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

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (Civil Engineering) Programme

(Choice Based Credit System)

Charotar University of Science and Technology (CHARUSAT)
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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.

1. 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.

2. Duration of Programme

Undergraduate programme (B. Tech.)

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

3. Eligibility for Admissions

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

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

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:

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

7.1.3 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 – 1 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**

8.1 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= Number of credits of course i
G_i = Grade Point for the course i
i = 1 to n
n = number of courses in the semester

(ii) CGPA = $\Sigma C_i G_i / \Sigma C_i$ where,
C_i = Number of credits of course i
G_i = Grade Point for the course i
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 – 1

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
	HS123	Critical Thinking and Logic	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

MA 241: ENGINEERING MATHEMATICS-III

B TECH 3rd SEMESTER (CL/EE/ME)

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

CL241: GEOLOGY FOR CIVIL ENGINEERS

B TECH 3RD 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 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.	**3 Hrs**	
1.2	Work of natural agencies: Lakes, Oceans, Atmosphere, wind, streams, sea, glacier, mass movements	**6 Hrs**	
1.3	Plate tectonics: Concepts and plate boundaries	**2 Hrs**	
1.4	Earthquakes: Basics of earthquake, intensity and magnitude, causes, Earthquake zones of India	**4 Hrs**	
2	**Natural Materials**	**11 Hours**	**18%**
2.1	Minerals: Formation, Identification and Use Physical properties of minerals; basics of optical mineralogy, SEM, XRD	**4 Hrs**	
2.2	Rocks: Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic Igneous Rock: Agents, structure, texture, IUGG 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	**7 Hrs**	
3	**Structural Geology**	**10 Hours**	**17%**
3.1	Introduction: Outcrop, stratification, dip and strike relation	**2 Hrs**	
3.2	Study of Structural Features: Fold, Fault, Joints and Unconformities; Classification, formation and Identification	**8 Hrs**	
4	**Engineering Geology**	**16 Hours**	**27%**
4.1	Geologic Mapping: Various methods of geological investigations, mapping, preparation of geologic sections Interpretation of reports.	**3 Hrs**	
4.2	Indian geology: Geological framework of India, Geology of Gujarat	**2 Hrs**	
4.3	Ground water: Basics and engineering difficulties	**2 Hrs**	
4.4	**Geology for Site selection:** Dam, Tunnel, Reservoir and Highways	**5 Hrs**	

4.5 **Case studies:** Important international and Indian examples of failures of civil structures due to geological constrains. **4 Hrs**

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

CL 242: SURVEYING

B TECH 3RD SEMESTER (CIVIL ENGINEERING)

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	Profil**e** 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

CL243: MECHANICS OF SOLIDS

B TECH 3RD 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:

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/

B. Tech. (Civil Engineering) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CL244: FLUID MECHANICS- I

B TECH 4TH 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:

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/

CL245: BUILDING CONSTRUCTION TECHNOLOGY

B TECH 4TH 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 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=Jf1i-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

CL246: STRUCTURAL ANALYSIS -I
B TECH 4TH 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 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

ME241: MATERIAL SCIENCE AND TECHNOLOGY

B TECH 4TH SEMESTER (CIVIL / MECHANICAL 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 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/