soundness of Cement with the Le-Chatelier Apparatus
4	Determination of Compressive Strength of Cement
5	Sieve Analysis of Coarse and Fine Aggregates
6	Flakiness Index and Elongation Index of Course Aggregate
7	To Measure the Workability of the Concrete by Slump Method
8	To Measure Workability of Mix by Using Compaction Factor Apparatus
9	To Measure Workability of Mix by Vee Bee Consistometer
10	Determination of Compressive Strength of Concrete Cubes
11	Determination of Flexural Strength of Concrete (Modulus of rupture)
12	Determination of Tensile Strength of Concrete by Split Cylinder Test
13	Ultrasonic Pulse Test

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	4	7	5
Marks	100	100	200	

A. Objectives of the Course:

The main objectives of the course are

- To introduce and expose students to the complex inter-relationship between man and the built environment
- To introduce various aspects of principles of planning and architecture in building design and understand planning and drawing of buildings
- To familiarize with local building byelaws and provisions of National Building Code in respect of building and town planning
- To make the students familiar with different types of plumbing and electric fittings and layout
- To enable students to appreciate various architectural forms and shapes with the help of perspective views
- To provide the basic knowledge of Town Planning and principles involved

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Building Drawing	03
2	Building Byelaws	07
3	Planning of Residential Buildings	15
4	Building Services	06
5	Perspective Drawing	08
6	Introduction to Town Planning	06

Total Hours (Theory): 45

Total Hours (Lab): 60

Total Hours: 105

C. **Detailed Syllabus:**

1	**Building Drawing**	03 Hours	07%
1.1	Classification of buildings		
1.2	Basic principles of planning		
1.3	Principles of Architecture		
1.4	Standard conventional signs, symbols and abbreviations		
1.5	ISI nomenclature: Size of scale, standard method of dimensioning		
2	**Building Byelaws**	07 Hours	16%
2.1	Objectives, Scope, Applicability and Principles		
2.2	Basic terminology		
2.3	Various forms of building coverage		
2.4	Bye-laws for Open spaces, Area limitations, Height limitations, Plinth Area, Means of Access, Light and Ventilation, Parking spaces		
2.4	Minimum standard dimensions of building elements		
2.5	Examples on FSI or FAR		
2.6	Submission of drawings for issue of permission for construction		
3	**Planning of Residential Buildings**	15 Hours	33%
3.1	Different types of Residential Buildings		
3.2	Selection of site for residential buildings		
3.3	Orientation of Buildings		
3.4	Guidelines for making wall thickness plan from line diagram		
3.5	Detailed drawing–plan, elevation, sections		
3.6	Design of Individual rooms with particulars attention to anthropometric data, functional and furniture requirements.		
3.7	Design of buildings with particular attention to orientations, FSI and allowable built up area.		
3.8	Furniture layout, Kitchen layout with emphasis on kitchen work triangle		
4	**Building Services**	06 Hours	13%
4.1	Water supply and Drainage – water distribution systems, materials used for plumbing, drainage systems		

4.2	Electrification – distribution of electrical energy, accessories of electrical installation, purpose of earthing		
4.3	Working drawing of a building – Electrical layout, Water supply and drainage layout		
5	**Perspective Drawing**	08 Hours	18%
5.1	Introduction & technical terms		
5.2	Classifications, elements of perspective		
5.3	Examples		
6	**Introduction to Town Planning**	06 Hours	13%
6.1	History, ancient planning in India		
6.2	Objects & importance of town planning		
6.3	Principles of town planning		
6.4	Horizontal growth, vertical growth		
6.5	Satellite town, ribbon development, concentric growth		

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.
- The course includes tutorial / drawing practice, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Theoretical concepts will be supported by different models and charts in the tutorial.

E. **Learning Outcomes:**

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

- Utilise basic principle of planning and architecture in design of various types of building.
- Understand local building bye-laws and provisions of National Building Code in respect of building and town planning.
- Utilise the knowledge of different types of plumbing and electric fitting and laying procedure.
- Understand perspective drawing and represent various forms in perspective view.
- Have basic understanding of Town planning and its history.

F. **Recommended Study Material:**

Text Books:

1) Singh Gurcharan, Building Planning, Designing and Scheduling, Standard Publishers and Distributors.
2) Dr. N. Kumara Swamy & Rao A. Kameswara, Building Planning and Drawing, Charotar Publishing House.
3) Wagh Sajjan V., Building and Town Planning, Tech-Max Publications.
4) Khasiya R. B, Motiani A. T and Khasiya K. R, Building & Town Planning, Mahajan Publishing House.

Reference Books:

1) Rangwala S. C., Town Planning, Charotar Publishing House, Anand.
2) Hiraskar G. K., Town Planning, Dhanpatrai & Sons, New Delhi.
3) Sikka V. B., Civil Engineering Drawing, S. K. Kataria & Sons Publication.
4) Shah M. G., Kale C. M and Patki S. Y., Building Drawing, Tata McGraw Hill Publication, New Delhi.
5) General Development Control Regulations published by AUDA and GICEA.
6) National Building Code of India, Indian Standard Institution (ISI), New Delhi, 2005.

Web Materials:

1) http://www.vastu-design.com/vastu-video-workshop/
2) https://www.youtube.com/watch?v=EIDXE28_8eQ
3) https://www.youtube.com/watch?v=VYiVjVulnm4
4) https://www.youtube.com/watch?v=bCn0X9RRjN0&list=PL060E3166E87E1FD5

5) https://www.designingbuildings.co.uk/wiki/Types_of_drawings_for_building_design
6) http://freevideolectures.com/Course/86/Building-Materials-and-Construction/31

LIST OF TUTORIALS

Sr. No.	Details
1	Conventional Signs & Symbols (Copying exercise)
2	Plan, Sectional Elevation, Front Elevation and site plan for a small house (One Room and Verandah) (Copying exercise)
3	Plan for Three bed room House in Hot and Arid zone
4	Plan for Three bed room House in Hot and humid zone
5	Plan, Sectional Elevation, Front Elevation and site plan for Duplex Type House
6	Model Making
7	Design of houses with given functional requirements and climatic data
8	Perspective Drawing: One Point Perspective Problem
9	Perspective Drawing: Two Point Perspective Problem

Credit and Hours:

Teaching Scheme	Project	Total	Credit
Hours/week	30	90	3
Marks	150	150	

A. Objective of the Course:

Summer internships are required to be carried out in order to help students to find and know the application of their theoretical knowledge, enhance their industry experience, get familiar with the industry culture and work ethics.

The main objectives for offering the internship to the students are:

- To get perspective and experience of the their field
- To make them industry ready
- To get familiar with modern tools and technologies
- To enhance their technical writing skills in reporting as per the industry standards
- To get them involved in design, development and testing practices followed in the industry
- To enhance their soft-skills, presentation skills, interpersonal skills, documentation skills and office etiquettes required to sustain in industry environment
- To participate in teamwork and preferably as part of a multi-disciplinary team
- To understand the professional and ethical responsibilities of an engineer
- To make them more productive, consistent and punctual
- To make them aware about industry best practices, processes and regulations

B. Instructional Method and Pedagogy:

- Summer internship shall be for at least 90 hours during the summer vacation only.
- Department/Institute will help students to find an appropriate company/industry/organization for their summer internship.

- The student must fill up and get approved a Summer Internship Acceptance form by the company and provide it to the Coordinator of the department within the specified deadline.
- Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed.
- During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and also those of the University.
- Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later.
- The student shall submit following two documents to the Coordinator for the evaluation of the summer internship:
    - Summer Internship Report
    - Summer Internship Assessment Form
- Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted to the Coordinator by the first day of the new term.
- The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in this guideline. Each report will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester.
- If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.

C. Format of Summer Internship Report:

The report shall comply with the summer internship program principles. Main headings are to be centered and written in capital boldface letters. Sub-titles shall be written in small letters and boldface. The typeface shall be Times New Roman font with 12pt. All the margins shall be 2.5cm. The report shall be submitted in printed form and filed. An electronic copy of the report shall be recorded in a CD and enclosed in the report. Each report shall be bound in a simple wire vinyl file and contain the following sections:

- Cover Page
- Page of Approval and Grading
- Abstract page: An abstract gives the essence of the report (usually less than one page). Abstract is written after the report is completed. It must contain the purpose and scope of internship, the actual work done in the plant, and main conclusions arrived at.
- TABLE OF CONTENTS (with the corresponding page numbers)
- LIST OF FIGURES AND TABLES (with the corresponding page numbers)
- DESCRIPTION OF THE COMPANY: Summarize the work type, administrative structure, number of employees (how many engineers, under which division, etc.), etc. Provide information regarding
- Location and spread of the company
- Number of employees, engineers, technicians, administrators in the company
- Divisions of the company
- Your group and division
- Administrative tree (if available)
- Main functions of the company
- Customer profile and market share
- INTRODUCTION: In this section, give the purpose of the summer internship, reasons for choosing the location and company, and general information regarding the nature of work you carried out.
- PROBLEM STATEMENT: What is the problem you are solving, and what are the reasons and causes of this problem.
- SOLUTION: In this section, describe what you did and what you observed during the summer internship. It is very important that majority of what you write should be based on what you did and observed that truly belongs to the company/industry/organization.
- CONCLUSIONS: In the last section, summarize the summer internship activities. Present your observations, contributions and intellectual benefits. If this is your second summer internship, compare the first and second summer internships and your preferences.

- REFERENCES: List any source you have used in the document including books, articles and web sites in a consistent format.
- APPENDICES: If you have supplementary material (not appropriate for the main body of the report), you can place them here. These could be schematics, computer programs, drawings, etc. If the document is a datasheet and it can be easily accessed from the internet, then you can refer to it with the appropriate internet link and document number. In this manner you don't have to print it and waste tons of paper.

D. Learning Outcomes:

After completion of the course, students will be able:

- To apply knowledge and skills learned in company/industry/organization to real-world problems with confidence
- To solve engineering problems
- To function in a team work
- To work with teammates from other disciplines
- To use experience related to professional and ethical issues in the work environment
- To explain the impact of engineering solutions, developed in a project, in a global, economic, environmental, and societal context
- To finds relevant sources (e.g., library, Internet, experts) and gather information
- To demonstrates knowledge of contemporary issues related with engineering in general
- To use new tools and technologies

Credits and Hours:

Teaching Scheme	Theory	Practical/Tutorial	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of the course are

- To make students capable of applying engineering fundamentals and economic aspects on planning, selection and operation of construction equipment.
- To make student to able to demonstrate an operations and productivity of construction equipment.
- To analyse major excavating and material handling equipment for construction planning operations.
- To make the students familiar with the operations, systems and techniques used in ground water control during excavation.
- To equip students with adequate knowledge on the recent developments in the area of construction material and technology.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Construction Equipment & Fundamental of Moving Earth	09
2	Excavating Equipment	06
3	Handling and Hauling Equipment	06
4	Overview of Other Construction Equipment	06
5	Procurement and Planning of Construction Equipment	04
6	Ground Water Control During Excavation	06
7	Latest Building Material and Technology	08

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Introduction to Construction Equipment & Fundamental of Moving Earth**	**09 Hours**	**21%**
1.1	Contribution and Importance of construction equipment		
1.2	Classification of Equipment, Selection of construction equipment		
1.3	Soil Fundamentals, Weight-Volume Relations of Materials		
1.4	Machine power, coefficient of traction, rim pull and available pull and drawbar pull, Effect of grade & altitude on power		
2	**Excavating Equipment**	**06 Hours**	**13%**
2.1	Features of excavating equipment		
2.2	Production/Output analysis and Suitability of Power Shovel, Dragline, Backhoe, Clamshells		
3	**Handling and Hauling Equipment**	**06 Hours**	**13%**
3.1	General		
3.2	Tractor, Dumper, Bulldozer, Ripper, Scraper, Truck		
4	**Overview of Other Construction Equipment**	**06 Hours**	**13%**
4.1	Hosting Equipment		
4.2	Conveying Equipment		
4.3	Drilling Equipment		
4.4	Pumping Equipment		
4.5	Compacting Equipment		
5	**Procurement and Planning of Construction Equipment**	**04 Hours**	**09%**
5.1	Procurement criteria		
5.2	Equipment cost		
5.3	Replacement analysis		

6	**Ground Water Control During Excavation**	**06 Hours**	**13%**
6.1	Importance, selection of method for ground water control during excavation		
6.2	Well point system, Dewatering Systems etc.		
6.3	Grouting-preparation of grouting, material and equipment used.		
7	**Latest Building Material and Technology**	**08 Hours**	**18%**
7.1	Introduction		
7.2	Building Material from Waste: Recycle Concrete Aggregates, Paper as building material, Composite: Matrices and Reinforcement		
7.3	Introduction to Advance Techniques used in Construction: Slip Formwork, Jump Formwork, Tunnel Formwork, Trenchless Technology for excavation, Shortcreting		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Theoretical concepts will be supported by charts in the laboratory.
- Field Visits of construction industry and related construction equipment will be arranged during semester.

E. Learning Outcomes:

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

- The students will be able to plan and select suitable construction equipment for different construction activities.
- The students will acquire ability to do planning for construction operations based on equipment productivity.
- Students will have an understanding on various systems and techniques used in ground water control during excavation.
- Students will be familiar with materials and systems used in the temporary supporting structures/systems used at construction sites.

F. Recommended Study Material:

Text Books:

1) Peurifoy, L., Schexnayder, C.J. and Shapira, A., Construction Planning, Equipment and Methods, McGraw Hill, New Delhi, 8th Edition, 2010.
2) Roy Chudley, Roger Geeno," Advanced Construction Technology" Latest Edition
3) Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers Delhi, 2008

Reference Books:

1) Jha, Kumar Neeraj, "Construction Project Management: Theory and Practice", Pearson Education India, 2011
2) Seetharaman, S., Construction Engineering & Management, Umesh Publications, 2007.
3) Kotadia, A.S., "Construction Management and equipments", Mahajan Publishing House, 8th Edition, 2010
4) Sharma, S.C., Construction Equipment & Management, Khanna Publications, New Delhi, 1988.
5) Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.
6) Sahu, G.C. and Jena, Joygopal, "Building Materials and Construction", McGraw Hill Education, Latest Edition
7) Punmia, B. C., Jain, Ashok Kumar, "Soil Mechanics and Foundations", Laxmi Publication, 16th edition.

Web Materials:

1) http://nptel.ac.in/courses/105103023/
2) https://www.youtube.com/watch?v=XEAc1lFHzpY
3) https://www.youtube.com/watch?v=pN2Th96poHQ
4) https://www.youtube.com/watch?v=D0DCtN0SXGQ
5) https://www.youtube.com/watch?v=pBJfKHRzDEM
6) https://www.youtube.com/watch?v=RB91Sm-kGJ8

LIST OF PRACTICAL/TUTORIAL

Sr. No.	Name of Tutorials
1.	Estimating Earth Work For Construction Projects
2.	Machine Power
3.	Owning Operating Cost
4.	Output Analysis of Equipment
5.	Replacement Analysis of Equipment
6.	Excavating Equipment-Basic parts, selection and operation
7.	Handling and Hauling Equipment- Basic parts, selection and operation
8.	Conveying Equipment and Drilling Equipment- Basic parts, selection and operation
9.	Ground Water Control During Excavation
10.	Latest Building Material and Technology

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

This course covers the advanced topics of Fluid Mechanics. The principles and application of the core branch of civil engineering is covered. The objectives of the course are to:

- Understand the different flow regimes like laminar, turbulent, submerged flow, and open channel flow.
- How to use the commercial pipes for pipe systems.
- Determine the water profiles and energy dissipation for non-uniform flow in open channel flow.
- Provide insights to various forces acting on submerged objects.
- Study functioning of various pumps and turbines.
- Develop insight for many complex flow problems by establishing functional relationship.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1	Dimensional analysis and Model similitude	8
2	Viscous fluid flow	8
3	Turbulent flow in pipes	8
4	Flow around a body- Forces on submerged body	6
5	Non-uniform flow in open channel	7
6	Hydraulic machinery	8

Total Hours (Theory): 45
Total Hours (Practical): 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Dimensional analysis and Model similitude**	**08 Hours**	**18%**
1.1	Fundamental dimensions		
1.2	Rayleigh's and Buckingham's method		
1.3	Dimension less numbers and their significance		
1.4	Hydraulic similitude		
1.5	Type of models		
2	**Viscous fluid flow**	**08 Hours**	**18%**
2.1	N-S equations in Cartesian Coordinates and Cylindrical coordinates.		
2.2	Exact Solutions of N-S equations, Poiseulle flow		
2.3	Couette flow		
2.4	Laminar flow in pipe		
2.5	Boundary Layer, Developments of boundary layer along flat plate, laminar boundary layer, turbulent boundary layer, boundary layer separation		
2.6	Boundary Layer thicknesses		
3	**Turbulent flow in pipes**	**08 Hours**	**18%**
3.1	Laminar flow stability, causes and mechanism of turbulence, shear stress due to turbulence		
3.2	Prandtl's mixing length theory, Laws of turbulent flow		
3.3	Turbulent flow in pipes, pipe resistance factors smooth and rough pipes		
3.4	Resistance to commercial pipes, Moody's diagram, Explicit equation for friction factor		
3.5	Pipe Network, Aging of pipes		
3.6	Water Hammer, Causes, Rapid closure, slow closure, Basic equation of water hammer		
3.7	Surge tanks, Types of surge tanks		
4	**Flow around a body- Forces on submerged body**	**06 Hours**	**13%**
4.1	Regime of external flow, Drag and Lift , Pressure drag, Friction drag, stream lined body, Blunt body		
4.2	Drag coefficient and similarity considerations		
4.3	Flow past a cylinder, sphere		

4.4	Flow past airfoil of infinite length and finite length		
5	**Non-uniform flow in open channel**	**07 Hours**	**15%**
5.1	Specific energy, specific energy diagram, Discharge Diagram		
5.2	Application specific energy diagram and discharge diagram, Critical depths, critical flow, critical slope		
5.3	Momentum principle to open channel flow, specific force, small waves in open channel		
5.4	Gradual Varied flow, Derivation of water surface slopes, classification of water surface profiles		
5.5	Hydraulic Jump, Types, elements and characteristics of hydraulic jump		
6	**Hydraulic machinery**	**08 Hours**	**18%**
6.1	Jet striking a stationary plate and moving plate,		
6.2	Force exerted by jet on curved vane		
6.3	Turbo machineries, Pumps and turbines		
6.4	Classification of hydraulic turbines, impulse turbine		
6.5	Reaction turbines, specific of turbines		
6.6	Centrifugal pump, classification, definitions for CF,		
6.7	Installation and priming of pump, NPSH, Cavitation in pump,		

D. Instructional Methods and Pedagogy:

- At the starting of the course, delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of Multi-Media projector, Black Board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students will get opportunities to build appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

- Industrial visits will be organized for students to explore industrial facilities. Students are required to prepare a report on industrial visit and submit as a part of the assignment.

E. Student Learning Outcomes:

On the completion of the course one should be able to:

- Develop an ability to analyze laminar flow and turbulent flow for pipe
- Will be able to design the pipe system (Network) and process for the required need of whether discharge or head.
- Develop the skill to perform experiments as well as analyze and interpret the results.
- Design open channels for non-uniform flow water surface profiles and dissipation of energy in hydraulic jump.
- Select the type of pumps and turbine required with reference to available head of water and discharge
- Able to define the relationship between dimensional magnitude contained in mass, force and acceleration and empirical constants linking various dimensionless parameters.

F. Recommended Study Material:

Text Books:

1) Jain, A.K., Fluid Mechanics, Khanna Publishers, New Delhi.
2) Bansal, R.K., Fluid Mechanics, Laxmi Publication, New Delhi.

Reference Books:

1) Streeter, V.L. and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1985, New York.
2) Subramanya, K., Theory and Applications of Fluid Mechanics, Tata-McGraw Hill Publishing Co., New Delhi, 1993.
3) Shaughnessy, E.J., Katz, I.M. and Schaffer, J.P., Introduction to Fluid Mechanics, SI edition, Oxford University Press, New Delhi, 2005.
4) White, F.M. Fluid Mechanics, McGraw Hill Publication, New York.
5) Kumar, D.S., Fluid Mechanics, S.K.Kataria& Sons Publication.
6) Rajput, R.K., Fluid Mechanics, S. Chand & Co. Publication.
7) Modi, P.N. and Sheth, Fluid Mechanics & Hydraulic Machines, Standard Book House.

8) Ramamurtham, S., Hydraulic Fluid Mechanics & Fluid Machines, Dhanpatrai Publishing Co. Publication.
9) Garde, R.J. and Mirajgaoker, A.C., Engineering Fluid Mechanics, New Chand & Sons Publication.

Web Materials:

1) http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Guwahati/fluid_mechanics/index.htm
2) http://nptel.iitm.ac.in/video.php?subjectId=105101082
3) http://www.mvsengineering.com
4) http://nptel.iitm.ac.in/courses/IIT-MADRAS/Hydraulics/index.php
5) http://nptel.iitm.ac.in/video.php?subjectId=105103096

CL 373: AIR POLLUTION AND CONTROL
B TECH 5th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours / week	03	02	05	04
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are

- To have the knowledge of mathematics, science and engineering to identify and to solve the problem of air pollution
- To emphasis on the principles underlying the understanding of ambient air pollution, sources, effects and air pollution problems in India
- To learn the fundamental concepts about sources of air pollution, basic meteorological processes and technology for air pollution control and odour control
- To understand the health problems, risk assessment, global atmospheric changes and reasons for environment degradation due to air pollution

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Air Quality: History, Definitions, Characteristics and Perspectives	04
2	Sources and Effects of Air Pollution	06
3	Meteorological Aspects of Air pollution	06
4	Transport of Pollution in Atmosphere	07
5	Sampling and analysis of Air Pollutants	05
6	Air Pollution Control Systems	12
7	Air Pollution Legislation	02
8	Current Global Issues of Air Pollution	03

Theory Hours: 45
Laboratory Hours: 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Air Quality: History, Definitions, Characteristics and Perspectives**	**04 Hours**	**08%**
1.1	Composition of dry ambient air properties of air, function of air, definition of pollution		
1.2	Air pollution – historical overview		
1.3	Air pollutants – classification		
1.4	Global and national scope of the problem- general, urban, rural and specific		
1.5	Air quality management concept		
2	**Sources and Effects of Air Pollution**	**06 Hours**	**10%**
2.1	Air pollutants – sources		
2.2	Units for measurement of air pollution, Emission factors		
2.3	Major pollutants from different sources in Gujarat		
2.4	Effects of air pollution on human health, plants , animals, properties and visibility		
2.5	Economic effects of air pollution		
2.6	Indoor air pollution and personal exposure to air pollution		
2.7	Simple numerical problems based on COH, CoHb		
3	**Meteorological Aspects of Air Pollution**	**06 Hours**	**16%**
3.1	Introduction to meteorology: Global winds, Headley cells, wind rose terrestrial wind profile		
3.2	Effects of terrain and topography on winds		
3.3	Atmospheric stability and instability		
3.4	Theory and application of acoustic sounding (SODAR) technique		
4	**Transport of Pollution in Atmosphere**	**07 Hours**	**16%**
4.1	Lapse rate		
4.2	Plume behaviour under different atmospheric conditions		
4.3	Plume behaviour in valley and terrains		
4.4	Maximum mixing depths		
4.5	Mathematical models of dispersion of air pollutants		

4.6	Stack design		
5	**Sampling and analysis of Air Pollutants**	**05 Hours**	**12%**
5.1	Methods and Instruments for sampling and analysis of air for stack and ambient air monitoring		
6	**Air Pollution Control Systems**	**12 Hours**	**25%**
6.1	Air Pollution control at source		
6.2	Equipment for control of air pollution : For particulate matter - Settling chambers - Fabric filters - Scrubbers - Cyclones - Electrostatic precipitators		
6.3	For Gaseous pollutants : control by absorption - adsorption - scrubbers - secondary combustion after burners		
6.4	Working principles advantages and disadvantages		
6.5	Design criteria and examples		
6.6	Fugitive Emissions – sources and control , odour control		
7	**Air Pollution Legislation**	**02 Hours**	**06%**
7.1	Government of India: air pollution laws		
7.2	Indian standards- emission and air quality standards		
7.3	Role of pollution control boards		
8	**Current Global Issues of Air Pollution**	**03 Hours**	**07%**
8.1	Greenhouse effect, Ozone depletion, heat island, dust storms		
8.2	Automobile pollution sources and control		
8.3	Photochemical smog		
8.4	Future engines and fuels		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector and black board.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignment / Surprise tests/ Quizzes/ Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an illustration for the concepts being taught in lectures.
- Experiments/ Tutorials related to course content will be carried out in the laboratory or field as per the need.
- A field visit related to the Air pollution and control will be carried out for further understanding of the subject. Report will be prepared by the students for the same.

E. Student Learning Outcomes:

On the successful completion of this course,

- The students will be able to classify the sources of air pollution, describe effects, various methods and equipment available for controlling air pollution.
- The students will recognize the diverse knowledge of air pollution control practices applied to real life problems.
- The students will be able to review the theories and practical aspects of air pollution control along with the applications and further, they shall have an ability to plan air pollution control systems.

F. Recommended Study Material:

Text Books:

1) Peavy, Howard S., Donald R. Rowe, and George Tchobanoglous. 1985. *Environmental Engineering*. McGraw-Hill, New York (Latest edition)
2) Rao, C.S. 2007. *Environmental pollution control Engineering*. New Age International, New Delhi (Latest edition)
3) Rao. M. N. and Rao, H. V. N. 2007. *Air Pollution*. Tata McGraw Hill Publication, New Delhi (Latest edition)

Reference Books:

1) Government of India's Publication of laws related to air pollution, Gujarat Pollution Control Board's (GPCB) Publication of standards. Indian Standards relevant to Air Pollution Monitoring.
2) David H.F. Liu, Bela G. Liptak. 2016 Special Indian Edition. *Environmental Engineers' Handbook* Part 1 and Part 2, CRC Press LLC, Florida
3) Doren, K. L. 2016. *Air Pollution*, CBS Publishers and Distributors, New Delhi
4) Wark, K., & Warner, C. F. 1981. *Air pollution: its origin and control*. Harper & Row, New York (Latest edition)
5) Parker, A. 1978. Industrial *Air Pollution Handbook*. Tata McGraw Hills Publication, New Delhi (Latest edition)
6) Wang, Lawrence K., Pereira, Norman C., Hung, Yung-Tse. 1979. *Handbook of Environmental Engineering*. Vol. 1 , Air and Noise Pollution Control, The Humana Press, Clifton, New Jersey (Latest edition)
7) Brauer, H. and Verma, Y. B. G. 1981. *Air Pollution Control Equipment*. Berlin Heidelberg, New York (Latest edition)
8) Richard C. Flagan & John H. Seinfeld. *Fundamentals of Air Pollution engineering*. 1988. Prentice Hall, Englewood Cliffs, N.J (Latest edition)
9) Roy M. Harrison. Pollution: Causes, Effects and Control. 2000. Royal Society of Chemistry, Cambridge (Latest edition)

Web Material:

1) ‹http://cpcbenvis.nic.in/airpollution/database.htm›
2) ‹http://cpcb.nic.in/›
3) ‹http://www.gpcb.gov.in/›
4) ‹http://nptel.ac.in/courses/105104099/›
5) ‹http://nptel.ac.in/courses/105102089/8›
6) ‹http://www.envfor.nic.in/legis/air/air1.html›
7) ‹http://www.indiacode.nic.in/acts-in-pdf/2015/201503.pdf›
8) ‹ http://envfor.nic.in/›

LIST OF EXPERIMENTS

Sr. No.	Title of Experiment
1	Introduction to Air Quality Monitoring and Air Quality Standards
2	Determination of Wind Direction and Speed
3	Monitoring of Suspended Particulate Matter
4	Monitoring of Respirable Particulate Matter (PM_{10}, $PM_{2.5}$ and $PM_{1.0}$)
5	Monitoring of Gaseous Air Pollutants in Ambient Air: Oxides of Nitrogen
6	Monitoring of Gaseous Air Pollutants in Ambient Air: Sulphur Dioxide
7	Monitoring of Gaseous Air Pollutants in Ambient Air: Carbon Monoxide
8	Monitoring of Stack for Particulate Matter
9	Monitoring of Stack for Gaseous Pollutants
10	Automobile Exhaust Monitoring

CL374: ARCHITECTURAL DESIGN OF FACILITIES
B TECH 5th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives of the course are

- To make students aware about Architectural Design process with facilities and its importance
- To explain various parameters to make Sustainable Infrastructure
- To make students aware about Architectural planning and design
- To make students aware about application of various Engineering principles in the process of architectural designing and its importance

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Architectural Design	12
2	Architectural Detailing	15
3	Architectural Facilities	18

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

C. Detailed Syllabus:

1	**Architectural Design**	**12 Hours**	**25 %**
1.1	The Site: Challenges and Opportunities		
1.2	Site Design and Environmental Analysis		
1.3	Sustainable Infrastructure		
1.4	The Skin: Materials and Techniques		
1.5	Evolving a Sustainable Design Practice		
1.6	Sustainable Design and Existing Buildings		
2	**Architectural Detailing**	**15 Hours**	**40%**
2.1	General Planning and Design Data		
2.2	Site work		
2.3	Masonry		
2.4	Metals		
2.5	Wood and Plastics		
2.6	Thermal and Moisture Protection		
2.7	Doors and Windows		
2.8	Interior Stairs and Stairwells		
2.9	Specialties		
2.10	Conveying Systems		
2.11	Electrical		
2.12	Energy and Environmental Design		
2.13	Layout of Plates		
2.14	Exterior Details		
3	**Architectural Facilities**	**18 Hours**	**35%**
3.1	Controlling Water		
3.2	Controlling Air		
3.3	Controlling Heat Flow		
3.4	Controlling Water Vapor		
3.5	Controlling Sound		
3.6	Accommodating Movement		
3.7	Providing Structural Support		

3.8 Providing Passages For Mechanical and Electrical Services

3.9 Health and Safety

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory for lectures and laboratory which carries 5 Marks.
- Field case studies based on such principles, selection of site as well as materials and teaching case wise solutions with proposals.
- Two internal exams will be conducted of 30 marks and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Tutorials will be conducted which carries 10 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

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

- Architectural design of facilities,
- Use basic architectural principles in the design of buildings, interior spaces and sites,
- Understanding of the western architectural canons and traditions in architecture, landscape and urban design as well as the climatic, technological, socioeconomic and other cultural factors that have shaped and sustained them,
- Read architectural drawings and make technically precise drawings.

F. **Recommended Study Material:**

Text Books:

1) Daniel E. Williams., Sustainable Design: Ecology, Architecture, and Planning, John Wiley & Sons, 2007.
2) Charles George Ramsey, Harold Reeve Sleeper, Architectural Details: Classic Pages from Architectural Graphic Standards 1940 – 1980, Wiley, 2001.
3) Louis Rouillion, Charles George Ramsey, Architectural Details: Classic Pages from Architectural Graphic Standards 1940 – 1980, J. Wiley, 1924.
4) Edward Allen, Patrick Rand, Architectural Detailing: Function, Constructibility, Aesthetics, John Wiley & Sons, 2016.

Reference Books:

1) Rangwala S. C., Building Construction, Charotar Publishing House, Anand.

LIST OF TUTORIALS

Sr. No.	Details
1	Internet Case studies of sustainable buildings like Suzlon One Earth, Pune, ZED housing, Bangalore etc. (Group work)
2	Study of green building rating systems like GRIHA, TERI, LEED etc. (Individual Work)
3	Study of materials that can bring sustainability like solar panels, wind mills etc. (Group work)
4	Case study and model making on: (Group Work) A. DOORS: Types of doors, its use, materials and joinery details B. EXTERIOR DETAILS: Type of paints finishes, alco panels, aluminum panels, glass etc. C. MASONRY: Brick masonry detail and types of brick bonds D. METALS: Types of metals and its use in building construction E. INTERIOR STAIRCASES: Study and analysis of staircases used in interior spaces F. EXTERIOR STAIRCASES : Study and analysis of staircases used in exterior spaces

	F. ELECTRICAL SYSTEMS: Electric conducting systems, types of conduits used in construction and interior designs
5	To make a detail report on one building/mall that depicts all the Architectural facilities like; HVAC (Heating Ventilation and Air Conditioning), AHU (Air Handling Units), Fire safety measure and fire Exits, Plumbing and Sanitation, Structural layout, Mechanical Services, Water supply services etc. (Group work)

CL 375: BUILDING SERVICES
B. TECH 5TH SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The objectives of the course are

- To understand the basic principles, installations, operations and maintenance of building services
- To identify building services equipment and explain its function
- To describe how building services are integrated into a building
- To determine how building performance and regulatory requirements affect the design and commissioning of building services

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Building Services	5
2	Plumbing Services in Buildings	8
3	Mechanical Services in Buildings	10
4	Illumination, Fire Protection, Acoustic and Sound Insulations	12
5	Heating, Ventilation and Air Conditioning (HVAC)	10

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction to Building Services**	**05 Hours**	**11%**
1.1	Definitions, Objective and uses of services		
1.2	Applications of services for different types building considering		
1.3	Classification of building services		
1.4	Types of services and selection of services		
2	**Plumbing Services in Buildings**	**08 Hours**	**18%**
2.1	**Elements of plumbing** Objectives of plumbing, purpose of plumbing, role of plumber, licensing of plumbers their functions, sewer Air, supply pipes, drainage & vent pipes application for obtaining supply connection		
2.2	**Pipes joints & fittings** Introduction. Types of Pipe – G.I. Pipes, PVC Pipes, Copper pipes, C.I. Pipes, A.C. Pipes, prestressed concrete pipes, joints in pipes, method of fixing pipes such as G.I. fitting C.I. fitting		
2.3	**Valves & Terminal Fittings** Types of valves & its purpose, sluice valve, reflux valve, scour valve, Air relief valve, pressure relief valve, gate valves, Bio-taps & stop valve self-closing valve. Flush valve, mixing valve		
2.4	**Sanitary fixture & Building drainage system** Building sanitary fittings – water closet, flushing appliances, urinals, washbasins, flushing cisterns, principles of building drainage, siphonic action, traps & its types, capacity & sizing of pipe, soil pipe, waste pipe, rain water pipe, system of plumbing, Installation of pipes, testing of pipes		
3.	**Mechanical Services in Buildings**	**10 Hours**	**22%**
3.1	Introduction of mechanical services		
3.2	**Lifts:** Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts- Lift Well, Travel, Pit, Hoist		

	Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push		
3.3	**Elevators & Escalators**: Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators, Uses of different types of elevators Escalators		
3.4	**Pumps**: Reciprocating, Centrifugal, Deep well, Submersible, Automatic pumps, Sewerage pumps, Compressors, Vacuum pump – their selection, installation and maintenance		
3.5	**Conveyors**: Different types of Conveyors, Uses of different types of Conveyors		
4.	**Illumination, Fire Protection, Acoustic and Sound Insulations**	**12 Hours**	**27%**
4.1	Natural and artificial lighting- principles and factors, Arrangement of luminaries, Distribution of illumination, Utilization factors		
4.2	Causes of fire and Effects of fire, General Requirements of Fire Resisting building as per IS and NBC 2005.,Characteristics of Fire resisting materials, Maximum Travel Distance, Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs		
4.3	Requirement of good Acoustic, Various sound absolvents, Factors to be followed for noise control in residential building		
5.	**Heating, Ventilation and Air Conditioning (HVAC)**	**10 Hours**	**22%**
5.1	Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity. General methods of thermal insulation: Thermal insulation of roofs, exposed walls		
5.2	Ventilation: Definition and necessity, Principles, Temperature Control, Air Velocity Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric preceptors, Types of Air Conditioners, (Central type, Window Type, Split Unit)		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Theoretical concepts will be made clearer by discussing case studies of multi-storey buildings and lessons from those experiences.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and marks of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment work will be given based on various aspects related to building services and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- Photographs /videos etc. related to the building services will be shown.
- Site visits to building complexes under construction will be arranged to show different building services being installed.
- Students will be asked to give presentation of subjects related to latest trends in building services.

E. Students Learning Outcomes:

On successful completion of this course

- The students will aquaire competencies to plan various types of services required for different types of building.
- Students will be able to manage building services provisions in big construction sites.
- Students will be able to synchronize the construction activities with installation of building services.
- Students will learn the needs of a building occupant in an enclosed built environment regarding; thermal comfort, indoor air quality, fire safety, electric usage and wet area usage.

- Students will gain technological solution alternatives and knowledge of equipment in the market for ventilation, heating, cooling techniques, building service systems.

F. **Recommended Study Material:**

Text Books:

1) Building Services by S. M. Patil, Seema Publication, Mumbai, Revised edition.
2) Building Construction by Dr. B. C. Punmia, Laxmi Publications (P) Ltd., New Delhi.
3) Water supply and Sanitary Engineering by S. K. Garg, Delhi.

Reference books

1) A text book on Building Services by R. Uday kumar. Eswar Press, Chennai.
2) Building Construction by P. C. Varghese PHI Learning (P) Ltd., New Delhi.
3) Elements of Public Health Engineering, by K. N. Duggal, New age international.
4) Building repair and Maintenance Management by P. S. Gahlot CBS Publishers & Distribution (P) Ltd.
5) Building Construction by Charotar publishing House, Anand.
6) A to Z of practical building and its management by Sandeep Mantri, Mantri Institute of Development & Research, Pune.
7) Building Systems for Interior Designers by Corky Binggeli, John Wiley & Sons, 2003.

Web Material:

1) www.academia.edu
2) www.nptel.iitm.ac.in
3) http://en.wikipedia.org/w/index.php?title=Dumbwaiter_(elevator)&oldid=62176813
4) www.bis.org.in/sf/nbc.htm
5) cpwd.gov.in/Units/handbook.pdf
6) http://www.civilengineeringnews.tk/2014/07/methods-of-demolition-of-building.html thecontractor.org

LIST OF PRACTICAL/EXERCISE

Tutorials	Tutorial 1	Introduction to building services
	Tutorial 2	Draw diagrams of various plumbing fixtures.
	Tutorial 3	Identify proper locations for Lift/ Escalator/ Elevator in a given commercial complex
	Tutorial 4	Prepare a case study for the firefighting services for commercial building.
	Tutorial 5	Suggestions for noise control methods for a given commercial complex
Seminar	Seminar on course related topic to be given to a group of students not more than three. Students have to present/ defend the seminar in front of teachers and students. This work should be accompanied in the submission	
Site visit	Visit a residential building & commercial building under construction and study the services like mechanical, plumbing, HVAC, Fire safety, acoustics and related allied services of civil engineering and prepare site visit detailed report	

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 6)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

HS125.01 A: SOCIETY, GOVERNANCE AND INTERNATIONAL STUDIES
B TECH 6th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Credits	Teaching Scheme	Evaluation Scheme				
	Contact Hours/Week	Theory		Practical		Total
		Internal	External	Internal	External	
02	02	30	70	_	_	100

A. Course Objectives

To facilitate learners to:

- Develop a familiarity with the mechanics of critical thinking and logic
- Understand basic concepts of critical thinking and logic
- Explore and understand critical thinking and logic in context of professional, social and personal spectrum
- Explore an application critical thinking and logic in personal, social, academic, global and profession life.

B. Course Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**Fundamental Concepts** • Civil Society • Governance • Democracy • Citizenship • Globalization • International Studies	04
2	**Self, Citizenship, and Social Responsibility** • Aspects of Self & Citizenship • Aspects of Self, Citizenship and Social Responsibility	06
3	**Governance & Society** • Concept of Governance and Government : the Relationship	06

- Role of Civil Society in Effective Governance
- The System of Democratic Governance: the features of Effective Democratic Governance

4	**International Studies** • Study of International Organizations • International Laws • Concept of Human Rights • Concept of Multiculturalism • Globalization and Communication • Concept and Methods of International Relationship	**08**
5	**Society, Governance and International Studies & Contemporary Issues** • Sustainable Living • Peace & Conflict • Contemporary Global Trends • Contribution and Creativity • Case Studies	**06**
	Total	**30**

C. Instruction Methods and Pedagogy

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

D. Evaluation

Internal Evaluation

The students' performance in the course will be evaluated (30 marks for theory) on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Assignment	02	07	14
2	Project	01	11	11
			Attendance	05
			Total	30

External Evaluation

The University examination will be for 70 marks (Theory). The examination will avoid, as far as possible, direct questions on usage, grammar, errors, etc. and will focus on applications.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

E. Learning Outcomes

At the end of the course, learners will be able to:

- Understand the concept of society, governance and international studies.
- Understand the application of citizenship, governance, international principles and trends
- Understand the application of society, governance and international studies in personal, social, academic, global and profession life.

F. Reference Books / Reading

1) Theories of International Relations, Scott Burshilet. al. Palgrave Macmillan, 2005. (http://psi505.cankaya.edu.tr/uploads/files/Theories%20of%20IR.pdf)
2) http://cmsdata.iucn.org/downloads/eplp_70_governance_for_sustainability.pdf
3) www.uno.org
4) www.unesco.org

Credits and Schemes:

Credits	Teaching Scheme	Evaluation Scheme				
	Contact Hours/ Week	Theory		Practical		Total
		Internal	External	Internal	External	
02	02	30	70	_	_	100

A. Course Objectives

To develop in the students

- An understanding of the concepts of law and justice
- An appreciation of the significant role played by the judiciary in the protection of individual liberty and human rights
- An understanding of the substantive law concerning his / her professional field
- A broad understanding of human rights
- Acceptable attitudes and viewpoints with respect to professional ethics and social responsibility.

B. Course Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**An Introduction to Law and Justice** • Concept and Meaning of Law and Justice • Fundamentals of Law and Justice • Introduction to Indian Constitution • Law and Justice in the Globalized World	**05**
2	**Literature and Social Justice** • Concept of Literature and Social Justice • Conceptual History of Social Justice • Race and Racism in 21st Century	**05**
3	**Understanding Human Rights** • Scope and Significance of Human Rights • Human Rights in the Indian Sphere - An Overview • Constitutional Analysis of Preamble, Citizenship • Directive Principles and Fundamental Duties	**05**

	• Fundamental Rights – Right to Life, Right to Education, Right to Equality, Right to Freedom, Right to Information, Right against Exploitation, Right to Property, Intellectual Property Rights, Right to Speech	
4	**International Law with reference to Social Justice** • Perspectives on International Law • Origin and Nature • Is International Law, "Law"? • Theories and Basis of International Law • International Personalities in Law and Justice	**05**
5	**Social Justice and Sustainability** • Need for reforms in Global Context • Law related to the Weaker Section: Women and Law, Crime against Women, Reservation and its various forms • Development v/s Social Justice & Sustainability	**05**
6	**Contemporary Issues in Law and Justice** • Contemporary Issues Concerning 1) Law and Justice in India: A Study of Supreme Court Judgements / Landmarks 2) Important Amendments in Law and Justice 3) Contemporary Issues in Law and Justice: Perspectives of all Stake Holders 4) Reservation Policies 5) Global Environment Protection 6) Public Interest Litigation	**05**
	Total	**30**

C. Instruction Methods and Pedagogy

The course is based on theoretical perspectives based on real-life cases. Teaching (Classroom Deliberations) will be facilitated by reading material, discussions, case and task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

D. Evaluation

The students will be evaluated continuously in the form of internal as well as external examinations. The evaluation - Theory is schemed as 30 Marks for internal evaluation and 70 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be on a continuous basis through the following components:

Sl. No.	Component	Number	Marks per incidence	Total Marks
Theory				
1	Assignment	03	5	15
2	Participation / Project	01	10	10
3	Attendance			05
			Total	30

External Evaluation

The University examination – Theory will be for 70 marks. The examination will focus more on case studies, prevalent practices and contemporary issues.

Sl. No.	Component	Number	Marks per incidence	Total Marks
1	Theory Paper	01	70	70
			Total	70

E. Learning Outcomes

At the end of the course, learners will have developed:

- An understanding of the concepts of law and justice
- An appreciation of the significant role played by the judiciary in the protection of individual liberty and human rights
- An understanding of the substantive law concerning his / her professional field
- A broad understanding of human rights
- Acceptable attitudes and viewpoints with respect to professional ethics and social responsibility.

F. **Reference Books / Reading**

1) HLA Hart, Concept of Law
2) Law and Constitution by A V Dicey
3) Intellectual Property Law by Cornish P

Credits and Hours:

Credits	Teaching Scheme Contact Hours/Week	Evaluation Scheme				Total
		Theory		Practical		
		Internal	External	Internal	External	
02	02	_	_	30	70	100

A. Course Objectives

To facilitate learners to:

- Become familiar with basic concept of personality and personality development
- Understand personality development theories and strategies
- Evaluate one's personality and inculcate traits of an assertive personality
- Develop an assertive personality
- Develop life skills and required management traits
- Enhance contributory personality for academic and career success

B. Course Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**Concept of Personality:** • Meaning of Personality • Types of Personality • Factors contributing to Personality • Personality Traits	06
2	**Soft Skills and Personality Development:** • Critical, Creative and Positive Thinking • Leadership, Assertiveness and Negotiation Skills • Self-Management • People's Skills • Building Relationship Skills • Being a Team Player	08

3	**Developing Contributor Personality – Part I** • Concept of Contributor • Characteristics of a Contributor • The Contributor's Vision of Success & Career • The Scope of Contribution • Embarking on the Journey to Contributor ship	06
4	**Developing Contributor Personality – Part II** • Focus on Values • Engage Deeply • Think in Enlightened Self-Interest • Practice Imaginative Sympathy • Demonstrate Trust Behavior • Developing a sense of duty and morality	06
5	**Contemporary Issues in CPD** • Contemporary Practices & Trends in Contributor Personality Development • Case Study & Presentations	04
	Total	**30**

C. Instruction Methods and Pedagogy

The course is based on practical learning. Teaching will be facilitated by reading material, discussion, task-based learning, projects, assignments and various interpersonal activities like case studies, critical reading, group work, independent and collaborative research, presentations etc.

D. Evaluation:

The students will be evaluated continuously in the form of internal as well as external examinations. The practical evaluation is schemed as 30 marks for internal evaluation and 70 marks for external evaluation in the form of University examination.

Internal Evaluation

The students' performance in the course will be evaluated on a continuous basis through the following components:

Sr. No.	Component	Number	Marks per incidence	Total Marks
1	Assignment / Project Work / Term Work / Quiz	2	25	25
2	Attendance and Class Participation			05
			Total	30

External Evaluation

The University Practical examination will be of 70 marks and will test the contributory personality aspects and their applications by carrying out practical assessment. The examination will avoid, as far as possible, grammatical errors and will focus on applications.

Sr. No.	Component	Number	Marks per incidence	Total Marks
1	Practical Exam / Viva	01	70	70
			Total	70

E. Learning Outcomes:

At the end of the course, learners will be able to:

- Identify one's individual personality strengths and challenges
- Develop more assertive and optimist attitude towards work and life
- Develop quintessential soft skills to groom one's personality

F. Reference Books / Reading

1) Contributor Personality Program Workbook (Volume 1,2),
2) Contributor Personality Program ActivGuide, Illumine Knowledge Pvt. Ltd.

CL345: ENVIRONMENTAL ENGINEERING- I
B TECH 6th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are:

- To learn the fundamental concepts in the field of water supply and environmental engineering.
- To understand sources of water, water requirements and methods for estimation of water quantities.
- To perceive the basic understanding of various methods of conveyance and fundamentals of distribution systems.
- To learn the various characteristics of drinking water and methods for their examination.
- To develop an alertness towards methods of water treatment with their functioning.
- To learn the importance of house drainage and it's planning.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Environmental Engineering	05
2	Water Demands and Sources of Water	07
3	Water Conveyance and Distribution Systems	12
4	Quality and Treatment of water	32
5	House Drainage	04

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. **Detailed Syllabus:**

1	**Introduction to Environmental Engineering**	**05 Hours**	**08%**
1.1	Scope and Importance of Environmental Engineering		
1.2	Necessity of planned water supplies		
1.3	Present water supply systems scenario		
1.4	Environmental Ethics and Role of Environmental Engineer		
2	**Water Demands and Sources of Water**	**07 Hours**	**12%**
2.1	Various types of water demands & factors affecting per capita demand		
2.2	Variations in Demand & Design Periods		
2.3	Population Forecasting Methods		
2.4	Surface and Ground water Sources		
3	**Water Conveyance and Distribution Systems**	**12 Hours**	**20%**
3.1	Water Intakes-types and design considerations		
3.2	Types of Conduits, Flow in pipe systems and types of pressure pipes		
3.3	Selection of pumps, their types and economical diameter of mains		
3.4	Distribution System-Requirements, layouts and methods		
3.5	Distribution Reservoirs-functions, types and determination of storage capacity		
3.6	Analysis of Pipe Networks		
4	**Quality and Treatment of water**	**32 Hours**	**53%**
4.1	Necessity of characterization		
4.2	Quality of Water- Physical, Chemical and Biological Aspects		
4.3	Analysis of Water and Drinking water quality standards		
4.4	Water Treatment Processes		
4.5	Design of Water Treatment Plant Units		
5	**House Drainage**	**04 Hours**	**07%**
5.1	Principles of House Drainage		
5.2	Types of Traps		
5.3	House drainage plan for residential building		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the completion of the course one should be able to understand

- The knowledge on hydraulic concepts and their relation in transport and distribution systems.
- The water quality criteria and standards with their relation to public health and environment.
- Water quality concepts and their relation with treatment process selection.
- The fundamental working of a house drainage system.

F. Recommended Study Material:

Text Books:

1) Garg, S.K., Environmental Engg. Vol. – I & II , Khanna Publications.
2) Punmia, B.C., Environmental Engg. Vol. - I & II, Laxmi Publications.
3) Peavy, Rowe and Tchobanoglous, Environmental Engg, Tata Mcgraw Hill.

Reference Books:

1) Bhole, A.G., Water Treatment Plant Design, Indian Water Works Association.
2) Dix, H.M., Environmental Pollution, Edward Arnold Publishers Ltd.
3) Mackenzie L. Davis, David, A. Cornwell, Introduction to Environmental Engineering, Tata Mcgraw Hill Publications.
4) Sanitary Engg. and Sewage Treatment, Manual, Ministry of Works & Housing, New Delhi
5) Chaterjee, A.K., Environmental Engg, Khanna Publishers.
6) Steel, E.W. and McGhee, T.J., Water Supply & Sewerage, McGraw-Hill College.
7) Water Supply and Treatment, Manual, Ministry of Works and Housing, New Delhi.

Web Materials:

1) http://nptel.iitm.ac.in
2) http://www.epa.gov
3) http://www.nesc.wvu.edu

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
A	**Analysis of Water Quality Parameters**
1.	Determination of pH and Conductivity for a given water sample
2.	Determination of Acidity for given water sample
3.	Determination of Alkalinity in water sample
4.	Determination of Solids in water sample
5.	Determination of Hardness in water sample
6.	Determination of Chlorides in water sample
7.	Determination of Residual Chlorine in water sample
8.	Determination of Optimum Coagulant Dose by Jar Test for a given water sample
9.	Determination of Dissolved Oxygen in water sample
10.	Determination of Most Probable Number (MPN)
B.	**Design Problems on Treatment Units / Distribution Systems**

CL346: GEOTECHNICAL ENGINEERING-I
B TECH 6th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives of the course are

- To make students aware about Geotechnical Engineering and its importance
- To explain how soil properties are estimated using three phase system
- To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage are estimated
- To determine shear parameters of soil
- To estimate the magnitude and time-rate settlement due to consolidation

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	02
2	Origin & Evolution of Soil	03
3	Index Properties & Plasticity Characteristics	07
4	Soil water	06
5	Compaction	08
6	Shear Strength	10
7	Consolidation	09

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. **Detailed Syllabus:**

1	**Introduction**	**02 Hours**	**06%**
1.1	Historical Development of Soil Engineering		
1.2	Importance of Soil Engineering		
1.3	Major soil deposit in India		
2	**Origin & Evolution of Soil**	**03 Hours**	**10%**
2.1	Origin and General types of soils		
2.2	Geological cycle, physical and chemical agencies for soil		
2.3	Soil structure & Clay minerals		
3	**Index Properties & Plasticity Characteristics**	**07 Hours**	**15%**
3.1	Three phase diagram of soil		
3.2	Volumetric relationship and Weight – Volume relationships		
3.3	Determination of different index properties		
3.4	Grain size distribution by sieve analysis, Hydrometer analysis		
3.5	Atterberg's Limits and indices		
3.6	Activity, sensitivity & thixotropy of soil		
3.7	Different classification systems: Textural Classification, AASHTO classification, Unified soil classification, IS classification		
3.8	Field Identification of soil		
4	**Soil water**	**06 Hours**	**14%**
4.1	Types of soil water, capillary phenomena		
4.2	Concept of effective and neutral stresses		
4.3	Permeability of soil, Darcy's law, Factors affecting permeability		
4.4	Seepage velocity, Permeability of Stratified soil		
4.5	Tests for determination of coefficient of permeability in field and laboratory		
4.6	Seepage pressure, quick sand phenomenon and piping		
4.7	Introduction of flow net		
5	**Compaction**	**08 Hours**	**16%**
5.1	Definition and importance, factors affecting compaction, Influence of compaction on soil properties		

5.2	Laboratory compaction test, relative density and its determination		
5.3	Field compaction and its control		
6	**Shear Strength**	**10 Hours**	**20%**
6.1	Definition, Mohr strength theory, Mohr-coulomb's strength theory		
6.2	Shear test based on drainage condition		
6.3	Factors affecting shear strength of granular and cohesive soil		
6.4	Direct shear test, Triaxial compression test, unconfined compression test, vane shear test		
7	**Consolidation**	**09 Hours**	**19%**
7.1	Compressibility of soil & its type, mechanism of consolidation		
7.2	Assumptions and Terzaghi's one dimensional consolidation theoretical equation		
7.3	One dimensional consolidation test, Co-efficient of consolidation and its determination, determination of pre-consolidation pressure		
7.4	Consolidation settlement, rate of settlement for uniform pressure increment in a clay layer		
7.5	Introduction to secondary compression		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.

- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

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

- Evaluate soil properties by performing various experiments
- Carry out soil classification,
- Solve practical problems related to permeability, seepage and consolidation settlement,
- Relate soil properties to workout theoretical soil strength with confidence.

F. Recommended Study Material:

Text Books:

1) Arora, K.R., Soil Mechanics & Foundation Engineering, Standard Publicaiton, New Delhi.
2) Punamia, B.C., Soil Mechanics & Foundation Engineering; Laxmi Publication Pvt. Ltd., Delhi.
3) Murthy, V.N.S., Soil Mechanics & Foundation Engineering, Sai Kripa Technical Consultants, Bangalore.
4) Shroff, A. V., Shah D. L., Soil Mechanics & Geotechnical Engineering, Oxford & IBH, Delhi.

Reference Books:

1) Singh Alam, Soil Engineering, Agion Publishers, Jodhpur.
2) Purshottam Raj, Geotechnical Engineering, Tata McGraw Hill Publication.
3) Purushothama, P. Raj, Soil Mechanics and Foundation Engineering, Pearson Education.
4) Singh, Alam, Soil Mechanics & Foundation Engineering, CBS Publishers & Distributors, New Delhi.
5) Taylor, D.W., Fundamentals of Soil Mechanics, Asia Publishing House, Mumbai.
6) Ranjan Gopal and Rao, A.S.R., Basic and Applied Soil Mechanics, New Age International Pvt. Ltd.
7) Braja Das, M., Principles of Geotechnical Engineering, Thomson Asia Pvt. Ltd.

Web Materials:

1) http://edudel.nic.in
2) http://bis.org.in/other/quake.htm
3) http://www.thepeninsulaneighborhood.com/ThePlan.html
4) http://www.historytution.com/indus_valley_civilization/town_planning.html

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Moisture Content by Oven-drying Method
2	Specific Gravity by Pycnometer Method
3	Sieve Analysis
4	Hydrometer Analysis
5	Liquid Limit & Plastic Limit Tests
6	Shrinkage Limit Test
7	In Situ Density by Core Cutter Method
8	In Situ Density by Sand Replacement Method
9	Direct Shear Test

CL347: WATER RESOURCES ENGINEERING-I
B TECH 6th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are:

- To build on the student's background in hydrology and understanding of water resources systems
- To create a vision for the water resources development and management
- To understand the importance of estimation of runoff, analysis of rainfall data and hydrographs
- To build the necessary theoretical background of ground water hydrology, types of aquifers and their yields
- To introduce students to basic concepts of water, plants, their interactions as well as irrigation systems

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Water Resources Engineering	04
2	Precipitation and Abstractions	12
3	Runoff and Hydrograph	12
4	Groundwater Hydrology	16
5	Irrigation & Irrigation Methods	04
6	Water Requirements of Crops	12

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Introduction to Water Resources Engineering**	**04 Hours**	**07%**
1.1	Need of water resources projects		
1.2	Hydrologic cycle - scope and application		
1.3	Hydro-metrology and its significance in water resources engineering		
1.4	Hydrologic Equation (Water Balance Equation)		
2	**Precipitation and Abstractions**	**12 Hours**	**20%**
2.1	Precipitation: Types, forms, measurement, estimation of missing data, mean rainfall computation		
2.2	Evaporation: Process, factors affecting, measurement – analytical methods & evaporimeters		
2.3	Evapotranspiration: Transpiration, evapotranspiration, factors affecting, measurement – field methods, Empirical equations & examples for determining evapotranspiration - Blanny-Criddle, Modified Penmen methods		
2.4	Infiltration: Process, infiltration rate, infiltration capacity, infiltration indices, measurement - infiltrometers		
3	**Runoff and Hydrograph**	**12 Hours**	**20%**
3.1	Runoff: Types, factors affecting, estimating volume of runoff (yield) – rainfall runoff correlation & empirical equations		
3.2	Hydrograph: Factors affecting, components, unit hydrograph, S-Hydrograph, computation of flood		
3.3	Flood& Flood Routing: Definition, types, causes, effects, flood estimation – rational, empirical, Gumble's method		

	& flood frequency studies, SPF, PMF, Flood routing – reservoir (storage) & channel, examples		
4	**Groundwater Hydrology**	**16 Hours**	**26%**
4.1	Occurrence and movement of groundwater, Darcy's law, governing ground water flow equations, Factors governing ground water flow, Types of aquifers, porosity, specific yield, specific retention, storage coefficient, permeability, hydraulic conductivity, hydraulic transmissibility, Conjunctive use and it's necessity		
4.2	Introduction to Ground Water Geophysical Investigation techniques		
4.3	Hydraulics of wells under steady & introduction to unsteady condition in confined and unconfined aquifers yield of wells, pumping and recuperation tests, types of tube wells.		
4.4	Needs of ground water recharge, ground water recharge methods, Rain water harvesting		
4.5	Occurrence and causes of saline water intrusion, Ghyben-Herzberg Relation, Upconing of saline water, Control of saline water intrusion		
5	**Irrigation & Irrigation Methods**	**04 Hours**	**07%**
5.1	Irrigation: Definition, merits, demerits, irrigation in India, water quality of irrigation water		
5.2	Irrigation methods: Detailed classification		
5.3	Surface methods: Over view of border, basin & furrow methods		
5.4	Pressurized methods: Over view of drip & sprinkler systems		
6	**Water Requirements of Crops**	**12 Hours**	**20%**
6.1	Crop seasons and crops in India		
6.2	Terms used in crop water requirement		

6.3 Soil-water-plant relationship: Classification of soil water, soil moisture constants, extraction pattern of moisture in root zone

6.4 Duty of water and delta, factors affecting on duty and delta, relation between duty-delta & examples based on it

6.5 Irrigation efficiencies and calculation of efficiencies

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the completion of the course one should be able to

- Understand the fundamental concepts of hydrological cycle, occurrence and distribution of surface and ground water.
- Understand the significance of various hydrological parameters, types and forms of precipitations
- Implement remedial measures to control the ground water pollution and apply different techniques of ground water recharge to augment the ground water table.
- Understand types of irrigation systems and different hydraulic structures.

- Estimate the quantity of water required by crops.

F. **Recommended Study Material:**

Text Books:

1) Subramanya, K., Engineering Hydrology, Tata McGraw Hill, New Delhi.
2) Raghunath, H.M., Groundwater, 1987, Wiley Eastern Ltd., New Delhi.
3) Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.

Reference Books:

1) Garg, S.P., Groundwater and Tube Wells, 1993, Oxford & IBH Publishing Co.
2) Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.
3) Raghunath, H.M., Hydrology – Principles, Analysis and Design, 1986, Wiley Eastern Ltd.
4) Todd, D.K., Groundwater Hydrology, 1993 John Wiley & Sons.
5) Karanth, K.R., Ground Water Assessment Development and Management, Tata
6) McGraw Hill, New Delhi.
7) Patel, A.S. and Shah, D.L., Water Management – Conservation, Harvesting & Artificial
8) Recharge, New Age International Publishers.
9) Punmia and Pando, Lal, B.B., Irrigation and Water Engineering, Standard Publishers Distributors, New Delhi.
10) Michael, A.M., Irrigation - Theory and Practice, Vikas Publishing House, New Delhi.
11) Arora, K.R. Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors, New Delhi.

Web Materials:

1) http://nptel.iitm.ac.in
2) http://www.groundwatermanagement.org/module2_000.pps
3) http://www.uiowa.edu/~c012003a/14.%20Groundwater.pdf
4) http://www.authorstream.com/presentation/brod-17752-lect-18-groundwater-
5) http://www.ngwa.org/public/gwbasics/index.aspx

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1.	Measurement of Infiltration Using Double- Ring Infiltrometer
2.	Measurement of Evaporation Using Pan Evaporimeter

LIST OF TUTORIALS

Tutorial No	Title
1	Introduction to Hydrology
2	Precipitation
3	Evaporation & Evapotranspiration
4	Infiltration
5	Runoff
6	Hydrograph
7	Flood
8	Ground Water Hydrology
9	Well Hydraulics
10	Ground Water Recharge and Salt Water Intrusion
11	Irrigation Methods
12	Water Requirements of Crop

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

- The eventual aim of this subject is to incorporate psychological perception of learning and reasoning of engineering aspects of highway field into Engineers in general.
- To provide fundamental knowledge in transportation so that students can understand and be able to solve transportation related problems and design for highway mode of transportation involving the application of scientific and technological principles with focus on highway user characteristics, geometric and pavement design, traffic engineering and transportation planning.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	07
2	Traffic Engineering	13
3	Highway Geometric Design	13
4	Highway Materials and Construction	04
5	Highway Pavement Design	13
6	Highway Drainage, Maintenance, Economics and Arboriculture	10

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. **Detailed Syllabus:**

1	**Introduction**	**07 Hours**	**14%**
1.1	Role/Impacts of transportation in nation's development, Modes of transportation and its characteristics, Scope of Transportation Engineering		
1.2	Importance of Highway Engineering		
1.3	Highway Planning and Development in India: Jayakar Committee, IRC, CRRI, CRF, HRB, NTPC, NHAI,NHDP, MORTH, Motor Vehicle Act, National Highway Act, Nagpur Road Plan, Bombay Road Plan, Lucknow Road Plan , Vision 2021, Rural Roads: Vision 2025.		
1.4	Classification of Roads		
1.5	Highway Alignment and Surveys: Introduction, Ideal Requirement of Alignment, Factors controlling Alignment, Engineering Surveys, Drawing and Reports, Highway Project		
2	**Traffic Engineering**	**13 Hours**	**20%**
2.1	Introduction		
2.2	Characteristics of Traffic Engineering		
2.3	Traffic Surveys: Traffic Volume Studies, Speed Studies, Traffic Density & Capacity, Relations between traffic parameters, Level of service, Passenger car unit, Parking studies, Accident Studies		
2.4	Traffic Operations: Traffic Regulations, Traffic Control Devices (Signs, Signals and Markings) with its design		
2.5	Highway Intersection: At grade & Grade separated intersections, Rotary intersection, IRC Recommendations		
2.6	Highway Lightning: Definitions, Factors affecting street lightening, IRC Recommendations		

3	**Highway Geometric Design**	**13 Hours**	**20%**
3.1	Introduction		
3.2	Highway Cross-section Elements		
3.3	Sight Distance		
3.4	Design of Horizontal Alignment		
3.5	Design of Vertical Alignment		
4	**Highway Materials and Construction**	**04 Hours**	**10%**
4.1	Introduction		
4.2	Aggregates and Test on Aggregates		
4.3	Bitumen and Test on Bitumen		
4.4	Test on Soil: CBR Test		
4.5	Highway Construction: Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavement and Cement Concrete Pavement		
5	**Highway Pavement Design**	**13 Hours**	**20%**
5.1	Introduction		
5.2	Types of Highway Pavement: Flexible pavement & rigid pavement, their components & its functions.		
5.3	Design Factors		
5.4	Design of Flexible Pavement: CBR Method, IRC Guidelines		
5.5	Design of Rigid Pavement: IRC method, Westergaard theory, loads & temperature stresses.		
6	**Highway Drainage, Maintenance, Economics and Arboriculture**	**10 Hours**	**16%**
6.1	Highway Drainage: Introduction, Importance of Highway Drainage, Surface Drainage, Sub-surface Drainage, Drainage of slopes and erosion controls		
6.2	Highway Maintenance: Pavement Failures, Maintenance Techniques, Strengthening of existing pavements.		

6.3 Highway Economics and Finance: Introduction, Methods of Economic Evaluation of highway projects: Annual cost method, Rate of return method & benefit- cost ratio method, Highway Project administration and Finance: Public Private Partnership

6.4 Highway Arboriculture: Environmental Factors affecting highway planning, Road Side Development, Planning Plantation of trees, Species and their selection, Care of trees

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

The course content should be taught and learning imparted with the aim to develop required knowledge and skills so that they are able to acquire following competency:

- To design highway pavement geometrics
- To understand the procedure to collect the traffic data for design and the need of traffic management
- Test the highway material as per IS recommendations

- Carryout preliminary design of flexible and rigid pavement as per IRC
- To understand the concept for providing highway drainage, maintenance and arboriculture.

F. **Recommended Study Material:**

Text Books:

1) Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand & Bros, Roorkee (U.A).
2) Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
3) Kadiyali, L.R. & Lal, N.B., Principles & Practices of Highway Engineering, Khanna Publishers, New Delhi.

Reference Books:

1) Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.

Web Materials:

1) http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Transportation%20Engg%20I/TOC.htm

Other Materials:

1) IRC – 37 "Guidelines for Design of flexible Pavements", IRC, New Delhi, 2001.
2) IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001.
3) IRC: 58, 2002: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.
4) IRC:70, 1977: "Guidelines on Regulation and Control of Mixed Traffic in Urban Areas"
5) IRC:106, 1990: "Guidelines for Capacity of Urban Roads in Plain Areas"
6) IRC SP 30: "Manual of Economic Evaluation of Highway Projects in India", IRC, New Delhi, 2009.
7) IRC SP 41: "Guidelines for the Design of At-Grade Intersections in Rural and Urban Areas", IRC, New Delhi, 1994.

8) Khanna S. K. & Justo C. E. G., "Highway Material Testing (Laboratory Manual), Nem Chand & Bros, Roorkee

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
	Test on Subgrade Soil
1	California Bearing Ratio Test
	Tests on Aggregates
2	Aggregate Crushing Test
3	Aggregate Impact Test
4	Los Angeles Abrasion Test
5	Shape Tests
6	Specific Gravity & Water Absorption Test
	Tests on Bitumen
7	Penetration Test
8	Ductility Test
9	Flash & Fire Point Test
10	Softening Point Test
11	Specific Gravity Test
12	Viscosity Test

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

- To explain the importance of maintenance of buildings with study of the damages in the buildings
- To teach the importance of durability of structure and introducing causes of deterioration of structures
- To equip student with damage assessment and evaluation of structures
- To introduce the students in depth about knowledge of professional practice of repair techniques with right selection of repairing materials
- To study principles of Retrofitting and Rehabilitation
- To explain demolition techniques for structures and safety measures to be followed during demolition
- To enlighten on care to be taken in dismantling of buildings

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Maintenance of Building	04
2	Deterioration and Durability Aspects	10
3	Conditional/damage assessment & Evaluation of structures	08
4	Materials and Techniques for Repair	08
5	Rehabilitation and Retrofitting Methods	10
6	Demolition and Dismantling Techniques	05

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Maintenance of Building**	**04 Hours**	**09%**
1.1	Introduction		
1.2	Objectives		
1.3	Phases of Maintenance		
1.4	Common Defects In Buildings And Measures To Prevent And Control The Same		
1.5	Building Failures- Causes And Effects		
1.6	Cracks In Buildings		
2	**Deterioration and Durability Aspects**	**10 Hours**	**22%**
2.1	**Deterioration:** Types of deterioration – Signs, causes & symptoms, Mechanism of deterioration, contributing factors like permeability, inadequate durability & micro-structure of concrete		
2.2	Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, abrasion, erosion, cavitation, crystallization of salts, Efflorescence, exposure to severe environment like marine exposure		
2.3	Chemical deterioration due to corrosion of reinforcement (chloride induced, carbonation induced), Alkali-silica reaction, sulphate attack, Acid attack		
2.4	Deterioration due to water leakage, fire – detection & mitigation of the same. Deterioration due to ageing, inadequate maintenance, Design & construction deficiencies, overloading etc.		
2.5	Visual deterioration of structures- Types of cracks, causes & characteristics of cracking in various structural components like beam, column, slab, masonry walls. Measurement of cracks, interpretation of the cause of particular type of crack		
2.6	**Durability:** Life Expectancy of Different Types of Buildings – Influence of Environmental Elements Such as Heat, Moisture,		

	Precipitation and Frost on Buildings- Design and Construction Errors, Corrosion Mechanism		
2.7	Effect of Biological Agents like fungus, moss, plants, trees, algae, Termite Control and Prevention		
2.8	Chemical Attack on Building Materials and Components		
2.9	Aspects of Fire and Fire Prevention on Buildings		
2.10	Impact of Pollution on Buildings		
3	**Conditional/damage assessment & Evaluation of structures**	**08 Hours**	**18%**
3.1	Conditional evaluation– Importance, objective & stages, Conditional/damage assessment procedure, Preliminary & Detailed investigation–Scope, Objectives, Methodology & Rapid visual inspection of structures		
3.2	Damage Assessment allied Tests (Destructive, Semi-destructive, Nondestructive)		
3.3	Non-destructive Evaluation Tests - Concrete Strength Assessment Chemical Tests, Fire Damage Assessment, Structural Integrity/Soundness Assessment		
3.4	Interpretation & Evaluation of Test Result Data		
4	**Materials and Techniques for Repair**	**08 Hours**	**18%**
4.1	Essential Parameters for Repair Materials		
4.2	Materials for Repair		
	4.2.1 Premixed cement concrete/mortars		
	4.2.2 Polymer Modified Mortars and Concrete (PMM/PMC)		
	4.2.3 Epoxies and Epoxy Mortars/Concretes		
	4.2.4 Polyester Resins		
	4.2.5 Sulphur infiltrated concrete		
	4.2.6 Ferro cement		
	4.2.7 Fibre reinforced concrete		
	4.2.8 Foamed concrete		
	4.2.9 Dry pack		
	4.2.10 Vacuum concrete		
	4.2.11 Surface Coatings		
4.3	Gunniting, Grouting, Shotcrete and Epoxy injection		

5	**Rehabilitation and Retrofitting Methods**	**10 Hours**	**22%**
5.1	Important factors to be considered for selection of repair methods.		
5.2	Repair Stages		
5.3	Repair Methods		
5.4	Repair of stone, brick and block masonry (Cracks, dampness, efflorescence, joint separation, etc.), Flooring , Roofs (sloping, flat, pitched, etc.)		
5.5	Repair of Concrete members due to (i) Steel Corrosion (ii) Lack of Bond (iii) shear, tension, torsion, compression failure		
5.6	Repair of leakage due to rain water		
5.7	Strengthening of Earthquake Damage Buildings		
6	**Demolition and Dismantling techniques**	**05 Hours**	**11%**
6.1	Engineered demolition techniques for Dilapidated structures		
6.2	Safety measures during demolition operation		
6.3	Dismantling of buildings and reuse of materials/fittings from environmental and financial point of view		
6.4	Case studies		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Internal Exams/Assignments/Surprise tests/Quizzes/Seminar/Project, etc., will be conducted as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials/Term work related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- Students can understand the types of requirement of maintenance in building.
- Can able to assess the quality aspects of existing building.
- Identify and define all the terms and concepts associated with deterioration of concrete structures.
- Students will learn the damage assessment and Rapid Visual inspection of a building showing signs of deterioration and thus should be able to detect the possible cause /source of deterioration.
- Carryout analysis using NDT and evaluate structures.
- Develop a knowledge of the Concrete repair industry equipped with variety of repair materials and techniques.
- Understand and apply rehabilitation and retrofitting processes.
- Can able to strengthen earthquake deficiency in the structure.
- Can gain knowledge regarding dismantle and demolish structures which cannot be repaired in an environment friendly, with maximum saving of materials and in a safe way.
- Can understand care to be taken in dismantling of buildings so that maximum resale value of materials is generated.

F. Recommended Study Material:

Text Books:

1) P. C. Varghese, Maintenance, Repair & Rehabilitation and Minor Works of Buildings, PHI learning.
2) R. T. Allen and S. C. Edwards, "Repair of Concrete Structures", Blakie and Sons, UK, 1987.
3) A. R. Santhakumar, "Concrete Technology", 2012 Oxford University Press, 2006.
4) V. M. Malhotra, Nicholas J. Carino 2004 "Handbook on Nondestructive Testing of Concrete".
5) Handbook on Repairs and Rehabilitation of RCC buildings – CPWD, Government of India.

6) R. Dodge Woodson, Concrete Structures: Protection, Repair and Rehabilitation, Elsevier, 2009.
7) Xilin Lu, "Retrofitting Design of Building Structures", Science Press, 2010.
8) Structural Condition assessment by Robert T. Ratay.
9) IS 13935 : 2009, Seismic Evaluation, Repair And Strengthening of Masonry Buildings — Guidelines

Reference Books:

1) A.C. Panchdhari, "Maintenance of Buildings", New Age International.
2) Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RHDC – NBO" Anna University, July 1992.
3) Concrete Technology by M. L. Gambhir, Tata McGraw-Hill Education.
4) R. T. Allen and S. C. Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1987
5) M. S. Shetty, Concrete Technology – Theory and Practice, S. Chand and Company, New Delhi, 1992.
6) Concrete Structures, Protection, Repair and Rehabilitation by R. Dodge Woodson.
7) Repairs and rehabilitation of concrete structures by P. I. Modi & C. N. Patel, PHI Publication.

Web Materials:

1) cpwd.gov.in/Units/handbook.pdf
2) www.bis.org.in/sf/nbc.htm
3) http://www.civilengineeringnews.tk/2014/07/methods%20-of-demolition-of-%20building.html
4) http://www.indianconcreteinstitute.org/repair-and-rehabilitation.html

TERM WORK

1) Study of rehabilitation/retrofitting of RCC/Masonry buildings covering (a) damage assessment by visual inspection and using various techniques including NDT (b) one/two alternatives for rehabilitation/retrofitting (considering strength criteria & serviceability criteria).
2) Case study of construction and design failures.
3) Market survey for material for repairs.

4) Case study of repairing/rehabilitation structures and retrofitting of EQ damage/deficit structure.
5) Presentations / finding engineering applications /preparation of learning material based on the syllabus.

CL377: ADVANCED SURVEY
B TECH 6th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The main objective of the course is

- To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the same principles
- Identify and correct errors in field measurements
- Understand the basic principles of astronomical survey
- Understand procedures of Triangulation
- To get introduced to modern advanced surveying techniques involved such as remote sensing, Total station, GPS, Photogrammetry, etc.
- To know the ground topography and be able to use different software applications in surveying

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Tacheometric Surveying	09
2	Geodetic Surveying	07
3	Trigonometric Levelling	07
4	Theory of Errors	06
5	Field Astronomy	04
6	Aerial photogrammetry	06
7	Total Station and GPS	06

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Tacheometric Surveying :**	**09 Hours**	**19%**
1.1	Introduction		
1.2	Tacheometric Systems – Tangential, Stadia and substense methods		
1.3	Stadia systems – horizontal and inclined sights – vertical and normal staff – fixed and movable hair – stadia constants		
1.4	Field work in tacheometry, anallatic lens – subtense bar – Self reducing tacheometers		
1.5	Errors and precisions		
2	**Geodetic Surveying**	**07 Hours**	**15%**
2.1	Principle and Classification of triangulation system		
2.2	Selection of base line and stations		
2.3	Orders of triangulation		
2.4	Triangulation figures- Horizontal and vertical control		
2.5	Station marks and signals- marking signals		
2.6	Extension of base, Reduction of Centre, Selection and marking of stations		
3	**Trigonometric Levelling**	**07 Hours**	**15%**
3.1	Introduction		
3.2	Methods of trigonometric levelling: Base of object accessible, base of object inaccessible – same vertical plane, base of object inaccessible – not in same vertical plane		
3.3	Determination of height of elevated object above ground when its base & top are visible but not accessible		
4	**Theory of Errors**	**06 Hours**	**13%**
4.1	Introduction		
4.2	Types and sources of errors & definitions		
4.3	Laws of accidental errors, laws of weights, theory of least squares		
4.4	Rules for giving weights and distribution of errors to the field observations		
5	**Field Astronomy**	**04 Hours**	**10%**
5.1	Introduction & purposes, astronomical terms		

5.2	Determination of azimuth, latitude, longitude and time corrections to the observations		
6	**Aerial photogrammetry**	**06 Hours**	**14%**
6.1	Photogrammetric terms, Applications, Type of photographs, floating marks		
6.2	Scale of a vertical and oblique photographs, heights and tilt distortions		
6.3	Flight planning, Stereoscopy, base lining		
6.4	Developments in photogrammetry, Photomaps and mosaics		
6.5	Photographic interpretations, Parallax bar		
7	**Total Station and GPS**	**06 Hours**	**14%**
7.1	Digital theodolite, Electronic Distance Measurement, Total Station: Introduction, principle and uses		
7.2	Remote sensing: Principle of Remote sensing, EMR, types, resolutions, types of satellites, type of sensors, visual and digital image processing and its applications		
7.3	Global Positioning System: Definition, Principles of GPS and applications.		
7.4	Introduction and principle of GIS, Applications of GIS in Civil Engineering		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP, etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- At the end of each unit/topic the students will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.

- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 8 experiments including 1 field project based on above course content will be carried out in the laboratory.

E. Students Learning Outcomes:

After studying this subject students will be able to:

- Conduct tacheometry and geodetic survey
- Apply principles of theory of errors for correction of measurements
- Apply knowledge of astronomy for solving civil engineering problems
- Explain use of aerial camera, aerial photographs and procedure of aerial survey
- Utilize stereoscope and parallax bars
- Utilize total station and other modern survey instruments
- Apply GIS in solving engineering problems

F. Recommended Study Material:

Text Books:

1) Duggal, S. K., Surveying Vol. I & II, Tata McGraw Hill Publication, New Delhi.
2) Subramanian, R., Surveying &Levelling, Oxford University Press, New Delhi.

Reference Books:

1) Surveying Vol. I, II and III by Dr. B.C. Punamia, Laxmi Publishers. New Delhi
2) Surveying and Levelling Vol. I and II by T.P. Kanetkar and S.V. Kulkarni, Pune Vidhyarthi Gruh
3) Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House. New Delhi
4) Surveying Vol. I and II by S. K. Duggal, Tata Mcgraw Hill, New Delhi
5) Surveying and Levelling by N.N. Basak, Tata Mcgraw Hill, New Delhi
6) Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi
7) Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
8) Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi

9) Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
10) Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
11) Remote sensing and Image interpretation by T.M. Lillesand,. R.W. Kiefer,. and J.W. Chipman, 5th edition, John Wiley and Sons India
12) Surveying theory and practice 7th Edition by James M Anderson and Adward M. Mikhail Tata McGraw Hill Publication.
13) Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2007.

Web Materials:

1) http://nptel.iitm.ac.in/courses/Webcourse-contents/IITROORKEE/SURVEYING/home.htm
2) http://nptel.iitm.ac.in/video.php?subjectId=105104101
3) http://en.wikipedia.org/wiki/Geographic_information_system
4) http://www.naicc.org/meeting/2009/GPSRemoteSensing.pdf

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Introduction to Tacheometry
2	Determination of multiplying and additive constants of a Tacheometer
3	Use of (i) Tacheometer, (ii) Total Station for determination of Reduced levels and Horizontal distances of various points in the field
4	Project: Tacheometric Survey Project
5	Use of different Softwares for surveying
6	Extension of Baseline using Theodolite
7	Remote Sensing
8	Applications of GIS Software's
9	Total Station Surveying – Measurements of Distances and angles, Slope distances, Height, Traversing.
10	Use of Stereoscope for 3-D Viewing, Height determination from a Stereo pair using the Parallax bar

CL378: STRUCTURAL ANALYSIS-III
B TECH 6th SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are:

- To understand the advanced methods of structural analysis that are essential for an economical dimensional proportioning of various civil engineering structures
- To learn and practice the analysis process to be involved in designing various structural components used in professional structural engineering
- To make students recognize the different structural systems and their range of applications
- To provide essential knowledge of Matrix method used in developing programme

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Beams Curved in Plan	06
2	Cable and Suspension Bridge	04
3	Plastic Theory of Structures	08
4	Column Analogy	06
5	Approximate analysis of Indeterminate Structures	06
6	Matrix Method of Structural Analysis – System Approach	15

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Beams Curved in Plan**	**06 Hours**	**13 %**
1.1	Uses of curved beam		
1.2	Types of internal forces		
1.3	Analysis of curved beam fixed at ends for point load, uniformly distributed load		
1.4	Analysis of closed circular beam supported symmetrically		
2	**Cable and Suspension Bridge**	**04 Hours**	**09%**
2.1	Introduction: Cables and cable bridge		
2.2	General cable theorem		
2.3	Cable under uniformly distributed loads		
2.4	Suspension bridge		
2.5	Suspension bridge with three-hinged stiffening girder		
3	**Plastic Theory of Structures**	**08 Hours**	**18%**
3.1	Concept, assumptions, upper and lower bound theorems		
3.2	Shape factor for different cross sections		
3.3	Collapse load, load factor, plastic modulus of section, plastic moment of resistance		
3.4	Computation of collapse load for fixed beam, continuous beam and plane frame subjected to various load cases		
4	**Column Analogy**	**06 Hours**	**13%**
4.1	introduction		
4.2	Sign convention		
4.3	Analysis of fixed beam and propped cantilever beam		
4.4	Stiffness and carry-over factors for non-prismatic members		
5	**Approximate analysis of Indeterminate Structures**	**06 Hours**	**13%**
5.1	Introduction		
5.2	Portal method		
5.3	Cantilever method		
5.4	Substitute Frame Method		
6	**Matrix Method of Structural Analysis – System Approach**	**15 Hours**	**34 %**
6.1	Introduction to flexibility and stiffness method		

6.2 Flexibility and stiffness coefficient

6.3 Application of flexibility and stiffness method system approach to analysis of beams, plane frame and plane truss

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

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

- Recognize the importance of structural analysis and the tools available to determine the response of a structural system to external loads.
- Identify and formulate an engineering problem and to develop a solution.
- Recognize the need for technical updating on a continuing basis, since the course emphasizes on the changing nature of software.
- Use various approximate methods for analysis of indeterminate structures

F. Recommended Study Material:

Text Books:

1) Junarkar, S.B. & Shah, H.J., Mechanics of Structures Vol-I & II, Charotar Publishing House

2) Negi, L.S. and Jangid, R.S., Structural Analysis, Tata McGraw Hill
3) Vazirani, V.N. and Ratwani, N.M., Analysis of Structures, Khanna Publishers
4) Weaver William and Gere James, Matrix Analysis of Framed Structures, CBS Publishers
5) R.S. Khurmi and N. Khurmi, Theory of structures, S. Chand

Reference Books:

1) Gere & Timoshenko, Mechanics of Materials, CBS Publishers & Distributors, Delhi
2) Hibbler, R.C., Structural Analysis, Pearson Education
3) Wang, C.K., Intermediate Structural Analysis, Tata McGraw Hill
4) Reddy, C.S., Basic Structural Analysis, Tata McGraw Hill
5) Jangid, R.S., Structural Analysis, Tata McGraw Hill
6) Devdas Menon., Structural Analysis, Alpha Science
7) William M.C. McKenzie, Examples in Structural Analysis, Second Edition, CRC Press

Web Materials:

1) http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Structural%20Analysis/New_index1.html
2) http://www.nptelvideos.in/2012/11/structural-analysis-ii.html
3) http://nptel.ac.in/courses/105106050/2
4) http://nptel.iitg.ernet.in/Civil_Eng/IIT%20Delhi/Structural%20Analysis%201%20(Video).htm
5) http://freevideolectures.com/Subject/Civil-Engineering
6) http://freevideolectures.com/Course/3015/Advanced-Structural-Analysis

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Simple suspension bridge
2	Plastic bending of beams
3	Plastic bending of portals
4	Redundant truss
5	Beam Apparatus

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The main objective of the course is

- To expose the students to the history and development of town planning, its relevance & application to modern day principles of town planning.
- To develop an appreciation of the planning procedure, concepts and issues involved at the scale of a town or a city.
- To create awareness about the causes and consequences of housing problems and to impart knowledge about the possible solutions.
- To give an insight into the works of well-known town planners.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction to Town Planning	06
2	Ancient System of Town Planning	04
3	Surveys	04
4	Zoning	05
5	Housing and Slums	08
6	Development Plan	05
7	Planning Concepts	08
8	Planned Cities of India	05

Total Hours (Theory): 45
Total Hours (Lab): 30
Total Hours: 75

C. **Detailed Syllabus:**

1	**Introduction to Town Planning**	06 Hours	13%
1.1	Objects & importance of town planning		
1.2	Principles of town planning		
1.3	Origin of Towns		
1.4	Growth of Towns		
1.5	Stages in Town Development		
1.6	Distribution of land uses		
1.7	Forms of planning		
2	**Ancient System of Town Planning**	04 Hours	9%
2.1	Town Planning in Ancient India		
2.2	Planning thought behind Fatehpur Sikri, Shahjahanabad, Jaipur and Delhi		
2.3	Indus Valley Civilization		
3	**Surveys**	04 Hours	9%
3.1	Necessity of surveys		
3.2	Collection of Data and Methods Adopted to Collect Data		
3.3	Types and Uses		
4	**Zoning**	05 Hours	11%
4.1	Objects and Principles of Zoning		
4.2	Advantages and Importance of Zoning		
4.3	Aspects of Zoning, Transition Zone		
4.4	Maps for Zoning		
5	**Housing and Slums**	08 Hours	18%
5.1	Importance of housing, its demand		
5.2	Requirements of residential buildings		
5.3	Design of residential areas		
5.4	Low cost housing, Laurie Baker's work and ideology		
5.5	Slums – Causes, Characteristics, Effects		
5.6	Slum clearance, Works of Improvement, Re-housing		
5.7	Prevention of slum formation		
6	**Development Plan**	05 Hours	11%
6.1	Objects and Necessity of development plan		

6.2	Stages of preparation of development plan, Data to be collected		
6.3	Features of Development Plan		
7	**Planning Concepts**	08 Hours	18%
7.1	Land use planning, Neighbourhood planning		
7.2	Protective strips, green belt		
7.3	Radburn Layout		
7.4	Urban Roads – Requirements, Classification, Types of Street Systems, Ring Roads		
7.5	Geddesian Triad, Ekistics		
8	**Planned Cities of India**	05 Hours	11%
8.1	Chandigarh, Contribution of Le Corbusier to Town Planning		
8.2	Gandhinagar		

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory.
- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.
- The course includes tutorial, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Theoretical concepts will supported by different models and charts in the laboratory.

E. Learning Outcomes:

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

- Have a proper understanding of history of town planning, ideas developed in the past and its relevance in today's world.

- Understand procedure involved in making development plans and various concepts, and issues of town planning.
- Understand the importance of housing and its cost effectiveness.
- Understand the causes of slum formation and measures needed to prevent it.
- Understand the ideology behind different planned cities.

F. **Recommended Study Material:**

Text Books:

1) Rangwala, S.C., Town Planning, Charotar Publishing House, Anand.
2) Hiraskar, G.K., Town Planning, Dhanpatrai& Sons, New Delhi.
3) A.Bandopadhyay, Text book of Town Planning, Books and Allied, Calcutta 2000

Reference Books:

1) Mathur, G.C., Low Cost Housing in Developing Countries, South Asia Books
2) K. S. Rame Gowda, Urban and regional planning: principles and case studies, Prasaranga, University of Mysore, 1972
3) John Ratcliffe, An Introduction to Town and Country Planning, Hutchinson 1981
4) Kevin A. Lynch, The Image of the City, MIT Press
5) Alex Krieger and William S. Saunders, Urban Design, University of Minnesota Press

Web Materials:

1) https://townplanning.gujarat.gov.in/
2) http://www.udd.gujarat.gov.in/ctp.php
3) http://hcp.co.in/file_manager/publications/Town-Planning-of-Gujarat_Research-Paper.pdf
4) https://www.planetizen.com/
5) http://www.itpi.org.in/

CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

ACADEMIC REGULATIONS & SYLLABUS

Faculty of Technology & Engineering

Bachelor of Technology Programme

(Fourth Year Civil Engineering)

Effective From 2015-16

Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the choicest destinations by students. It has been transformed into **Charotar University of Science and Technology(CHARUSAT)** through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. of India.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmes, one Institute and an investment of about Rs. 3 Crores (INR 30 million). At present there are seven different institutes falling under ambit of six different faculties. The programmes offered by these faculties range from undergraduate (UG) to Ph.D degrees including M.Phil. These faculties, in all offer 64 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Charotar Institute of Technology	B. Tech M. Tech MTM Ph. D
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm M. Pharm MPM PGDCT/ PGDPT Ph. D
Faculty of Management Studies	IndukakaIpcowala Institute of Management	M.B.A PGDM Dual Degree BBA+MBA Ph.D
Faculty of Computer Applications	Smt. ChandabenMohanbhai Patel Institute of Computer Applications	M.C.A/MCAL M.Sc (IT) Dual Degree BCA+MCA

		Ph. D
Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc Dual Degree B.Sc+M.Sc Ph.D
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy ManikakaTopawala Institute of Nursing Charotar Institute of Paramedical Sciences	B.PT M.PT Ph.D B.Sc (Nursing) M.Sc PGDHA PGDMLT GNM Ph.D

The development and growth of the institutes have already led to an investment of over Rs.125 Crores (INR 1250 Million). The future outlay is planned with an estimate of Rs.250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 105 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 360 core faculty members, educated and trained in IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, **CHARUSAT** has the vision of entering the club of premier Universities initially in the country and then globally. **High Moral Values like Honesty, Integrity and Transparency** which has been the foundation of ECC continues to anchor the functioning of **CHARUSAT**. Banking on the world class infrastructure and highly qualified and competent faculty, the University is

expected to be catapulted into top 20 Universities in the coming five years. In order to align with the global requirements, the University has collaborated with internationally reputed organizations like Pennsylvania State University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute –UK, ISRO, BARC, etc.

CHARUSAT has designed curricula for all its programmes in line with the current international practices and emerging requirements. Industrial Visits, Study Tours, Expert Lectures and Interactive IT enabled Teaching Practice form an integral part of the unique **CHARUSAT** pedagogy.

The programmes are credit-based and have continuous evaluation as an important feature. The pedagogy is student-centred, augurs well for self-learning and motivation for enquiry and research, and contains innumerable unique features like:

- Participatory and interactive discussion-based classes.
- Sessions by visiting faculty members drawn from leading academic institutions and industry.
- Regular weekly seminars.
- Distinguished lecture series.
- Practical, field-based projects and assignments.
- Summer training in leading organizations under faculty supervision in relevant programmes.
- Industrial tours and visits.
- Extensive use of technology for learning.
- Final Placement through campus interviews.

Exploration in the field of knowledge through research and development and comprehensive industrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

CHARUSAT welcomes you for a Bright Future

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (Civil Engineering) Programmes

Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

Academic Year – 2016-17

CHARUSAT

FACULTY OF TECHNOLOGY AND ENGINEERING
ACADEMIC REGULATIONS
Bachelor of Technology Programmes

To ensure uniform system of education, duration of undergraduate and post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

- ***System of Education***

The Semester system of education should be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate and Master's levels. Each semester will be at least 90 working day duration. Every enrolled student will be required to take a specified load of course work in the chosen subject of specialization and also complete a project/dissertation if any.

- ***Duration of Programme***

Undergraduate programme (B. Tech.)

Minimum	8 semesters (4 academic years)
Maximum	12 semesters (6 academic years)

- ***Eligibility for admissions***

As enacted by Govt. of Gujarat from time to time.

- ***Mode of admissions***

As enacted by Govt. of Gujarat from time to time.

- ***Programme structure and Credits***

As per annexure – I attached

- ***Attendance***

All activities prescribed under these regulations and enlisted by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student regarding attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Principal.

Student's attendance in a course should be 80%.

7 Course Evaluation

7.1 The performance of every student in each course will be evaluated as follows:

7.1.1. Internal evaluation by the course faculty member(s) based on continuous assessment, for 30% of the marks for the course; and

7.1.2 Final examination by the University through modes such as; written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, is set to 70% of the marks for each the course.

7.2 Internal Evaluation

As per Annexure – I attached

7.3 University Examination

The final examination by the University for 70% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.

7.4 In order to earn the credit in a course a student has to obtain grade other than FF.

7.5 Performance at Internal & University Examination

7.5.1 Minimum performance with respect to internal marks as well as university examination will be an important consideration for passing a course.
Details of minimum percentage of marks to be obtained in the examinations (internal/external) are as follows

Minimum marks in University Exam per course	Minimum marks Overall per course
40%	45%

7.5.2 A student failing to score 40% in the final examination will get an FF grade.

7.5.3 If a candidate obtains minimum required marks in each course but fails to obtain minimum required overall marks, he/she has to repeat the university examination till the minimum required overall marks are obtained.

8 Grading

8.1 The total of the internal evaluation marks and final University examination marks in each course will be converted to a letter grade **on** a ten-point scale as per the following scheme:

Table: Grading Scheme (UG)

Range of Marks (%)	**≥80**	**<80 ≥73**	**<73 ≥66**	**<66 ≥60**	**<60 ≥55**	**<55 ≥50**	**<50 ≥45**	**<45**
Corresponding Letter Grade	**AA**	**AB**	**BB**	**BC**	**CC**	**CD**	**DD**	**FF**
Numerical point (Grade Point) corresponding to the letter grade	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**0**

8.2 The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his/her performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are calculated as follows:

(i) SGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses in the semester

(ii) CGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses of all semesters up to which CGPA is computed.

(iii) No student will be allowed to move further in next semester if CGPA is less than 3 at the end of an academic year.

(iv) A student will not be allowed to move to third year if he/she has not cleared all the courses of first year.

(v) A student will not be allowed to move to fourth year if he/she has not cleared all the courses of second year.

9. Award of Degree

9.1 Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

9.1.1 He/She should have earned minimum required credits as prescribed in course structure; and

9.1.2 He/She should have cleared all internal and external evaluation components in every course; and

9.1.3 He/She should have secured a **minimum CGPA of 4.5** at the end of the programme;

9.1.4 In addition to above, the student has to complete the required formalities as per the regulatory bodies, if any.

9.2 The student who fails to satisfy minimum requirement of CGPA will be allowed to improve the grades so as to secure a minimum CGPA for award of degree. Only latest grade will be considered.

10 Award of Class:

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction:	CGPA ≥ 7.5
First class:	CGPA ≥ 6.0
Second Class:	CGPA ≥ 5.0

11 Transcript:

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA,CGPA, class obtained, etc

Annexure – I

TEACHING & EXAMINATION SCHEME FOR YEAR 4 - B TECH PROGRAMME IN CIVIL ENGINEERING (2016-17)											
Sem	Course Code	Course Title	Teaching Scheme				Examination Scheme				Total
			Contact Hours			Credit	Theory		Practical		
			Theory	Practical	Total		Internal	External	Internal	External	
Sem-7	CL412	Professional Practices	4	4	8	6	30	70	50	50	200
	CL406.01	Design of Structures - II	4	4	8	6	30	70	50	50	200
	CL408.01	Irrigation & Hydraulic Structures	4	2	6	5	30	70	25	25	150
	CL409.01	Construction Management	3	2	5	4	30	70	25	25	150
	CL 4XX	Department Elective (Any One)	3	2	5	4	30	70	25	25	150
	CL413	Industrial Training (During Summer of 6th Semester)			6	3			50	50	100
		Assignment Practice/Coaching for Interview			6						
					36	28					950
Sem-8	CL411	Structural Dynamics & Earthquake Engineering	4	2	6	5	30	70	25	25	150
	CL414	Construction Technology	3	2	5	4	30	70	25	25	150
	CL410.01	Project	16	16	16	16			250	250	500
		Assignment Practice/Coaching for Interview									
					36	25					800

List of Department Elective (Select Any One)

Sr No	Subject Code	Name of Subject
1	CL421.01	ADVANCED STRUCTURAL ANALYSIS
2	CL422	ADVANCED GEOTECHNICAL ENGINEERING
3	CL423	WATER AND WASTE WATER ENGINEERING
4	CL424	ADVANCED TRAFFIC & TRANSPORTATION PLANNING
5	CL425	SOIL EROSION & CONSERVATION
6	CL432.01	FIELD APPLICATIONS OF GEOTECHNICAL ENGINEERING
7	CL433	ENVIRONMENTAL POLLUTION & CONTROL
8	CL434	URBAN TRANSPORTATION SYSTEM
9	CL435	IRRIGATION WATER MANAGEMENT
10	CL436	REPAIR & REHABILITATION OF STRUCTURES

CONTENTS

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 7)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CL406.01: DESIGN OF STRUCTURES – II
B TECH 8TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	4	8	6
Marks	100	100	200	

A. Objectives of the Course:

The objectives of the course are:

- To make students familiar with the fundamental design concepts of steel and reinforced cement concrete structures.
- To make students aware with the behavior and design of R.C.C. and steel structural elements, this will be useful for the design of various structures.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Design of Retaining Wall	08
2	Analysis & Design of Multi-storied buildings	20
3	Design of Plate Girder	08
4	Roof Trusses	08
5	Design of Gantry Girder	08
7	Column Bases and Caps	08

Total Hours (Theory): 70

Total Hours (Lab): 70

Total Hours: 120

C. Detailed Syllabus:

1	**Design of Retaining Wall**	**08 Hours**	**13%**
1.1	Types, active & passive earth pressure, earth-pressure at rest		
1.2	Design of cantilever & counter fort retaining wall		
2	**Analysis & Design of Multi-storied buildings**	**20 Hours**	**34%**
2.1	Determination of dead load & live load on various components of the buildings		
2.2	Design of continuous beams		
2.3	Design of slender columns		
2.4	Design of stair ways		
2.5	Design of combined footings		
2.7	Detailing of reinforcement and bar bending schedule		
3	**Design of Plate Girder**	**08 Hours**	**14%**
3.1	General considerations, preliminary design procedure		
3.2	Web panel subjected to shear, behaviour of transverse web stiffeners		
3.3	Design of plate girders		
4	**Roof Trusses**	**08 Hours**	**13%**
4.1	Selection of the type of truss, spacing of truss		
4.2	Panel layout of truss		
4.3	Loads on the roof truss, load combinations		
4.4	Analysis of roof truss, deflection of trusses		
4.5	Selection of sections, connections		
4.7	End bearings, bracing of trusses		
4.7	Design procedure		
5	**Design of Gantry Girder**	**08 Hours**	**13%**
5.1	Loading considerations		
5.2	Loads on gantry girder		
5.3	Maximum load effects		
5.4	Selection of gantry girder		
5.4	Design of gantry girder		
7	**Column Bases and Caps**	**08 Hours**	**13%**
7.1	Types of column bases		

7.2 Slab Base, gusset base

7.3 Design of moment: Resisting base plates, foundation Bolts

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- Students will able to understand service criteria and factored strength criteria for acceptance of basic reinforced concrete and steel members.

F. Recommended Study Material:

Text Books:

1. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice – Hall of India.
2. Shah, H. J., Reinforced Concrete Vol-I & II, Charotar Publishing House.
3. S UnnikrishnaPillai&DevdasMenon, Reinforced Concrete Design, Second Edition, Tata McGraw Hill
4. Punamia, B. C., & Jain, A.K., R.C.C. Designs (Reinforced Concrete Sturctures), Laxmi Publications (P) Ltd.
5. Duggal, S.K., Limit State Design of Steel Structures, McGraw Hill Education (P) Ltd, New Delhi
6. Subramanian, N., Steel Structures: Design and Practice, Oxford University Press.

Reference Books:

1. Variyani and Radhaji, Manual of Limit State Design, CBS Publishers, New Delhi.
2. Pillai, S., &Menon, D., Reinforced Concrete Design, TATA McGraw-Hill.
3. Ramchandra&Gehlot V., Limit State Design of Concrete Strucuters, Scientific Publishers, India.
4. Shah, V.L., &Karve, S.R., Limit State Theory and Design of Reinforced Concrete, Structures Publications.

Web Materials:

1. http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Design%20of%20Con%20Struc/pdf/m1l1.pdf
2. http://en.wikipedia.org/wiki/Reinforced_concrete
3. http://en.wikipedia.org/wiki/I-beam
4. http://nptel.iitm.ac.in/courses/IIT MADRAS/Design_Steel_Structures_I/7_beamcolumns/2_concepts_of_limit_state_design.pdf

Other Materials:

1. IS: 457-2000, Plain and Reinforced Concrete
2. IS: 875 (Part 1 to 5), Code of Practice for Design Loads
3. IS: 800-2007, General Construction in Steel- Code of Practice
1. SP 17, Design Aids For Reinforced Concrete to IS: 457-1978
4. Steel Table

CL412: PROFESSIONAL PRACTICES
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	4	8	6
Marks	100	100	200	

A. Objectives of the Course:

The objectives of this course are

- Determination of quantities of items and labour requirement of civil engineering works.
- Preparation of estimate of the civil engineering works. Preparation of specification of construction items.
- To introduce the basic learning requirements for the civil engineer project manager and to make the appreciation for the qualitative nature of the construction project management.
- To introduce the students in depth knowledge of professional practice as well the quantity analysis of big construction works, like, multi-storied structures, culverts, etc.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Estimation	05
2.	Rules & Method of Measurement	04
3.	Detailed Quantity Estimation	30
4.	Specification	04
5.	Rate Analysis	07
6.	Public Work Procedures	03
7.	Valuation	07

Total Hours (Theory): 60

Total Hours (Lab): 60

Total Hours: 120

C. Detailed Syllabus:

1	**Estimation**	**05 Hours**	**8%**
1.1	General		
1.2	Purpose of estimates		
1.3	Types of estimates		
1.4	Approximate estimate, general principle of approximate estimate, Construction cost index, Approximate method of costing for buildings, water supply and sanitary works.		
1.5	Detail estimate, data required for detail estimate, preparation of detail estimate, Standard measurement form, Abstract of measurement. Factors to be consider during preparation of a detailed estimate.		
1.6	Procedure of estimate		
1.7	Quantity estimate, Revised estimate, Supplementary estimate, complete estimate and Annual maintenance or repair estimate Data required for sanction of project, Administrative approval, expenditure sanction, Technical Sanction		
2	**Rules and Methods of Measurement**	**04 Hours**	**6%**
2.1	General rules which are applicable during the calculation of quantity for different associated items		
2.2	Principles in selecting units of measurement for items, various units and standard modes of measurement for different item of work and materials as per IS:1200 revised		
2.3	Deduction criteria for various item of works		
3	**Detailed Quantity Estimation**	**30 Hours**	**50%**
3.1	**Building Estimate:** General items of work for building estimate and their units of measurements, Long wall short wall and centre line methods. • Estimation of quantity of load bearing structure. • Quantity analysis of R.C.C. framed multi-storied Building. Estimation of structural component: footing, column, lintel, chajja, beam, slab, stair, • All with schedule of bar bending, material estimate.		

- Quantity analysis of steel roof truss of any one type.
- Quantity analysis of steel framed structure
- Abstract preparation

3.2 Estimate of retaining wall and water tank,

3.3 Sanitary and water supply works of a building. Estimation of quantity of a septic tank and soak pit including sanitary and water supply installations

3.4 **Road work**: Estimation of earthwork for roads. Estimates of Metalled road, Estimate of village road culvert

3.5 **Irrigation work:** Estimation of earthwork for canal. Quantity of lining work for canal. Estimate of aqueduct.

4	**Specifications**	**04 Hours**	**6%**
4.1	Definition		
4.2	Objective, importance, use, types of specification		
4.3	General and special specification		
4.4	Specification for material and workmanship		
4.5	Design and principles of specification		
4.6	Sources of information		
4.7	Typical specification of various item of works		
5	**Rate Analysis**	**07 Hours**	**13%**
5.1	Rate analysis and requirement of the rate analysis		
5.2	Factors affecting rate analysis		
5.3	Method of preparation of rate analysis of work		
5.4	Quantity of materials per unit rate of work		
5.5	Estimating Labour		
5.6	Cost of equipment or tools and plant		
5.7	Overhead expenses		
5.8	Contractor profit		
5.9	Task of work		
5.10	Load for trucks		
5.11	Rate analysis of all typical items of works for building construction.		
6	**Public Work Procedures**	**03 Hours**	5%

6.1 Organization of Engineering department

6.2 Establishment of Public works Departments in Gujarat

- R&B, Irrigation, PHED & other Public Sector Organisations

6.3 Classifications of works

6.4 Methods of carrying out works

6.5 Measurement book

6.6 Account procedure of Stores - Unstamped receipts, Material at site Account, Various stock accounting forms

6.7 Mode of Payments - Bill, Voucher, First and Final Bill, Running bills, Advance payment, Secure advance payment, Bill forms, Hand receipt, Refund of security deposit, form 28

6.8 Cash Accounting - heads of accounts, Cash ; Debit and Credit, Completion report, Transfer entry etc.

7 Valuation **07 Hours 12%**

7.1 Valuation, value, price and cost, purpose and principles of valuation

7.2 Different form of value

7.3 Mortgage and lease

7.4 Freehold and leasehold property

7.5 Sinking fund, depreciation, types of depreciation

7.6 Years of purchase

7.7 Outgoings

7.8 Methods of valuation

7.9 Rent fixation

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks Weightage respectively.

- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar/Group project will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will get a diverse knowledge of estimating, costing and professional practice, which will be use full in tackling real life problems.
- The students will be able to understand the procedure to carry out the estimation and steps to prepare reports of the construction works.
- The students will learn the purpose and importance of valuation

F. Recommended Study Material:

Text Books:

1. Dutta, B.N., Estimating & Costing in Civil Engineering Theory and Practice, UBS Publishers & Distributors Limited, New Delhi, 1997.
2. Chakraborti, M., Estimating, Costing, Specification and Valuation on Civil Engineering, M. Chakraborty Publication, 2007.
3. RoshanNamavati, Theory & Practice Of Valuation, (Land & Buildings) for Architects, Engineers, Surveyors, Advocates, & Income Tax Practitioners, Universal Book Corp

Reference Books:

1. Patil, B.S., Civil Engineering Contracts, Vol. – I, Orient Longman Publication, 1998.
2. Rangwala, S.C., Elements of Estimating and Costing, Professional practice, Charotar Publishing House, Anand.
3. Aggarwal, A., Upadhyay, A.K., Civil Estimating, Costing &Valuation, S.K Kataria& Sons, New Delhi.

4. Chandola, S.P. and Vazirani, Estimating and Costing, Khanna Publication.

Web Materials:

http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Guwahati/cpm/index.html

CL408.01: IRRIGATION & HYDRAULIC STRUCTURES
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	5
Marks	100	50	150	

A. Objectives of the Course:

The main objective of the course is

- To take up the basic concepts of irrigation and construction of various hydraulic structures.
- To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management.
- To develop analytical skills relevant to the areas mentioned above, particularly the design of irrigation and drainage projects.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Irrigation & Irrigation Methods	03
2	Water Requirements of Crops	12
3	Dams	14
4	Reservoir	09
5	Diversion Head Works	06
6	Spillways & Energy Dissipators	04
7	Canal Irrigation System	08
8	Cross Drainage Works & Outlets	02
9	Canal Regulation Works	02

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Irrigation & Irrigation Methods**	**03 Hours**	**05%**
1.1	Irrigation: Definition, merits, demerits, irrigation in India, water quality of irrigation water		
1.2	Irrigation methods: Detailed classification		
1.3	Surface methods: Over view of border, basin & furrow methods		
1.4	Pressurized methods: Over view of drip & sprinkler systems		
2	**Water Requirements of Crops**	**12 Hours**	**20%**
2.1	Crop seasons and crops in India		
2.2	Terms used in crop water requirement		
2.3	**Soil-water-plant relationship:** Classification of soil water, soil moisture constants, extraction pattern of moisture in root zone		
2.4	Duty of water and delta, factors affecting on duty and delta, relation between duty-delta & examples based on it		
2.5	Irrigation efficiencies and calculation of efficiencies		
2.6	Empirical equations & examples for determining evapotranspiration - Blanny-Criddle, Modified Penmen methods		
3	**Dams**	**14 Hours**	**23%**
3.1	Definition, classification, factors affecting selection of type of dam		
3.2	Selection & investigation of site for a dam		
3.3	**Earth dams:** Types, foundation requirements, causes of failure, design criteria, suitable preliminary sections, seepage line determination & analysis, stability analysis - side slope, foundation, checking of stability, seepage control measures		
3.4	**Rockfill dams:** Foundation requirements, typical sections, design consideration for a rockfill dam		
3.5	**Gravity dam:** Definition, forces acting on dams, load combination for design, modes of failure & criteria for structural stability, stability analysis, elementary & practical		

	profile, design of gravity dam, openings in dams		
4	**Reservoir**	**09 Hours**	**15%**
4.1	Definition, types, site selection factors		
4.2	Capacity-elevation and area elevation curves of a reservoir site, derivation & examples based on topic		
4.3	Storage zones		
4.4	**Reservoir capacity:** Catchment yield and reservoir yield, determination of dependable catchment yield of reservoir, fixing the reservoir capacity for the computed value of the dependable yield of the reservoir catchment, relation between the inflow, outflow and storage data for a reservoir, fixing the reservoir capacity from the annual inflow and outflow data, mass curve and demand curve		
4.5	Reservoir losses		
4.6	Reservoir sedimentation and control		
4.7	Reservoir clearance		
5	**Diversion Head Works**	**06 Hours**	**10%**
5.1	Classification of head works		
5.2	Types & components of diversion head works		
5.3	Location & typical layout of diversion headworks		
5.4	Difference between dam, weir and barrage		
5.5	Types of weirs with merits and demerits		
5.6	Criteria for designing weir and barrage		
5.7	Theories of subsurface flow: Bligh's creep theory, Lane's weighted creep theory, theory of seepage flow (critical gradient), Khosla's theory		
6	**Spillways & Energy Dissipators**	**04 Hours**	**07%**
6.1	**Spillways:** Definition, location, essential requirements, components, classification		
6.2	**Energy Dissipators:** Formation & types of hydraulic jump; Jump Height Curve (JHC), Tail Water Rating Curve (TWRC) and alternatives of JHC & TWRC, types of energy dissipators		
7	**Canal Irrigation System**	**08 Hours**	**14%**

7.1	Classification of canals, alignment		
7.2	Distribution system		
7.3	Cross section and longitudinal sections of canals		
7.4	Design of unlined canal in alluvial & non-alluvial soils		
7.5	Design of channel using Kennedy's Garrat's diagram &Lacey's regime diagram		
7.6	Canal lining & design		
8	**Cross Drainage Works & Outlets**	**02 Hours**	**03%**
8.1	**Cross Drainage Works**: Definition, types, selection criteria		
8.2	**Outlets:** Definition, requirements, types		
9	**Canal Regulation Works**	**02 Hours**	**03%**
9.1	**Falls:** Definition, necessity, location, types		
9.2	**HR & CR:** Definition, functions		
9.3	**Escapes:** Definition, necessity, types		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- Minimum 2 field visits (one related Irrigation methods and another related to visit of Dam/weir/barrage) will be carried out for further understanding of subject. Report will be prepared by the students for the same.

E. **Students Learning Outcomes:**

On the completion of the course one should be able to understand:

- Concepts of irrigation and different hydraulic structures.
- How to estimate the quantity of water required by crops.
- Be able to plan and design irrigation projects.
- Design channels and other irrigation structures required for irrigation, drainage, soil conservation, flood control and other water-management projects.

F. **Recommended Study Material:**

Text Books:

1. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.
2. Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.
3. Sharma, R.K., Text book of Irrigation Engineering and Hydraulic Structures, Oxford and IBK Publishing House, New Delhi.

Reference Books:

1. Punmia and Pando, Lal, B.B., Irrigation and Water Engineering, Standard Publishers Distributors, New Delhi.
2. Michael, A.M., Irrigation - Theory and Practice, Vikas Publishing House, New Delhi.
3. Varshney, R.S., Gupta and Gupta, Theory and Design of Irrigation Structures, Nem Chand and Bros., Roorkee.
4. Singh Bharat, Fundamentals of Irrigation Engineering, Nem Chand and Brothers, Roorkee.
5. Arora, K.R. Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors, New Delhi.
6. Kushalani, K.B., Irrigation Engineering: Practice and Design Vol. I to VII, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Linsley, R.K. and Franzini, J.E., Water Resources Engineering. McGraw Hill International.
8. Varshneya, R.S., Gupta, S.C. and Gupta, R.L., Theory and Design of Irrigation Structures, Nem Chand and Brothers, Roorkee.

Web Materials:

1. http://nptel.iitm.ac.in/video.php?courseId=1029&v=XmO2pltg7YBz
2. http://nptel.iitm.ac.in/video.php?courseId=1029&v=SO0suW7TLiCs
3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/New_index1.html
4. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l02.pdf
5. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l03.pdf
6. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l05.pdf
7. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l07.pdf
8. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m3l09.pdf

LIST OF TUTORIALS

Tutorial 1	Irrigation & Irrigation Methods
Tutorial 2	Water Requirements of Crops
Tutorial 3	Dams in General
Tutorial 4	Earthen Dam Stability Analysis
Tutorial 5	Gravity Dam Design
Tutorial 6	Reservoir & Reservoir Capacity
Tutorial 7	Diversion Head Works
Tutorial 8	Spillways & Energy Dissipators
Tutorial 9	Canal Irrigation System & Canal Design
Tutorial 10	Cross Drainage Works, Outlets & Canal Regulation Works
Tutorial 11	Field Visit / Industrial Visit Report
Sheet 1	Canal sections: Canal in cutting, filling and in embankment
Sheet 2	Analysis of Earth dam by Strip circle method
Sheet 3	C/S of Gravity Dam Designed in Tutorial

CL409.01 CONSTRUCTION MANAGEMENT
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of the course are:

- To make the students aware of the method of construction management.
- To impart knowledge about different methods of network planning.
- To make students acquainted with tendering Procedure and various constructions contract systems.
- To make the students aware about laws for labors.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Construction sector in India	4
2	Project Feasibility Report	4
3	Construction Planning, Organizing, Controlling and Monitoring	5
4	Project management through networks	7
5	Program Evaluation and Review Technique (PERT)	7
6	Critical Path Method	9
7	Contracts and Tender	6
8	Construction Labors and Legislation	3

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1	**Construction sector in India**	**04 Hours**	**09%**
1.1	Volume of Construction work in India		
1.2	Necessity, objectives of construction management		
1.3	Stages in construction project management, Factors affecting various stages of construction management.		
1.4	Construction project Team and their Role		
1.5	Construction Resources		
1.7	Function of Construction Management		
1.7	Impact of Construction project on Indian economy and foreign exchange		
1.8	Causes of failures construction projects and its relevance with construction management		
1.9	Indian institutes offering P.G course in Construction project management		
2	**Project Feasibility Report**	**04 Hours**	**09%**
2.1	Need of Project Feasibility Report		
2.2	Technical Analysis		
2.3	Financial Analysis		
2.4	Economic Analysis		
2.5	Ecological Analysis		
2.7	Schematic diagram for feasibility study		
3	**Construction Planning, Organizing, Controlling and Monitoring**	**05 Hours**	**12%**
3.1	Planning: Stages in planning, Methods of planning, Scheduling.		
3.2	Organizing: Definition, functions, types of organization structures, Suitability for a Construction Project		
3.3	Controlling: Definition, establishing control standards, measurements of variations with respect to control standards.		
3.4	Monitoring: Definition, Variations with respect to control standards and its mitigations		
4	**Project management through networks**	**07Hours**	**15%**

4.1	Definition and Objective of network techniques		
4.2	Terms and definitions : Event, Activity, Dummies, Interrelationship of Events, Interrelationship of Activity		
4.3	Work-break down structure or schedule		
4.4	Scheduling by Bar chart		
4.5	Types of Networks		
4.7	Choice of Network type		
4.7	Basic assumption made for creating a Network		
4.8	Rules for network construction		
4.9	Fulkerson's rule for Numbering Events		
4.10	Advantages of Network techniques over conventional techniques		
5	**Program Evaluation and Review Technique (PERT)**	**07 Hours**	**15%**
5.1	PERT Network : Introduction		
5.2	Time Estimates: T_L, T_E		
5.3	Uncertainties: Uses of PERT		
5.4	Deterministic Approach		
5.7	Probabilistic Approach		
5.7	Probability Distribution		
6	**Critical Path Method**	**09 Hours**	**20%**
6.1	Introduction		
6.2	Difference between PERT and CPM		
6.3	Process of CPM		
6.4	CPM network: Drawing, Numbering events, Activity time estimate, Time estimate - T_L, T_E, Start and finish time , floats		
6.5	Critical activities and Critical path		
6.7	Time Cost relationship, Construction Cost control, Cost Optimization, Crashing, updating, resource allocation, resource leveling, resource smoothening, Line-of-Balance technique.		
7	**Contracts and Tender**	**06 Hours**	**14%**
7.1	Contract- definition		
7.2	Essentials of contract		
7.3	Types of contract & Suitability for construction projects		

7.4 Conditions of Contract – PWD and FIDIC contract conditions, Provisions for extra claims, delay, arbitration, extension of time, payments, defect liability etc.

7.5 Tender - definition

7.7 Tender Notice and Tender submission

7.7 Tender – Contract document

7.8 Opening of tender, Scrutiny of tender, Acceptance of tender

7.9 Rejection of Tender

7.10 Contract Agreement

8 Construction Labors and Legislation **03 Hours 06%**

8.1 Need for Legislation

8.2 Payment of Wages Act, Minimum Wage Act

8.3 Welfare, Training system, Incentive plans, Compensation to improve efficiency

8.4 Health & safety on construction site

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 05 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Tutorials related to course content will be carried out in the laboratory.
- Field visits of construction industry and related construction equipments will be arranged during the semester.

- Students will be made aware about software available for construction management, i.e., MS Project or Primavera.

E. Students Learning Outcomes:

On the successful completion of this course:

- The students will collect the knowledge about the various construction planning & Scheduling procedures for a project.
- The students will gain knowledge about the type of contract systems to be selected for construction projects.

F. Recommended Study Material:

Text Books:

1. Sharma, M.R., Fundamnetals of Construction Planning and Management, S.K. Kataria& Son, New delhi, 2012.
2. Seetharaman, S., Construction Engineering & Management, Umesh Publications, 2007.
3. Srinath, L.S., PERT & CPM Principles and Applications, Tata McGraw Hill, New Delhi.
4. Peurifoy, L., Schexnayder, C.J. and Shapira, A., Construction Planning, Equipment and Methods, McGraw Hill, New Delhi, 8th Edition, 2010.
5. Punamia, B.C. and Khandelwal, K.K., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi, 2004.

Reference Books:

1. Sharma, M.R., Fundamnetals of Construction Planning and Management, S.K. Kataria& Son, New delhi, 2012.
2. Seetharaman, S., Construction Engineering & Management, Umesh Publications, 2007.
3. Srinath, L.S., PERT & CPM Principles and Applications, Tata McGraw Hill, New Delhi.
4. Gahlot, P.S. and Dhir, B.M., Construction Planning & Management, New Age International (P) Ltd., New Delhi.

5. Sharma, S.C., Construction Equipment &Managemetn, Khanna Publications, New Delhi, 1988.
6. Sengupta and Guha, Construction Management and Planning, Tata McGraw Hill, New Delhi.
7. Chitkara, K. K., Construction Project Management Planning, Scheduling and Controlling, Tata McGraw Hill, New Delhi.
8. Chitkara, K. K., Construction Project Management Techniques and Practices, Tata McGraw Hill, New Delhi, 2004.

Web Materials:

1. http://nptel.iitm.ac.in/courses/IIT-MADRAS/Infrastructure_Planning_Management/index.php
2. http://www.deere.com/en_US/cfd/construction/deere_const/media/pdf/attachments.pdf
3. http://www.fta.dot.gov/documents/Construct_Proj_Mangmnt_CD.pdf
4. http://www.netmba.com/operations/project/pert/
5. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/cpm/index.html
6. http://www.youtube.com/watch?v=wJ8HZ7hqUs8
7. http://www.youtube.com/watch?v=IOn-erkINAo
8. http://www.youtube.com/watch?v=2Ow8JUgRC1Q
9. http://www.youtube.com/watch?v=UEXrsZ3vkx0
10. http://www.youtube.com/watch?v=7cCaY3zBhcs
11. http://www.youtube.com/watch?v=HPC41WTMjRM

http://www.youtube.com/watch?v=RYnUDLey-g4

CL421.01: ADVANCED STRUCTURAL ANALYSIS (Elective)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To impart analysis and design skills of structures at advance level.
- To impart the adequate knowledge enabling the students can analyze and design of concrete structures.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	02
2	Direct Stiffness Method	15
3	Finite Element Method	18
4	Domes	10

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Introduction**	**02 Hours**	**04%**
1.1	Basic concepts of Analysis		
2	**Direct Stiffness Method**	**15 Hours**	**34%**
2.1	Overview of different stiffness & rotation-transformation matrices		
2.2	Analysis of grid, space truss and space frames under loading & various secondary effects like deformation of support, Prestrain& temperature effect		
2.3	Symmetry / Anti-symmetry		
2.4	Oblique supports and elastic supports		
3	**Finite Element Method**	**18 Hours**	**40%**
3.1	Introduction to FEM		
3.2	Types of problems, stresses & equilibrium, strain-displacement relations, stress-strain relations		
3.3	Application of FEM to one dimensional (for bar & beam) & two dimensional problems using constant strain triangles		
3.4	Two dimensional iso-parametric elements: Four node quadrilateral elements, numerical integration, higher order elements		
3.5	Application of FEM to two dimensional truss element		
4	**Domes**	**10 Hours**	**22%**
4.1	Introduction		
4.2	Nature of Stresses in Spherical Domes& Conical Domes		
4.3	Loads acting on Domes		
4.4	Spherical Domes subjected to UDL		
4.5	Spherical Domes subjected to Concentrated Load at Crown		
4.7	Conical Domes subjected to Concentrated Load at Crown		
4.7	Design of RC Domes		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- Students will be able to analyze R.C.C. bridge super structure subjected to applied loads which are as per given in I.R.C. codes and also able to analyze the bridge structure using different methods
- Students will be capable enough to analyze and design of R.C.C. culverts and concrete water tanks.

F. Recommended Study Material:

Text Books:

1. Krishna Raju, N., Design of Bridges, Oxford & IBH publishing Co. Ltd., New Delhi.
2. Deshmukh S. K. &Meghre A.S., Metrix Methods of Structural Analysis, Charutar Publishing House
3. Rethaliya R.P., Structural Analysis III, AtulPrakashan

Reference Books:

1. Raina, V.K., Concrete Bridges Practice – Analysis, Design and Economics, Shroff Publications, 2nd edition, New Delhi, 2005.
2. Jaikrishna and Jain O.P., Plain and Reinforced Concrete, Vol.-II, Nem Chand & Bros., Roorkee.

3. Vazirani&Ratwani, Concrete Structures, Khanna Publishers, New Delhi, 1990.
4. Sayal&Goel, Reinforced Concrete Structures, S. ChandPublication, New Delhi, 2004.
5. Dayaratnam, P., Design of Reinforced Concrete Structures, Oxford & IBH publication, New Delhi, 2000.
6. Vazirani, Ratwani and Aswani, Design of Concrete Bridges, Khanna Publishers, 2nd edition, 2008.

Web Materials:

1. http://www.a-jacks.com/OpenChannel/GeneralInfo/Culverts/Culvert%20Design.pdf
2. http://happytreeflash.com/culverts-ppt.html
3. http://www.springfieldmo.gov/stormwater/pdfs/Criteria/Chapter7.pdf
4. www.inti.gov.ar/cirsoc/pdf/puentes_hormigon/31-bridgedesign.ppt

CL422: ADVANCED GEOTECHNICAL ENGINEERING(Elective)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To gain in-depth understanding of soil mechanics to apply in day-to-day geotechnical engineering, the eventual aim of this subject is to incorporate psychological perception of learning and reasoning of engineering aspects of foundation engineering in general.
- To know the application of scientific and technological principles of analysis, design and Geotechnical engineering.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	01
2	Effective Stress Principle	10
3	Introduction to Rock Mechanics	08
4	Foundation on Expansive Soils	08
5	Foundation on Collapsible Soils	08
7	Machine Foundations	10

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Introduction**	**01 Hours**	**02%**
1.1	Course overview		
1.2	Overview of soil mechanics and rock mechanics		
1.3	Overview of foundation engineering		
2	**Effective Stress Principle**	**10 Hours**	**22%**
2.1	Effective stress principle, nature of effective stress		
2.2	Effect of water table fluctuations on effective stress		
2.3	Seepage pressure		
2.4	Quick sand condition		
2.5	Failures of hydraulic structures and preventions		
3	**Introduction to Rock Mechanics**	**08 Hours**	**18%**
3.1	Introduction		
3.2	Geological classification of rocks		
3.3	Index properties of rocks		
3.4	Classification of rocks for engineering properties		
3.5	Modes of failure of rocks		
4	**Foundation on Expansive Soils**	**08 Hours**	**18%**
4.1	Identification of expansive soils		
4.2	Parameters of expansive soils		
4.3	Causes of moisture changes		
4.4	Preventive measures for expansive soils		
5	**Foundation on Collapsible Soils**	**08 Hours**	**18%**
5.1	Types of collapsible soils		
5.2	Parameters of collapsible soils		
5.4	Design of foundation on un-wetted collapsible soils and soils subjected to wetting.		
7	**Machine Foundations**	**10 Hours**	**22%**
7.1	Introduction, basic definitions		
7.2	Types of machine foundation		
7.3	General criteria for design of machine foundation		
7.4	Vibration analysis of a machine foundation		
7.5	Examples based on topic		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will get a diverse knowledge of geotechnical engineering practices applied to real life problems.
- Students will learn the various aspects of geotechnical engineering and be able to conduct independent work.
- The students will learn to understand the theories and practical aspects of geotechnical engineering along with the design and field applications.

F. Recommended Study Material:

Text Books:

1. Arora, K.R., Soil Mechanics & Foundation Engineering, Standard Publication, New Delhi.
2. Punamia, B.C., Soil Mechanics & Foundation Engineering, Laxmi Publication Pvt. Ltd. New Delhi.

3. Murthy, V.N.S., Soil Mechanics & Foundation Engineering, SaiKripa Technical Consultants, Bangalore

Reference Books:

1. Singh Alam, Soil Engineering, Vol. I and II, Asia Publication House.
2. Das B.M., Principles of Foundation Engineering.
3. Fang and Einterkorn, Foundation Engineering Handbook.
4. Peck, Thomson and Thornburn, Foundation Engineering,
5. ShamsherPrakash and GopalRanjan, Analysis and Design of Retaining Structures, Sarita Publications.
6. Nayak, N.B., Foundation Engineering Manual.
7. Sribivasula and Vaidyanathan, Handbook of Machine Foundation, Tata McGraw Hill Book Co., New Delhi.

Web Materials:

1. http://nptel.iitm.ac.in/video.php?subjectId=105107120
2. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Foundation_Engineering/Course%20Objective.html
3. http://web.mst.edu/~rogersda/expansive_soils/DAMAGE%20TO%20FOUNDATIONS%20FROM%20EXPANSIVE%20SOILS.pdf

CL423: WATER AND WASTEWATER ENGINEERING(Elective)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To provide an overview of both the theoretical and practical aspects of conventional and advanced technology for surface water and wastewater treatment.
- To gain the knowledge related to biochemical & physiochemical processes relevant to contemporary water and wastewater treatment.
- To understand conceptual design of systems for treating municipal wastewater and drinking water as well as reactor theory, process kinetics and models.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Review of Environmental Engineering	03
2	Reactors	07
3	Physico-Chemical Treatment Processes	12
4	Biological Treatment Processes for Wastewater	12
5	Sludge Processing	07
7	Advanced Water and Wastewater Treatment	07

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Review of Environmental Engineering**	**03 Hours**	**07%**
1.1	Introduction		
1.2	Water treatment processes and systems		
1.3	Wastewater treatment processes and systems		
2	**Reactors**	**07 Hours**	**13%**
2.1	Mass transport processes, mass balance analysis		
2.2	Types of reactions, reaction kinetics		
2.3	Principle of mass transfer, gas-liquid mass transfer, two film theory		
2.4	Introduction to process selection for domestic and industrial wastewater		
3	**Physico-Chemical Treatment Processes**	**12 Hours**	**27%**
3.1	Coagulation processes, stability of colloids and destabilization, coagulants, flocculation theory, design of slow and rapid mixers		
3.2	Sedimentation, particle settling theory, types of clarifier, high rate clarification, design of clarifiers.		
3.3	principal mechanisms of filtration, filter hydraulics, rate control patterns and methods, design and operation of slow sand, rapid sand and dual media filters		
3.4	Adsorption processes, causes and types of adsorption, influencing factors, adsorption equilibria and development of adsorption isotherms, activated carbon adsorption kinetics, analysis and design of GAC and PAC contactors		
3.5	Ion exchange, exchange materials, exchange capacity, ion exchange chemistry and reactions, applications for hardness and TDS removal		
3.7	Disinfection, modes of disinfection, mechanisms, factors influencing, ideal disinfectant, chemistry of chlorination, ozone chemistry, estimation of ozone dosage, UV disinfection, Estimation of UV dose		
4	**Biological Treatment Processes for Wastewater**	**12 Hours**	**27%**
4.1	Objectives and fundamentals of biological treatment		
4.2	Operational problems in biological treatment units		
4.3	Kinetics of biological treatment systems: Batch and continuous systems		

4.4 Theoretical principles and design: Suspended growth system

4.5 Theoretical principles and design: Attached growth system, principles and design of stabilization ponds

4.7 Fundamentals of anaerobic treatment, types of anaerobic reactors

5 Sludge Processing 07 Hours 13%

5.1 Sludge separation

5.2 Sludge thickening and volume reduction

5.3 Conditioning and digestion – aerobic and anaerobic

7 Advanced Water and Wastewater Treatment 07 Hours 13%

7.1 Principles of microfiltration, ultrafiltration and reverse osmosis

7.2 Nitrification and denitrification Processes

7.3 Phosphorous removal

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will be able to understand the basic principles of coagulation, flocculation and disinfection processes, and select appropriate processes

depending on the nature of impurities to be removed and the intended use of the treated water;

- The student will comprehend the principles and the capabilities/constraints of using specific process.
- The students will be able to select an appropriate process for a specific application, and be able to identify appropriate pre-treatment and post treatment schemes, and cleaning protocols.
- The student will list and discuss the components of water and wastewater and their influence on choice of treatment processes.
- The student will be described and contrasted the underlying mechanisms of the different biochemical and physiochemical reactions used in water and wastewater treatment.

F. Recommended Study Material:

Text Books:

1. Peavy, Rowe and Tchobanologous, Environmental Engineering,
2. Metcalf Eddy, Wastewater Engineering Treatment and Reuse,
3. Ronand, L. and Droste, Theory and Practice of Water and Wastewater Treatment, John Wiley and Sons Inc. 1997.

Reference Books:

1. Benefield, R.D. and Randal, C.W., Biological Process Design for Wastewater Treatment, Prentice Hall, EnglewoodChiffs, New Jersey, 1980.
2. Karia, G.L. and Christian, R.A., Wastewater Treatment Concepts and Design Approach, Prentice Hall of India Pvt.Ltd., New Delhi, 2001.
3. Lee, C.C. and Lin, S.D., Handbook of Environmental Engineering Calculations, McGraw Hill, New York, 1999.
4. Edward D. Schroeder, Water and Wastewater Treatment, McGraw Hill Inc.
5. Webber, W.J., Physico-Chemical Process of Water Quality Control, Wiley Inter-Science.
6. Tebbut, T.H.Y., Principal of Water Quality Control, Pergamon press.

Web Materials:

1. http://www.indiaenvironmentportal.org.in

2. http://engineering.dartmouth.edu/~cushman/courses/engs37/biotreatmenttypes.pdf
3. http://www.filtersource.com
4. www.tnav.be/pages/documents/slibtechnologie/Sanotec_slib_www_E.ppt
5. https://dgserver.dgsnd.gov.in

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Determination of Sulphate& Phosphorous
2	Determination of Ammonia, Nitrite, Nitrate
3	Settling Column Analysis
4	Development of Adsorption Isotherm
5	Determination of SVI
7	Determination of F/M Ratio
7	Preparation of Report Based on Field Visit

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of the course are

- To enable students understand and assess traffic characteristics and related studies required for planning and designing of efficient transportation infrastructure.
- To develop a strong knowledge base of transportation planning and its transit requirement in any urban area through various modern approaches.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Traffic Planning	02
2	Traffic Engineering & Studies	05
3	Traffic Flow Study & Analysis	08
4	Traffic Design	07
5	Traffic Control Devices, Regulation & Management	05
7	Urbanization Process	02
7	Transportation Planning Process	07
8	Travel Demand Estimation	07
9	Urban Mass Transit Study	04

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Traffic Planning**	**02 Hours**	**04%**
1.1	Introduction		
1.2	Scope, functions and administration		
1.3	Traffic issues in Indian cities		
2	**Traffic Engineering & Studies**	**05 Hours**	**11%**
2.1	Traffic elements		
2.2	Vehicular characteristics		
2.3	Road user characteristics		
2.4	Traffic volume study		
2.5	Origin destination study		
2.7	Speed & delay study		
2.7	Parking & accident study		
2.8	Data sampling, collection & presentation		
3	**Traffic Flow Study & Analysis**	**08 Hours**	**18%**
3.1	Stream characteristics		
3.2	Q-K-V Relationship		
3.3	Level of service		
3.4	Capacity analysis		
3.5	Queuing phenomenon		
3.7	Arrival, discharge & headway studies		
4	**Traffic Design**	**07 Hours**	**14%**
4.1	Channelization of islands		
4.2	Design of rotary		
4.3	Warrants for At-Grade & Grade separated intersection		
4.4	Facilities for pedestrian & bicycle-ways		
5	**Traffic Control Devices, Regulation & Management**	**05 Hours**	**11%**
5.1	Traffic signs, markings		
5.2	Methods of traffic control		
5.3	Warrants for signalized intersection		
5.4	Approaches for signal design		
5.5	Design of isolated traffic signals		

5.7	Traffic management measures, techniques & enforcement regulations		
7	**Urbanization Process**	**02 Hours**	**04%**
7.1	Urban area definition		
7.2	Urban land use structure		
7.3	Transportation problems in Indian context		
7.4	Zoning and planning surveys		
7	**Transportation Planning Process**	**07 Hours**	**13%**
7.1	Urban transport planning process		
7.2	Trip generation analysis		
7.3	Trip distribution analysis		
8	**Travel Demand Estimation**	**07 Hours**	**17 %**
8.1	Assumptions in demand estimation		
8.2	Travel demand curve		
8.3	Aggregate & disaggregate modeling		
8.4	Land-Use transportation models		
8.5	Hansen's accessibility model		
9	**Urban Mass Transit Study**	**04 Hours**	**09%**
9.1	History of mass transit system		
9.2	Modes of public transport & comparison		
9.3	Public transport travel characteristics		
9.4	Technology & basic operating elements		
9.5	Principles of good layout of bus terminals		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The studentswould be able to develop innovative ideas about various methodologies of Traffic & Transportation Planning that can enhance the transport infrastructure required in an urban area.
- The students would also gain insight of design and implementation of Transport related projects.

F. Recommended Study Material:

Text Books:

1. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
2. S.C. Saxena, Traffic Planning and Design, DhanpatRai Pub., New Delhi.

Reference Books:

1. Hutchison, B.G., Introduction to Transportation Engineering, & Planning, McGraw Hill Book Co.
2. John W. Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Pub. Co.
3. Vukan R. Vuchic, Urban Public Transportation System & Technology, Prentice Hall, Inc.
4. Papacostas, C.S., Fundamentals of Transportation System Analysis, PHI.
5. JotinKhisty, C. and Kent Lall, B., Transportation Engineering – An Introduction, Prentice-Hall, NJ.

Web Materials:

1. http://nptel.iitm.ac.in/
2. http://freedownloadengineeringebooks.blogspot.com/2011/07/evolving-transportation-networks-free.html
3. http://ebooksfreedownload.org/search/transportation-books-free-download
4. http://ebooksfreedownload.org/2011/05/transportation-systems-in-buildings.html
5. http://civilebook.com/fundamentals-of-transportation-engineering/
6. http://www.fhwa.dot.gov/

CL425: SOIL EROSION AND CONSERVATION(Elective)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To retard watershed degradation caused by deforestation, soil erosion, sedimentation, land degradation and hydrologic deterioration of the watersheds.
- To learn various techniques to assess the impact of short-term changes in land use practices and the effectiveness of specific soil conservation measures.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Conservation and the Environment	07
2	Water Erosion	10
3	Water Erosion Control Practices	08
4	Wind Erosion	07
5	Wind Erosion Control Practices	07
7	Soil Conservation in Special Problem Areas and Forests in Soil Conservation	07
7	Conservation Structures	02

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. **Detailed Syllabus:**

1	**Conservation and the Environment**	**07 Hours**	**13%**
1.1	Soil erosion: Introduction and factors affecting soil erosion		
1.2	Effects of soil erosion		
1.3	Conservation ethics		
1.4	Development, conservation and quality of water resources		
1.5	Impact of conservation practices on the environment		
2	**Water Erosion**	**10 Hours**	**22%**
2.1	Mechanics of water erosion		
2.2	Factors affecting erosion by water		
2.3	Raindrops and soil erosion		
2.4	Types of erosion		
2.5	Soil losses and estimation of water erosion losses		
2.7	Measurement of water erosion		
3	**Water Erosion Control Practices**	**08 Hours**	**18%**
3.1	Principles of water erosion control		
3.2	Land classification for soil conservation		
3.3	Control Practices: Mechanical & biological methods		
4	**Wind Erosion**	**07 Hours**	**17%**
4.1	Mechanics of wind erosion		
4.2	Avalanching and dunes		
4.3	Factors affecting wind erosion		
4.4	Methods of estimating of wind erosion		
5	**Wind Erosion Control Practices**	**07 Hours**	**13%**
5.1	Principles of wind erosion control		
5.2	Control practices		
7	**Soil Conservation in Special Problem Areas &Forests in Soil Conservation**	**07 Hours**	**13%**
7.1	Soil conservation in hilly areas		
7.2	Control of gullies		
7.3	Waterlogged and wet lands		
7.4	Role of forests in soil conservation		

7.5 Forest protection

7 Conservation Structures 02 Hours 05%

7.1 Temporary and permanent structures

7.2 Functional requirement and limitations of control structures

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The studentswill be gained the knowledge about various methods that can be used for controlling the soil erosion.
- The students will be solved the issues involved in designing and implementing soil conservation techniques.

F. Recommended Study Material:

Text Books:

1. Tripathi, R.P. and Singh, H.P., Soil Erosion and Conservation, New Age International Publishers, New Delhi.

2. Schwab, G.O., Fangmeier, D.D., Elliot, W.J. and Frevert, R.K., Soil and Water Conservation Engineering, John Wiley & Sons, New York.

Reference Books:

1. Ghanshyam Das, Hydrology and Soil Conservation Engineering, Prentice Hall of India Pvt. Ltd., New Delhi.
2. Dhruvanarayana, V.V., Soil and Water Conservation Research in India, Indian Council of Agricultural Research.
3. Singh, G., Venkatramanan, C., Sastry, C. and Joshi, B.P., Manual of Soil & Water Conservation Practices, Oxford IBH Publishing Co. Pvt. Ltd., New Delhi, 1990.
4. Bennet, H.H., Elements of Soil Conservation, McGraw Hill Book Co.

Web Materials:

1. http://www.slideshare.net/suryaveer/soil-erosion-and-soil-conservation
2. http://www.google.co.in/url?sa=t&source=web&cd=1&ved=0CEUQFjAA&url=http%3A%2F%2F202.200.144.17%2Fsykc%2Fhjx%2Fcontent%2Fwlkj%2F7.ppt&rct=j&q=soil%20erosion%20and%20conservation%2Bppt&ei=09AnTvOxK4fKrAfUhOyWCQ&usg=AFQjCNHMoe8bHlfKde73ZIQdMaIqMoA4-A

LIST OF TUTORIALS

Tutorial 1	Conservation and the Environment
Tutorial 2	Water Erosion
Tutorial 3	Water Erosion Control Practices
Tutorial 4	Wind Erosion
Tutorial 5	Wind Erosion Control Practices
Tutorial 7	Soil Conservation in Special Problem Areas and Forests in Soil Conservation
Tutorial 7	Conservation Structures

CL432.01: FIELD APPLICATIONS OF GEOTECHNICAL ENGINEERING(Elective)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To give knowledge about basic introduction, application and design of different field application methods in the field of Geotechnical Engineering.

B.Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Soil Stabilization	08
2	Retaining Walls & Sheet Pile Walls	10
3	Ground Improvement Techniques	09
4	Reinforced Earth and Geosynthetics	10
5	Earth Dam	08

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus

1	**Soil Stabilization**	**08 Hours**	**18%**
1.1	Introduction		
1.2	Types of stabilization techniques, mechanical stabilization		
1.3	Lime and cement stabilization		
1.4	Other chemicals		
1.5	Use of admixtures		
2	**Retaining Walls & Sheet Pile Walls**	**10 Hours**	**22%**
2.1	Introduction		
2.2	Types of retaining walls		
2.3	Stability of retaining wall		
2.4	Check for over turning, sliding, bearing capacity failure		
2.5	Types of sheet pile wall		
2.7	Examples		
3	**Ground Improvement Techniques**	**09 Hours**	**20%**
3.1	Introduction		
3.2	Improvement of cohesive soils		
3.3	Improvement of cohesion less soils		
3.4	General methods for ground improvement		
4	**Reinforced Earth and Geosynthetics**	**10 Hours**	**22%**
4.1	Types of geosynthetics		
4.2	Application of geosynthetics		
4.3	Principles and advantages of reinforced earth		
4.4	Design of reinforced earth wall		
5	**Earth Dam**	**08 Hours**	**18%**
5.1	Factors influencing design of earth dams		
5.2	Types of earth dams		
5.3	Critical study of earth dam failures		
5.4	Differential settlement and cracks		
5.5	Construction pore pressures and control		
5.7	Seepage analysis		
5.7	Critical evaluation of methods of stability analysis		

5.8 Various methods of construction of flow nets

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will get a diverse knowledge of geotechnical engineering practices applied to real life problems.
- Students will learn the various aspects of geotechnical engineering and be able to conduct independent work.
- The students will understand the theories and practical aspects of geotechnical engineering along with the design and field applications modern techniques.

F. Recommended Study Material:

Text Books:

1. Arora, K.R., Soil Mechanics & Foundation Engineering, Standard Publication, New Delhi.
2. Punamia, B.C., Soil Mechanics & Foundation Engineering, Laxmi Publication Pvt.Ltd. New Delhi.

3. Murthy, V.N.S., Soil Mechanics & Foundation Engineering; SaiKripa Technical Consultants, Bangalore

Reference Books:

1. Singh Alam, Soil Engineering, Vol. I and II, Asia Publication House.
2. Das, B.M., Principles of Foundation Engineering.
3. Fang and Einterkorn, Foundation Engineering Handbook.
4. Peck, Thomson and Thornburn, Foundation Engineering,
5. ShamsherPrakash and GopalRanjan, Analysis and Design of Retaining Structures, Sarita Publications.
6. Nayak, N.B., Foundation Engineering Manual.
7. Sribivasula and Vaidyanathan, Handbook of Machine Foundation, Tata McGraw Hill Book Co., New Delhi.
8. Sherrared, Earth Dam Engineering

Web Materials:

1. http://edudel.nic.in
2. http://bis.org.in/other/quake.htm
3. http://en.wikipedia.org/wiki/Geosynthetic
4. http://www.geotechlinks.com/gi.php
5. www.geo-solutions.com.

CL433: ENVIRONMENTAL POLLUTION AND CONTROL(Elective)

B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To give the students an overview of the more pressing environmental concerns facing us today. These would lead to a better practice in natural resources utilization and pollution prevention.
- To provide detail knowledge of different types of pollution prevalent around the world.
- To enable the students in analyzing global pollution issues as well as that of India.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Pollution Control Aspects	02
2	Water Pollution Control	07
3	Industrial Wastewater Treatment	12
4	Solid and Hazardous Waste Management	12
5	Air Pollution Control	10
7	Environmental Policies for Pollution Prevention	03

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Pollution Control Aspects**	**02 Hours**	**04%**
1.1	Industrialization and sustainable development		
1.2	Concept of pollution prevention and cleaner production, environmental management hierarchy – source reduction techniques		
2	**Water Pollution Control**	**07 Hours**	**13%**
2.1	**Freshwater pollution:** Various pollutants responsible for water pollution; Biological pollutants, inorganic, organic, heavy metals, pesticides and radioactive pollutants		
2.2	**Consequences of water pollution:** Effect on health on biosphere and on economy		
2.3	**Sampling methods:** Purpose of sampling, different types of samples, collection methods and various instruments used for it		
2.4	**Marine water pollution:** Types, sources and consequences, disposal of sewage & wash water from MV cargo & ships		
3	**Industrial Wastewater Management**	**12 Hours**	**27%**
3.1	Effects of industrial wastes on sewerage system and receiving water bodies		
3.2	Industrial waste survey: Process flow charts, condition of waste stream, material balance, sampling–grab, composite and integrated samples		
3.3	Pretreatment of industrial wastewater: Volume reduction, strength reduction, neutralization, equalization and proportion, removal of organic and inorganic dissolved solids		
3.4	Wastewater treatment in specific industries: Distillery, sugar, pulp and paper, cement, textile, dairy, fertilizer, pesticides, pharmaceutical, etc.		
4	**Solid and Hazardous Waste Management**	**12 Hours**	**27%**
4.1	Solid-waste pollution: Types, sources and consequences, wastes transfer and transport, conversion of solid wastes energy / manure, disposal methods		
4.2	Introduction, sources, classification, regulations for hazardous waste management, hazardous waste characterization, designated		

	hazardous wastes		
4.3	Waste minimization and resource recovery: Approaches, development of a waste tracking system		
4.4	Transportation of hazardous waste: Requirements, regulations, containers, bulk and non-bulk transport, emergency response		
4.5	Physico-chemical, chemical and biological treatment of hazardous waste		
4.7	Sanitary landfill: Design approach, leachate and gaseous collection system, facility siting and process selection for treatment, storage, disposal facility (TSDF)		
4.7	Recent developments in solid wastes reuse and disposal: Power generation, blending with construction materials and Best Management Practices (BMP)		
4.8	Biomedical waste management: Sources, treatment and disposal		
5	**Air Pollution Control**	**10 Hours**	**22%**
5.1	Meteorology: Composition and structure of the atmosphere, wind circulation, solar radiation, lapse rates, atmospheric stability conditions, wind velocity profile, Maximum Mixing Depth (MMD), temperature inversions, windrose diagram		
5.2	Monitoring of particulate matter and gaseous pollutants: Respirable, non-respirable and nano - particulate matter, CO, CO2, Hydrocarbons (HC), SOX and NOX, photochemical oxidants		
5.3	Pollutants dispersion models: Description and application of point, line and areal sources		
5.4	Air pollution control equipment for particulate matter & gaseous pollutants: Gravity settling chambers, centrifugal collectors, wet collectors, fabric filters, electrostatic precipitator (ESP), adsorption, absorption, scrubbers, condensation and combustion		
7	**Environmental Policies for Pollution Prevention**	**03 Hours**	**07%**
7.1	Introduction to environmental legislations		
7.2	Environmental auditing: Introduction cost of pollution, environmental audit solutions, financial and managerial opportunities		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will get a diverse knowledge of environmental engineering practices applied to real life problems.
- The students will learn to understand the theories and practical aspects of pollution control along with the design and management applications.

F. Recommended Study Material:

Text Books:

1. Mahajan, S.P., Pollution Control in Process Industries, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Washington, D.C., Eckenfelder, Industrial Water Pollution Control, McGraw hill Company, New Delhi, American Chemical Society, USA, 2000.
3. Rao, C.S., Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Age International Ltd.,
4. Rao, M.N. and Rao, H.V.N., Air Pollution, , Tata McGraw-Hill

Reference Books:

1. Wark, K., Warner, C.F. and Davis, W.T., Air Pollution - Its Origin and Control, Harper & Row Publishers, New York, 1998.
2. Perkins, H.C., Air Pollution, McGraw Hill, 1974.
3. Stern, A.C., Air Pollution, Vol. - I, II, III.
4. Nemerow, N.N., Liquid Waste of Industry Theories, Practices and Treatment. Addison Willey, New York, 1971.
5. Ross, R.D., Industrial Waste Disposal, Reinhold Environmental Series – New York, 1978.
6. Tchobanoglous, G., Theissen, H. and Eliassen, R., Solid Waste Engineering - Principles and Management Issues,McGraw Hill, New York, 1991.

Web Materials:

1. http://www.epa.gov
2. http://www.indiaenvironmentportal.org.in
3. http://nptel.iitm.ac.in
4. http://www.filtersource.com
5. https://dgserver.dgsnd.gov.in

LIST OF EXPERIMENTS

Experiment No.	Name of Experiment
1	Standards and Sampling for Water and Wastewater Analysis
2	Treatability Studies for Industrial Wastewater
3	Municipal Solid Waste Sampling and Analysis
4	Design of Air Pollution Control Equipments
5	Report Based on Field Visit

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of the course are

- To cover the major areas of Transportation Planning, Management and Economics at introductory level to provide the student with basic rational and a set of design concept.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	02
2	Urban Area Classification	03
3	Transportation Planning Process & Modeling	04
4	Design of Urban Roads	04
5	Design of At-Grade Intersections, Rotaries	07
7	Parking Analysis & Design	04
7	Transportation System Management	04
8	Demand Management	04
9	Traffic Operation Improvement	02
10	Introduction	03
11	Elasticity	05
12	Demand Model	04

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Introduction**	**02 Hours**	**04%**
1.1	Introduction to planning, road development plans		
1.2	Levels of planning		
1.3	Role of transportation at national, regional & urban level		
1.4	Objectives & goals of planning		
2	**Urban Area Classification**	**03 Hours**	**07%**
2.1	Definition of urban area		
2.2	Urban area classification		
2.3	Trends in urbanization		
2.4	Transportation problems & identifications		
3	**Transportation Planning Process & Modeling**	**04 Hours**	**09%**
3.1	Interdependence of land-use & traffic		
3.2	Systems approach		
3.3	Stages in transportation planning		
3.4	Modal split		
3.5	Trip assignment		
3.7	Travel forecasting		
4	**Design of Urban Roads**	**04 Hours**	**09%**
4.1	Cross sectional elements		
4.2	IRC specifications		
5	**Design of At-Grade Intersections, Rotaries**	**07 Hours**	**13%**
5.1	Types of intersections		
5.2	IRC specifications for At-Grade intersections		
5.3	Guidelines & specifications for islands & rotaries		
5.4	Channelization		
5.5	Features of channelizing islands		
5.7	Advantages & disadvantages rotaries		
5.7	Rotary design elements		
5.8	Capacity of rotary		
7	**Parking Analysis & Design**	**04 Hours**	**09%**
7.1	Traffic & parking problems		
7.2	Types of parking		

7.3	IRC standards for parking		
7.4	Parking design		
7	**Transportation System Management**	**04 Hours**	**09%**
7.1	Introduction to TSM		
7.2	Need, scope and Strategies for TSM		
7.3	TSM planning & classification		
8	**Demand Management**	**04 Hours**	**09%**
8.1	Traffic management measures		
8.2	Advantages and disadvantages		
9	**Traffic Operation Improvement**	**02 Hours**	**04 %**
9.1	A case study: Brief		
10	**Introduction**	**03 Hours**	**07 %**
10.1	Introduction to engineering economics		
10.2	Transport demand, supply		
10.3	Equilibrium		
11	**Elasticity**	**05 Hours**	**11 %**
11.1	Types of elasticites		
11.2	Sensitivity & elasticity		
11.3	Sensitivity of travel demand		
11.4	Factors affecting Elasticity		
12	**Demand Model**	**04 Hours**	**09%**
12.1	KRAFT demand model		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The studentswould be able to understand and evaluate current scenarios of traffic management and improve it.
- The students would also be able to correlate economy and growth of transportation sector alongwith basic knowledge to quantify the benefits from well developed transportation facilities.

F. Recommended Study Material:

Text Books:

1. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi
2. JotinKhisty, S.C. and Kent Lall, B., Transportation Engineering – An Introduction, Prentice-Hall, NJ
3. Salter, R J., Highway Traffic Analysis and Design, ELBS

Reference Books:

1. Hutchison, B.G., Introduction to Transportation Engineering, & Planning, McGraw Hill Book Co.
2. John W. Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Pub. Co.
3. Vukan R. Vuchic, Urban Public Transportation System & Technology, Prentice Hall, Inc.
4. Papacostas, C.S., Fundamentals of Transportation System Analysis, PHI
5. JotinKhisty, C. and Kent Lall, B., Transportation Engineering – An Introduction, Prentice-Hall, NJ

Web Materials:

1. www.adb.org
2. http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/0,,menuPK:477823~pagePK:74175237~piPK:74175141~theSitePK:479372,00.html
3. www.lpcb.org
4. http://nptel.iitm.ac.in/
5. http://freedownloadengineeringebooks.blogspot.com/2011/07/evolving-transportation-networks-free.html
6. http://ebooksfreedownload.org/search/transportation-books-free-download
7. http://ebooksfreedownload.org/2011/05/transportation-systems-in-buildings.htmlhttp://civilebook.com/fundamentals-of-transportation-engineering/

Other Materials:

1. IRC: SP:30-2010, Manual on Economic Evaluation of Highway Projects in India
2. IRC-SP 41: Guidelines for the Design of At-Grade Intersections in Rural & Urban Areas
3. IRC: 107-1997: Guidelines for Capacity of Urban Roads in Plain Areas
4. IRC: 74-1990: Guidelines for Capacity of Roads in Rural Areas

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To make optimal use of water to prevent an excessive wastage to preclude the degradation of the land and bring about its improvement for maximizing water productivity.
- To get enough knowledge related to pressurized irrigation systems, like drip and sprinkler.
- To prevent irrigation-induced soil and water quality problems such as salinity.
- To increase crop production on sustainable basis where water is a limitation.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Introduction	02
2	Consumptive Use of Water	08
3	Surface Methods of Water Application	04
4	Sprinkler Irrigation System	09
5	Drip Irrigation System	09
7	Waterlogging and Land Drainage	09
7	Watershed Management	04

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Introduction**	**02 Hours**	**04%**
1.1	Need for sustainable water management		
1.2	Measurement of irrigation water: Volumetric and velocity-area methods		
1.3	Land leveling operations and criteria		
1.4	Use of RS and GIS in study of irrigated areas		
2	**Consumptive Use of Water**	**08 Hours**	**18%**
2.1	Factors affecting consumptive use		
2.2	Estimation of consumptive use: Filed methods and empirical formulae		
3	**Surface Methods of Water Application**	**04 Hours**	**09%**
3.1	Overview of border, basin and furrow irrigation methods		
3.2	Design aspects in border, basin and furrow irrigation methods		
4	**Sprinkler Irrigation System**	**09 Hours**	**20%**
4.1	Types, components		
4.2	Uniformity Coefficient		
4.3	Design of sprinkler irrigation system		
4.4	Operation and maintenance		
4.5	Troubleshooting		
5	**Drip Irrigation System**	**09 Hours**	**20%**
5.1	Components		
5.2	Design emission uniformity		
5.3	Design of drip irrigation system		
5.4	Problems associated with system		
5.5	Operation and maintenance		
7	**Waterlogging and Land Drainage**	**09 Hours**	**20%**
7.1	Definition,effects and causes		
7.2	Prevention measures of waterlogging		
7.3	Reclamation of saline soil, leaching and leaching requirements		
7.4	Classification of drainages: surface and sub-surface		

7 Watershed Management **04 Hours 09%**

7.1 Definition and need

7.2 Characteristics

7.3 Conservation measures: Contour techniques and gully control

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The studentswill be regained the knowledge about use of irrigation water as efficiently as possible. Efficient irrigation systems and water management practices can help to maintain farm profitability in an era of limited, higher-cost water supplies.
- The students will be able to implement the collected knowledge related to pressurized irrigation systems in filed. The use of it will be controlled the volume and frequency of irrigation water applied to crops, so as to meet crop needs while conserving water resources.

F. **Recommended Study Material:**

Text Books:

1. Michael, A.M., Irrigation - Theory and Practice, Vikas Publishing House, New Delhi.
2. Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.
3. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.
4. Murty, J.V.S., Watershed Management, New Age International Publishers, New Delhi.

Reference Books:

1. Sharma, R.K., Irrigation Engineering and Hydraulic Structures, Oxford and IBK Publishing House, New Delhi.
2. Asawa, G.L., Irrigation Engineering, Wiley Eastern Ltd.
3. Majumdar, D.K., Irrigation Water Management Principles and Practice, PHI.
4. Israelsen, O.W. and Hansen, V.E., Irrigation Principles and Practice, John-Wiley and Sons, New York.
5. Thiruvengadachari, S. and Sakthivadivel, R., Satellite remote sensing for assessment of irrigation system performance: a case study in India By, Research Report, International Irrigation Management Institute Colombo, Sri Lanka.
6. Dhawan, B.D., Studies in Irrigation and Water Management, Common Wealth Publishers, New Delhi.
7. Singh, V.P. and YadavaRam Narayan, Watershed Management, Vol. 4, Allied Publishers Prv. Ltd., Mumbai.

Web Materials:

1. http://www.ers.usda.gov/publications/ah712/ah7124-7.pdf
2. http://www.angrau.net/StudyMaterial/Agronomy/Agro201.pdf
3. ftp://ftp.fao.org/agl/aglw/fwm/Manual7.pdf
4. http://www.fao.org/docrep/T0231E/t0231e03.htm
5. http://www.irrigationtutorials.com/dripguide.htm
6. http://www.dripirr.com/services/system_guide/Drip_Irrigation_Design_Guide.pdf
7. http://youtu.be/ykMvtFfPIqk
8. http://youtu.be/aWWTZxecOto

LIST OF TUTORIALS

Tutorial 1	Introduction
Tutorial 2	Consumptive Use of Water
Tutorial 3	Surface Methods of Water Application
Tutorial 4	Sprinkler Irrigation System
Tutorial 5	Drip Irrigation System
Tutorial 7	Waterlogging and Land Drainage
Tutorial 7	Watershed Management

CL436: REPAIR & REHABILITATION OF STRUCTURES(Elective)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To teach the importance of durability of structure and introducing causes of deterioration of structures.
- To introduce the students in depth about knowledge of professional practice of repair techniques with right selection of repairing material.
- To learn method of drafting contract for repair work and bidding for repair projects.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Causes of Deterioration and Durability Aspects	04
2.	Condition Survey & Non-destructive Evaluation	07
3.	Structural Analysis and Design	03
4.	Selection of Repair Materials for Concrete	03
5.	Rehabilitation and Retrofitting Methods	12
7.	Terms and Conditions of Contracts for Repair & Rehabilitation Works	07
7.	Introduction to Schedule of Structural Repair Work and its Specifications	07
8.	Demolition and Demolition techniques	03

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Causes of Deterioration and Durability Aspects**	**04 Hours**	**8%**
1.1	Holistic Model of Deterioration of RCC		
1.2	Permeability Of Concrete		
1.3	Aggressive Deteriorating Chemical Agents		
1.4	Durability Aspects:		
2	**Condition Survey & Non-destructive Evaluation**	**07 Hours**	**17%**
2.1	Definition, Objective, Stages of Condition survey		
2.2	Non-destructive Evaluation Tests - Concrete Strength Assessment Chemical Tests, Fire Damage Assessment, Structural Integrity/Soundness Assessment		
2.3	Interpretation & Evaluation of Test Result Data		
3	**Structural Analysis and Design**	**03 Hours**	**7%**
3.1	Reserve Strength, Analysis necessary to Identify Critical Section , Active and Passive Repairs , Modeling of Repaired Composite Structure		
3.2	Structural System & Its Validation		
3.3	Mechanical Properties of Materials		
3.4	Evaluation of Damage to Concrete/Reinforcement		
3.5	Service Loads Including Due to Change of Building use		
3.7	Evaluation of Building Configuration		
3.7	Analysis and Design		
3.8	Load Tests for Flexural Members		
4	**Selection of Repair Materials for Concrete**	**03 Hours**	**7%**
4.1	Essential Parameters for Repair Materials		
4.2	Materials for Repair		
	4.2.1 Premixed cement concrete/mortars		
	4.2.2 Polymer Modified Mortars and Concrete (PMM/PMC)		
	4.2.3 Epoxies and Epoxy Systems including Epoxy Mortars/Concretes		
	4.2.4 Polyester Resins		
	4.2.5 Surface Coatings		

5	**Rehabilitation and Retrofitting Methods**	**12 Hours**	**27%**
5.1	Repair Options		
5.2	Performance Requirements of Repair Systems		
5.3	Important factors to be considered for selection of repair methods.		
5.4	Repair Stages		
5.5	Repair Methods		
5.7	Repair/Rehabilitation Strategies		
7	**Terms and Conditions of Contracts for Repair & Rehabilitation Works**	**07 Hours**	**17%**
7.1	Identification of problem and estimated quantum of job		
7.2	Engagement of Consultants		
7.3	Engagement of Contractors		
7.4	Execution of Work		
7.5	Post Repair Inspection		
7.7	Performance Guarantee		
7	**Introduction toSchedule of Structural Repair Work and its Specifications**	**07 Hours**	**13%**
7.1	Schedule of Structural Repair Work		
7.2	General and special specifications of repair work		
8	**Demolition and Demolition techniques**	**03 Hours**	**7%**
8.1	Engineered demolition techniques for Dilapidated structures		
8.2	Case studies		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP, video lectures etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks Weightage respectively.

- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar/ Projects will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will get a diverse knowledge of concrete deteriorating mechanisms, repairs methods and its tools to enhance his professional practice, which will be use full in tackling repairs problems in construction industry.
- The students will be able to understand the procedure to carry out steps to prepare condition assessment reports on the repair works and its estimation.

F. Recommended Study Material:

Text Books:

1. Handbook on Repairs and Rehabilitation of structures, CPWD, Delhi
2. R.Dodge Woodson., Concrete Structures: Protection, Repair and Rehabilitation, Elsevier, 2009.
3. P.C.Varghese , Maintenance, Repair & Rehabilitation and Minor Works of Buildings, PHI learning

Reference Books:

1. M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.
2. Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RHDC – NBO" Anna University, July 1992.
3. Raikar, R.., Learning from failures – Deficiencies in Design, Construction and Service – R & D centre (SDCPL), RaikarBhavan, Bombay, 1987.
4. Lakshmipathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 -30th October 1999.
5. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK,1991.

6. R.T.Allen and S.C.Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1987

Web Materials:

1. cpwd.gov.in/Units/handbook.pdf
2. http://www.indianconcreteinstitute.org/repair-and-rehabilitation.html

CL413: INDUSTRIAL TRAINING
(During Summer at the end of 6th Semester)
B TECH 7TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	-	-	-	03
Marks	-	100	100	

A. Objectives of the Course:

The objectives of the course are

- To make students understand the applications of civil engineering related theories in field.
- To make students conversant about formulation and evaluation of Industry Projects.

B. Outline of the Project:

Sr. No.	Project Guidelines	%age Weightage
1	Selection the Company	20
2	Progress of Project	20
3	Report Writing	30
4	Presentation	30

Total Hours: 90

C. Detailed Guidelines:

1 Selection the Project Topic **20%**

1.1 Type of Project will be assigned to a group of students based on their inclination / willingness / interest

2 Progress of Project **20%**

2.1 They also need to report to respective project guide every week regarding the progress of the project

3 Report Writing **30%**

3.1 The students are required to prepare a report including the Preamble, Objectives, Scope, Study Area Selection, Survey Methodology, Data Collection, Data Analysis, Design (if any), Conclusions, Recommendations and Annexure of the concerned project

4	**Presentation & Question/Answer**	**30%**
4.1	During the semester, two presentations one at the mid of the semester and another at the end of the semester will be made by student/group of students	

D. Instructional Method and Pedagogy:

- Type of Project will be assigned to a group of students based on their inclination/willingness/interest at the end of 6thSemester.
- During summer break of 6 weeks (At the end of Semester 6), students will be undertaking a project at pre-defined industries for a minimum period of 3 Weeks.
- The project may include a site visit as per the project type, where group of students can avail an opportunity to build an appreciation for the concepts to be utilized in understanding the actual scenario.
- At the start of the 7thsemester, students have to submit the final project report during first week. The project report should consist of at least 50 pages and at the most 70 pages.
- At the First/Second Week of 7thsemester, a presentation of the project is required to be done in group or individually on scheduled date for at least 15 minutes.

E. Students Learning Outcomes:

On the successful completion of this course

- The studentswould be able to snatch ideas about projects and understand the significance of projects.
- The students would also gain a better approach towards design and performance of Transport related projects.

F. Recommended Study Material:

Project related study is to be carried out by each student/group of students.

e – Books

e – Journals

Codes

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 8)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CL411: STRUCTURAL DYNAMICS &EARTHQUAKE ENGINEERING
B TECH 8TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	7	5
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To gain knowledge of the nature and effect of earthquakes.
- To learn fundamental structural dynamics, seismology, structural earthquake response.
- To gather knowledge regarding earthquake mechanics, earthquake-induced effects, hazard and risk assessment and earthquake resistant design, as well as emergency response.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Dynamics of Single Degree of Freedom Systems	12
2	Dynamics of Multi-Degree of Freedom Systems	12
3	Earthquake Basics & Design Philosophy	08
4	Lateral Load Analysis of Masonry Building	10
5	Design Lateral Loads for RC Building	10
7	Ductile Detailing	08

Total Hours (Theory): 70

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	**Dynamics of Single Degree of Freedom Systems**	**12Hours**	**20%**
1.1	Introduction		
1.2	Free vibration of viscous-damped SDOF system		
1.3	Force vibration of SDOF System		
2	**Dynamics of Multi-Degree of Freedom Systems**	**12 Hours**	**20%**
2.1	**Introduction**		
2.2	Dynamics of multi degree of freedom system		
2.3	Free vibration analysis of MDOF system		
2.4	Concept of Transmissibility		
3	**Earthquake Basics & Design Philosophy**	**08 Hours**	**13%**
3.1	Elements of seismology		
3.2	Definitions of basic terms used in seismology		
3.3	General features of tectonics of seismic regions		
3.4	Seismographs, seismic zones as per IS: 1893-2002		
3.5	Philosophy of earthquake resistant design, earthquake proof v/s earthquake resistant design		
3.7	Four virtues of earthquake resistant structures: Strength, stiffness, ductility and configuration		
3.7	Seismic structural configuration		
4	**Lateral Load Analysis of Masonry Building**	**10 Hours**	**17%**
4.1	Earthquake resistant Masonry features & Elementary stress analysis for brick masonry		
4.2	Lateral load analysis of masonry building		
5	**Design Lateral Loads for RC Building**	**10Hours**	**17%**
5.1	Introduction		
5.2	Determination of static design lateral force		
5.3	Dynamic analysis procedure (Response Spectrum Analysis)		
7	**Ductile Detailing**	**08Hours**	**13%**
7.1	Concepts of detailing of various structural components as per IS: 13920 provisions		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will gain knowledge regarding expert systems that make it possible to predict the earthquake resistance of structures, which are being designed, have already been designed and have experienced an earthquake.
- The students will be able to recognize special conditions such as irregular buildings, building separation, P-delta effects, base isolation, and hazardous structures.
- The students will be understood basic earthquake mechanisms, tectonics, types of ground motion, and propagation of ground motion and interpret earthquake ground motion data.

F. Recommended Study Material:

Text Books:

1. Chopra, A.K., Dynamics of Structures, Prentice Hall, N.J.
2. Mario Paz, Structural Dynamics, McGraw-Hill.

3. Manish Shrikhande&PankajAgrawal; Earthquake resistant design of structures, PHI Publication, New Delhi
4. Duggal, S.K., Earthquake resistance design of structures; Oxford University Press, New Delhi.

Reference Books:

1. Park &Pauly, Behavior of RC Structure
2. Clough &Penzin, Dynamics of structures, McGraw-Hill.
3. IITK-GSDMA EQ27 – V-3.0, Design Example of a Six Storey Building
4. Murthy, C.V.R., Earthquake Tips, Nicee.

Web Materials:

1. http://en.wikipedia.org/wiki/Earthquake_engineering
2. http://www.curee.org
3. http://www.earthquakeengineering.com/
4. http://www.nicee.org/

Other Materials:

1. IS: 875,Code of Practice for Design Loads
2. IS: 1893-2002 (Part-I), Criteria for Earthquake Resistant Design
3. IS: 4327-1993, Earthquake Resisting Design & Construction Building
4. IS: 13920-1993, Ductile Detailing of RC Structures
5. IS: 13827-1993, Earthquake Resistance of Earthen Buildings
6. IS: 13828-1993, Earthquake Resistance Low Strength Masonry Buildings

CL414: CONSTRUCTION TECHNOLOGY
B TECH 8TH SEMESTER

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The objectives of this course are

- To make students capable of applying engineering fundamentals and economic aspects on planning, selection and operation of construction equipments
- Ability to demonstrate and understanding on operations and productivity analysis of major excavating and material handling equipments for construction planning operations
- To make the students familiar with the operations, systems and techniques used in concrete and other heavy constructions
- To equip students with knowledge of basic features, uses and limitations of different types of formworks, scaffolds and other temporary structures

B.Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Engineering Fundamentals of Construction Materials &Equipments	7
2	Procurement & Planning of Construction Equipments	5
3	Excavating Equipments	5
4	Material Handling & Hauling Equipments	7
5	Concreting Process &Equipments	7
7	Heavy Constructions Methods	12
7	Formwork, Scaffolding & Shoring	5

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detail Syllabus

1	**Engineering Fundamentals of Construction Materials &Equipments**	**7**	**13%**
1.1	Weight-Volume Relations of Materials,		
1.2	Machine Power:,		
1.3	coefficient of traction, rim pull and available pull and drawbar pull Effect of grade & altitude on power,		
2	**Procurement & Planning of Construction Equipments**	**5**	**11%**
2.1	Procurement criteria		
2.2	Equipment cost		
2.3	replacement analysis		
3	**Excavating Equipments**	**5**	**11%**
3.1	Features of excavating equipments		
3.2	Production/Output analysis and Suitability of Power Shovel, Dragline, Backhoe, Scrapper, Clamshells, Ripper, Bulldozer etc.		
4	**Material Handling & Hauling Equipments**	**7**	**14%**
4.1	Tractors		
4.2	Dumpers		
4.3	Conveyor belts: Systems & Design Parameters,		
4.4	Features, working and stability of cranes, tower cranes, lifts etc		
5	**Concreting Process &Equipments**	**7**	**14%**
5.1	Batching plants		
5.2	Equipments for concrete Production –mixers &transit mixers		
5.3	Concrete transportation systems		
5.4	Concrete placing systems - Pumps		
5.5	Equipments for compaction of Concrete,		
5.7	Tools and plants for Hot weather concreting, Underwater concreting, Shortcreting		
7	**Heavy Constructions Methods**	**12**	**27%**
7.1	Soil Stabilisation/Compaction - Compressed Air, Blasting		

	&Dewatering Systems etc		
7.2	Cofferdams		
7.3	Well foundations		
7.4	Pneumatic Caissons		
7	**Formwork, Scaffolding & Shoring**	**5**	**11%**
7.1	Materials &arrangement System forFormwork, Scaffolding & Shoring elements		
7.2	Formwork for foundations, columns, beams & walls,		
7.3	Slip formwork		
7.4	Types of Scaffolding and its suitability		
7.5	Types of Shoring and its suitability		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board,OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks and 5 Marks weightage respectively.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments/Surprise tests/Quizzes/Seminar will be conducted which carries 05 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Tutorials related to course content will be carried out in the laboratory.
- Field visits of construction industry and related construction equipments will be arranged during the semester.

E. Students Learning Outcomes:

On the successful completion of this course

- The students will be able to plan and select suitable construction equipments for different construction activities

- The students will acquire ability to do planning for construction operations based on equipment productivity
- Students will have an understanding on various systems and techniques used in concreting and other heavy construction operations
- Students will be familiar with materials and systems used in the temporary supporting structures/systems used at construction sites.

F. Recommended Study Material:

Text Books:

1. Peurifoy, L., Schexnayder, C.J. and Shapira, A., Construction Planning, Equipment and Methods, McGraw Hill, New Delhi, 8th Edition, 2010.
2. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers Delhi, 2008.
3. Roy Chudley, Roger Geeno ,"Advanced Construction Technology" Latest Edition

Reference Books:

4. Sharma, S.C., Construction Equipment & Management, Khanna Publications, New Delhi, 1988.
5. Dr. Mahesh Varma, "Construction Equipment and its planning and application", Metropolitan Book Company, New Delhi,2003.
6. M. J. Tomlinson, Foundation Design and Construction (7 Edition), Prentice Hall Publishing,
7. Sankar, S.K. and Saraswati, S., Construction Technology, Oxford University Press, New Delhi, 2008.
8. Robert L. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures, McGraw -Hill , 1997.

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	-	12	12	12
Marks	-	300	300	

G. Objectives of the Course:

The objectives of the course are

- To make students understand the applications of civil engineering related theories in field.
- To make students conversant about formulation and evaluation of Infrastructure Projects.

H. Outline of the Project:

Sr. No.	Project Guidelines	%age Weightage
1	Selection the Project Topic	10
2	Data Collection	10
3	Literature Review	10
4	Progress of Project	30
5	Report Writing	20
7	Presentation	20

Total Hours (Theory): 00

Total Hours (Lab): 270

Total Hours: 270

I. Detailed Guidelines:

1 Selection the Project Topic **10%**

1.1 Type of Project will be assigned to a group of students based on their inclination / willingness / interest

2 Data Collection **20%**

2.1 Collection of respective data for the project, its applications shall be covered in the project

3	**Literature Review**	**20%**
3.1	Collection the material related to topic and prepare the literature review	
4	**Progress of Project**	**10%**
4.1	They also need to report to respective project guide every week regarding the progress of the project	
5	**Report Writing**	**20%**
4.1	The students are required to prepare a report including the Preamble, Objectives, Scope, Study Area Selection, Survey Methodology, Data Collection, Data Analysis, Design (if any), Conclusions, Recommendations and Annexure of the concerned project	
7	**Presentation & Question/Answer**	**20%**
7.1	During the semester, two presentations one at the mid of the semester and another at the end of the semester will be made by student/group of students	

J. Instructional Method and Pedagogy:

- Type of Project will be assigned to a group of students based on their inclination/willingness/interest.
- The project may include a site visit as per the project type, where group of students can avail an opportunity to build an appreciation for the concepts to be utilized in understanding the actual scenario.
- Work progress of the project will be assessed and evaluated based on the guidelines laid down in **section C** at mid of the semester. It carries a weightage of 150 Marks as a part of internal evaluation.
- At the end of the semester, students have to submit the final project report. The project report should consist of at least 50 pages and at the most 70 pages.
- At the end of semester, a presentation of the project is required to be done in group or individually on scheduled date for at least 15 minutes.
- At the end of the semester, the projects will be evaluated as per the guidelines laid down in **section C** in consultation with subject experts. It carries a weightage of 150 Marks as a part of University Evaluation.

K. Students Learning Outcomes:

On the successful completion of this course

- The studentswould be able to snatch ideas about projects and understand the significance of projects.
- The students would also gain a better approach towards design and performance of Transport related projects.

L. Recommended Study Material:

Project related study is to be carried out by each student/group of students.

e – Books

e – Journals

Codes