CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

ACADEMIC REGULATIONS & SYLLABUS

cspit
Chandubhai S Patel Institute of Technology

Faculty of Technology & Engineering

Bachelor of Technology Programme (Second Year Civil Engineering)

Effective from 2019-20

Vision

"To provide state of the art education in Civil Engineering guided by innovative research leading to centre of excellence in Civil Engineering education having recognition at national and international levels"

Mission

"Being a pioneering branch of Engineering, the department of Civil Engineering under the shelter of CHARUSAT is intended as a facilitator for creating a liaison between the brilliant student community and the next generation industrial needs"

Programme Educational Objectives (PEO's):

PEO 1: The graduate will possess foundation of engineering knowledge and exhibiting critical thinking and problem solving skills

PEO 2: The graduates will have trait of lifelong learning and be able to inculcate the capabilities to meet the diversified needs of industry, academia and research.

PEO 3: The graduate will exhibit the professional ethics and be supportive to the social needs

PEO 4: The graduates will possess comprehending, analyzing and designing capabilities to generate sustainable solutions

Programme Outcomes (PO's)

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

Programme Specific Outcomes (PSO's):

By the completion of Civil Engineering program, the student will attain:

PSO 1: The ability to serve the infrastructure sector with capabilities to plan, design, analyze and building civil engineering-based systems

PSO 2: The ability to adopt to the state-of-the-art practices in all sectors of Civil Engineering.

PSO 3: Employability skills with the cognizance of social and environmental necessity along with ethical responsibility to have a successful career and to become an entrepreneur.

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

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
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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 of 90 working days 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 – I 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 – 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= 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 first and second year.

9. Award of Degree

9.1 Every student of the programme who fulfills 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 & ≤ 10.0
First class	:	CGPA ≥ 6.0 & < 7.5
Second Class	:	CGPA ≥ 5.0 & < 6.0

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.

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY (CHARUSAT)

FACULTY OF TECHNOLOGY & ENGINEERING (FTE)

CHOICE BASED CREDIT SYSTEM

A. 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. Core Courses

1.1.1 University Core (UC)

University Core Courses are those courses which all students of the University of a Particular Level (PG/UG) will study irrespective of their Programme/Specialization.

1.1.2 Programme Core (PC)

A 'Core Course' is a course which acts as a fundamental or conceptual base for Chosen Specialization of Engineering. It is mandatory for all students of a particular Programme and will not have any other choice for the same.

1.2 Elective Course (EC)

An 'Elective Course' is a course in which options / choices for course will be offered. It can either be for a Functional Course / Area or Streams of Specialization / Concentration which is / are offered or decided or declared by the University/Institute/Department (as the case may be) from time to time.

1.2.1 Institute Elective Course (IE)

Institute Courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization

1.2.2 Programme Elective Course (PE)

A 'Programme Elective Course' is a course for the specific programme in which students will opt for specific course(s) from the given set of functional course/ Area or Streams of Specialization options as offered or decided by the department from time-to-time.

1.2.3 Cluster Elective Course (CE)

A 'Cluster Elective Course' is a course which students can choose from the given set of functional course/ Area or Streams of Specialization options (e.g. Common Courses for EC/CE/IT/EE) as offered by or decided by the Institute from time-to-time.

1.3 Non Credit Course (NC) - AUDIT Course

A 'Non Credit Course' is a course where students will receive Participation or Course Completion certificate. This will not be reflected in Student's Grade Sheet. Attendance and Course Assessment is compulsory for Non Credit Courses.

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	MA 241	Engineering Mathematics III	4	0	4	4	30	70			100
	CL 241	Geology for Civil Engineers	4	2	6	5	30	70	25	25	150
	CL 242	Surveying	4	2	6	5	30	70	25	25	150
	CL 243	Mechanics of Solids	4	2	6	5	30	70	25	25	150
	XX XXX	University Elective	0	2	2	2			30	70	100
	HS 122A	Values and Ethics	2		2	2	30	70			100
		Remedial Classes			10						
					36	**23**					**750**
SY Sem-4	CL 244	Fluid Mechanics-I	4	2	6	5	30	70	25	25	150
	CL 245.01	Building Construction Technology	3	2	5	4	30	70	25	25	150
	CL 246.01	Structural Analysis I	3	2	5	4	30	70	25	25	150
	ME 241	Material Science & Technology	3	2	5	4	30	70	25	25	150
	XX XXX	University Elective	0	2	2	2			30	70	100
	HS 133A	Creativity, Problem Solving and Innovation	0	2	2	2			30	70	100
	MA 246	Numerical Analysis(Elective)	3	2	5	4	30	70	25	25	150
	MA 247	Probability & Statistics(Elective)	3	2	5	4	30	70	25	25	150
		Remedial Classes			06						
					36	**25**					**950**

LIST OF UNIVERSITY ELECTIVE COURSES

3RD SEMESTER UNDERGRADUATE PROGRAMME (ACADEMIC YEAR 2019-20)

Sr. No.	Course Code & Course Name	Department / Faculty offering the Course
1	EC281.01: Introduction to MATLAB Programming	EC / FTE
2	CE281.01: Art of Programming	CE / FTE
3	CL281.01: Environmental Sustainability and Climate Change	CL / FTE
4	EE283: Python for Electrical Engineers	EE/FTE
5	IT281.01: ICT Resources and Multimedia	IT/FTE
6	ME281.01: Engineering Drawing	ME/FTE
7	PH233.01: Fundamentals of Packaging	RPCP/FPH
8	PD260.01: Basic Laboratory Techniques	PDPIAS/FAS
9	NR251.01: First Aid & Life Support	NURSING / FMD
10	PT191.01: Health Promotion and Fitness	ARIP / FMD
11	CA224: Introduction to Web Designing	CMPICA / FCA
12	BM231: Banking and Insurance	I2IM / FMS
13	PD261: Astrophysics, Space and Cosmos-1 (ASC–1)	PDPIAS/FAS

LIST OF UNIVERSITY ELECTIVE COURSES

4TH SEMESTER UNDERGRADUATE PROGRAMME (ACADEMIC YEAR 2019-20)

Sr. No.	Course Code & Course Name	Department / Faculty offering the Course
1	EC282.01: Prototyping Electronics with Arduino	EC / FTE
2	CE282.01: Web Designing	CE / FTE
3	CL282.01: Basics of Environmental Impact Assessment	CL / FTE
4	EE286: Computer Programming for Electrical Engineering	EE/FTE
5	IT282.01: Internet Technology and Web Design	IT/FTE
6	ME282.01: Material Science	ME/FTE
7	PH238.01: Cosmetics in daily life	RPCP/FPH
8	NR261.01: Life Style Diseases & Management	NURSING / FMD
9	PT192.01: Occupational Health & Ergonomics	ARIP / FMD
10	CA225: Programming the Internet	CMPICA / FCA
11	BM241: Health Care Management	I2IM / FMS
12	PD262: Astrophysics, Space and Cosmos-2 (ASC-2)	PDPIAS/FAS

CONTENTS

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CL 241: GEOLOGY FOR CIVIL ENGINEERS 22
CL 242: SURVEYING 26
CL 243: MECHANICS OF SOLIDS 30
HS 122 A: VALUES AND ETHICS 35
CL 244: FLUID MECHANICS- I 39
CL 245.01: BUILDING CONSTRUCTION TECHNOLOGY 43
CL 246.01: STRUCTURAL ANALYSIS -I 48
ME 241: MATERIAL SCIENCE AND TECHNOLOGY 51
HS 133 A: CREATIVITY, PROBLEM SOLVING AND INNOVATION 55
MA 246: NUMERICAL ANALYSIS 60
MA 247: PROBABILITY & STATISTICS 64
ANNEXURE II - UNIVERSITY ELECTIVE SYLLABI 68

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. 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: 60

B. 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.		

C. Course Outcome (COs):

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

CO1 Represent continuous time periodic signals using concepts of Fourier series and determine the solution of complex engineering problems heat, wave and Laplace's equations using it.

CO2 Classify and apply the necessary Laplace transform and inverse Laplace transform techniques to solve ordinary differential equations of real world problems.

CO3 Differentiate the dot product, cross product, length of vectors, partial derivatives, derivatives of vector-valued functions, gradient functions and these tools are employed successfully in different branches of engineering and physics.

CO4 Analyze parameterize curves and calculate line integrals using them and Use vector operators and implement into surface integrals, Classify and examine the Green, Stokes and Divergence theorem

CO5 Find and explain significant of Eigenvalues and Eigenvectors of a square matrix, use Cayley-Hamilton's theorem to find inverse and power of a square matrix.

Course Articulation Matrix (ME/CL):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	1	1	-	1	-	-	1	-	1	2	2	-
CO2	3	2	1	1	1	-	1	-	-	1	-	1	2	2	-
CO3	3	2	2	1	1	-	1	-	-	1	-	1	2	2	-
CO4	3	2	2	1	1	-	1	-	-	1	-	1	2	2	-
CO5	3	1	-	-	-	-	-	-	-	-	-	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. Recommended Study Material:

Text Books:

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

2 Thomas, G. B., and R. L. Finney. "Calculus with Analytic Geometry (9th Edition), 1996.", Addison Wesley Publishing.

Reference Books:

1. Ahsaan, Zafar. Differential equations and their applications. PHI Learning Pvt. Ltd., 2004.
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.
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

CL 241: 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. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	Physical Geology	17
2	Natural Materials	13
3	Structural Geology	12
4	Engineering Geology	18

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

B. Detailed Syllabus:

1 Physical Geology **17 Hours** **28%**

1.1 **Earth:** **3**

Origin, internal structure.

1.2 **Work of natural agencies:** **7**

Lakes, Oceans, Atmosphere, wind, streams, sea, glacier, mass movements

1.3 **Plate tectonics:** **2**

Concepts and plate boundaries

1.4 **Earthquakes:** **5**

Basics of earthquake, intensity and magnitude, causes, Earthquake zones of India

2 Natural Materials **13 Hours** **22%**

2.1 **Minerals:** **5**

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, 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	**8**	
3	**Structural Geology**	**12 Hours**	**20%**
3.1	**Introduction:** Outcrop, stratification, dip and strike relation	**2**	
3.2	**Study of Structural Features:** Fold, Fault, Joints and Unconformities; Classification, formation and Identification	**10**	
4	**Engineering Geology**	**18 Hours**	**30%**
4.1	**Geologic Mapping:** **Various methods of geological investigations, mapping,** preparation of geologic sections **Interpretation of reports.**	**3**	
4.2	**Indian geology:** Geological framework of India, Geology of Gujarat	**2**	
4.3	**Ground water:** Basics and engineering difficulties	**2**	
4.4	**Geology for Site selection:** Dam, Tunnel, Reservoir and Highways	**6**	
4.5	**Case studies:** Important international and Indian examples of failures of civil structures due to geological constrains.	**5**	

C. Course Outcomes:

On the successful completion of this course:

CO1 The student will have basic understanding of Geology, natural materials such as minerals and rocks, use of rocks and minerals and availability of rocks and mineral.

CO2 The student will have basic understanding of Geological framework of India and Gujarat.

CO3 The student will be able to analyse geological maps and process of resolving geological issues in civil engineering projects.

CO4 The student will be able to apply the knowledge of natural dynamic process, and other geological factors while taking decision on civil engineering constructions.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	-	1	1	-	1	2	-	-	-	-	1	1	1	1
CO2	3	-	1	1	-	1	2	-	-	-	-	1	1	1	1
CO3	3	1	1	1	-	1	2	-	-	-	-	1	1	1	1
CO4	3	1	1	1	-	1	2	-	-	-	-	1	1	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. Recommended Study Material:

Text Books:

1. Prabin Singh, Engineering & General Geology, and 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/

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. 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

B. 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

C. Course Outcomes :

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

CO1 Carry out elevation measurement and prepare contour maps.

CO2 Plan theodolite survey applications.

CO3 Measure and Plot maps with plane table.

CO4 Set out curves, buildings, culverts and tunnels

CO5 Compute ground areas and earthwork volumes

CO6 Carry out basic hydrographic survey and invoke application of modern surveying instruments over conventional instruments.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	-	2	-	-	-	2	1	-	1	3	1	2
CO2	1	2	1	-	3	-	-	1	-	1	-	2	1	2	2
CO3	1	-	-	-	-	-	-	-	1	1	-	-	-	-	1
CO4	3	2	2	-	-	1	-	-	1	-	-	2	1	-	2
CO5	3	2	2	1	-	-	1	-	-	1	-	1	2	1	2
CO6	1	-	2	-	3	-	-	-	1	3	2	2	2	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. 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

CL 243: 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. 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

B. 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 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		

C. Course Outcomes

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

- CO1 Classify and determine the strength parameters of materials and compute stresses & strains for structural elements due to normal, shear loads and temperature changes.
- CO2 Calculate bending moment and shear force for statically determinate beams and draw the distributions.
- CO3 Calculate the cross sectional moment of inertia using the parallel axis theorem.
- CO4 Analyse stresses in a beam under combined loadings and also Calculate bending stress, shear stress and their distribution at any desired location along the beam elements.
- CO5 Evaluate the different mechanical properties of materials and also Calculate

strain energy due to different loadings.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	-	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	2	-	1	-	-	-	-	-	-	-	2	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-	2	1	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	1	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. 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

HS 122 A: VALUES AND ETHICS

B TECH 3RD SEMESTER (UNIVERSITY ELECTIVE)

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 Outline

Module No.	Title/Topic	Classroom Contact Hours
1	**Introduction to Values and Ethics**	
	Need, Relevance and Significance of Values and Ethics: General Concept and Meaning of Values and Ethics	06
2	**Elements and Principles of Values**	
	Universal & Personal Values Social, Civic & Democratic Values Adaptation Models & Methods of Values	08
3	**Applied Ethics**	
	Universal Code of Ethics Professional Ethics Organizational Ethics Ethical Leadership Domain Specific Ethics	08
4	**Value, Ethics & Global Issues**	
	Cross-Cultural Issues Role of Ethics & Values in Sustainability Case Studies	08
	Total	**30**

B. 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.

C. 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:

Sl. 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

D. Course Outcome (COs):

After completion of the course, the student would:

CO1 Understand the concepts and mechanics of values and ethics.

CO2 Understand the significance of value and ethical inputs in and get motivated to apply them in their life and profession.

CO3 Understand the significance of value and ethical inputs in and get motivated to apply them in social, global and civic issues.

CO4 Develop their responsibility towards society.

CO5 Comprehend their own core values and adhere to those values at their workplace.

CO6 Practice Ethical Leadership.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	-	1	3	2	1	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	1	1	-	-	-	-	-	-	2
CO5	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	2	-	-	-	-	1

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

Reference Books / Reading

1. 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).
2. Ethics for Everyone, Arthur Dorbin, 2009. (http://arthurdobrin.files.wordpress.com/2008/08/ethics-for-everyone.pdf).
3. 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

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. 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

B. 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		

C. Course Outcomes (COs):

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

CO1 Determine the properties of fluid and pressure and their measurement.

CO2 Apply continuity equation and energy equation in solving problems on flow through conduits.

CO3 Compute the frictional loss in laminar and turbulent flows.

CO4 Design open channels for most economical sections like rectangular, trapezoidal and circular sections.

CO5 Select the type of pumps and turbine required with reference to available head of water and discharge.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	-	2	-	-	-	-	-	-	-	2	1	-	-
CO2	3	3	2	-	-	-	-	-	-	1	-	2	1	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	1	1	-	-
CO4	3	3	2	1	-	-	-	-	-	1	-	2	2	-	2
CO5	3	1	-	-	-	1	-	-	-	-	-	2	1	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. 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/

CL 245.01: BUILDING CONSTRUCTION TECHNOLOGY

B TECH 4TH SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

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

A. Outline of the Course:

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

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

B. Detailed Syllabus:

1 Masonry Works **09 Hours 20%**

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**	**07 Hours**	**16%**
2.1	Classification, Necessity, essential requirements		
2.2	methods of site exploration		
2.3	Settlement, causes of failures of foundation and remedial measures		
2.4	Bearing capacity of soils		
2.5	Shallow foundations: Depth of footing, types and construction, design of strip footing		
3	**Doors, Windows & Ventilators**	**05 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		
3.2	Ventilators: Ventilators combined with window; fan light fixtures and fastenings		
4	**Stairs, Staircases and escalators**	**05 Hours**	**11%**
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**	**11%**
5.1	Components of a floor		
5.2	Flooring material and factors affecting selection of flooring material		
5.2	Types of ground floors –cement concrete, tiles, marble, timber etc., Recent Developments in Flooring Technology		
5.3	Types of upper floors –Conventional floors (timber, steel joist), reinforced cement concrete & pre-cast concrete floors		

6	**Roofs and Roof Coverings**	**05Hours**	**11%**
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.		
7	**Wall Finishes**	**04 Hours**	**09%**
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**	**11%**
8.1	Timbering in trenches		
8.2	Component and types of scaffolding		
8.3	Formwork		

C. Course Outcomes:

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

CO1 Understand the types, dimensions and method of construction of various building components along with various checks required for their construction.

CO2 Identify, select and recommend appropriate type of building elements suitable for a particular situation.

CO3 Select and recommend appropriate temporary structures suitable for various building construction needs.

CO4 Select and recommend appropriate mode of vertical movements and design of staircase

CO5 Design strip footing type of shallow foundation.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	1	-	-	-	-	-	-	-	1	-	2
CO2	1	2	-	1	-	-	-	-	-	-	-	1	1	-	2
CO3	1	1	-	1	1	-	-	-	-	-	-	-	1	-	1
CO4	1	1	3	-	1	-	-	-	-	-	-	-	1	-	1
CO5	1	-	3	-	-	-	-	-	-	-	-	-	1	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. Recommended Study Material:

Text Books:

1. Punamia, B.C., Building Construction, Laxmi Publication, 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. Varghese, P.C., Building Construction, Prentice-Hall of India (PHI) Learning Pvt. Ltd., 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. National Building Code of India, Indian Standard Institution (ISI), 2005, NewDelhi

Web Materials:

1. http://nptel.ac.in/courses/105102088/
2. https://www.youtube.com/watch?v=fDUD36VPD_U
3. https://www.youtube.com/watch?v=wmRYKrfQjuk

List of Tutorials:

Sr. No.	Topic
1.	Masonry work A) Stone masonry work
2.	Masonry work B) Brick masonry work
3.	Foundations -Shallow Foundation
4.	Doors, Windows & Ventilators
5.	Stairs and Staircases
6.	Floors and Flooring
7.	Roofs and Roof Coverings
8.	Temporary Works

CL 246.01: STRUCTURAL ANALYSIS -I

B TECH 4TH SEMESTER (CIVIL ENGINEERING)

Credits and Hours:

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

A. 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	09
3	Combined Direct and Bending Stresses	06
4	Columns and Struts	06
5	Influence Line for Determinate Beams	10
6	Torsion in Circular Shafts	04
7	Arches	06

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

B. Detailed Syllabus:

1. Introduction **04 Hours** **10%**

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 **09 Hours** **20%**

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, Macualay's Method (Method of Singularity Function), Moment Area Method, Conjugate Beam Method

3	**Combined Direct and Bending Stresses**	**06 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**	**06 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		
5	**Influence Line for Determinate Beams**	**10 Hours**	**22%**
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**	**04 Hours**	**9%**
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, Coupling and Keys		
7	**Arches**	**06 Hours**	**13%**
7.1	Arches as structural forms – Examples of arch structures, Types of arches		
7.2	Analysis of three hinged - parabolic and circular arches		

C. Course Outcomes :

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

CO1 Identify the stability and determinacy of planar structures.

CO2 Calculate deflections for statically determinate beams using different methods of analysis.

CO3 Analyses the columns with different end conditions and understand the effect of same.

CO4 Construct influence lines for statically determinate beams and to use influence lines to find maximum load effects in beams.

CO5 Calculate the combined stresses and torsion in the circular shaft.

CO6 To analyze the determinate arches.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	1	-	-	-	-	-	-	-	-	1	-	-
CO3	2	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO4	2	1	1	1	1	-	-	-	-	-	-	-	1	-	-
CO5	1	-	1	-	-	-	-	-	-	-	-	-	1	-	-
CO6	2	2	1	1	-	-	-	-	-	-	-	-	1	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. 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

Credit and Hours

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

A. 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): 20

Total Hours: 65

B. Detailed Syllabus

1 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 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 & Optical properties of materials		
3	**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	**Engineering Steels and Alloys**	**07 Hours**	**16%**
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	**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	**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 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

C. Course Outcomes :

On the successful completion of this course:

CO1 Familiar with various atomic bonding and crystal structure, and also their characteristics and influence on engineering properties

CO2 Understand basic engineering properties of materials and the underlying structural features which are governing such properties

CO3 Know the mechanism of crystallization and phase transformation in major engineering materials

CO4 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

CO5 Be able to understand the corrosion and other degradation in metals and suggest suitable remedial measures.

CO6 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

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	-	-	-	1	2	-	2	-	-	-	1	-	-
CO2	3	2	2	2	2	1	1	-	1	-	-	-	2	1	1
CO3	3	3	2	3	2	1	2	-	-	-	-	-	1	-	-
CO4	3	2	3	2	2	2	2	-	1	-	-	-	2	3	3
CO5	2	2	3	3	3	2	1	-	-	-	-	3	1	-	3
CO6	2	2	2	2	2	1	1	-	-	-	-	3	-	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. 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 K umar 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", Dhanpat Rai 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

Reading Materials, web materials with full citations

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

HS 133 A: CREATIVITY, PROBLEM SOLVING AND INNOVATION

B TECH 4TH SEMESTER (UNIVERSITY ELECTIVE)

Credits and Schemes:

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

A. Course Outline

Module No.	Title/Topic	Classroom Contact Hours	
1	**Introduction to Creativity, Problem Solving and Innovation**	6	20%
1.1	Definitions of Creativity and Innovation		
1.2	Need for Problem Solving and Innovation		
1.3	Scope of Creativity in various Domains		
1.4	Types and Styles of Thinking		
1.5	Strategies to develop Creativity, Problem Solving and Innovation skills		
2	**Questioning, Learning and Visualization**	6	20%
2.1	Strategy and Methods of Questioning		
2.2	Asking the Right Questions		
2.3	Strategy of Learning and its Importance		
2.4	Sources and Methods of Learning		
2.5	Purpose and Value of Creativity Education in real life		
2.6	Visualization strategies - Making thoughts Visible		
2.7	Mind Mapping and Visualizing Thinking		
3	**Creative Thinking and Problem Solving**	**6**	**20%**
3.1	Creative Thinking and its need		
3.2	Strategy of Thinking Fluency		
3.3	Generating all Possibilities		
3.4	SCAMPER Technique		

3.5	Divergent Vs Convergent Thinking		
3.6	Lateral Vs Vertical Thinking		
3.7	Fusion of Ideas for Problem Solving		
3.8	Applying strategies for Problem Solving		
4	**Logic, Language and Reasoning**	**6**	**20%**
4.1	Basic Concepts of Logic		
4.2	Statement Vs Sentence		
4.3	Premises Vs Conclusion		
4.4	Concept of an Argument		
4.5	Functions of Language: Informative, Expressive and Directive		
4.6	Inductive Vs Deductive Reasoning		
4.7	Critical Thinking & Creativity		
4.8	Moral Reasoning		
5	**Contemporary Issues and Practices in Creativity and Problem Solving**	**6**	**20%**
5.1	Cognitive Research Trust Thinking for Creatively Solving Problems		
5.2	Case Study on Contemporary Issues and Practices in Creativity and Problem Solving		
	Total hours	**30**	

The course is based on practical learning. Teaching will be facilitated by Slides Presentations, Reading Material, Discussions, Case Studies, Puzzles, Ted Talks, Videos, Task-Based Learning, Projects, Assignments and various Individual and Interpersonal activities like, Critical reading, Group work, Independent and Collaborative Research, Presentations, etc.

B. Evaluation:

There will be no end semester university examinations. Students will be evaluated continuously in the form of internal as well as external evaluation. The evaluation is schemed as 30 marks for internal evaluation and 70 marks for external evaluation. The concerned teacher shall evaluate students distribute the marks (out of 30 as Internal and out of 70 as External) and submit them.

Evaluation Scheme

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	Attendance	100 %	--	20
2	Individual Activity Participation	As stipulated by the Resource Person(s) in the Training		20
3	Group Activity Participation			20
4	Presentation			30
5	Feedback on Improvement			10
			Total	100

C. Course Outcome:

After completion of the course, the student would:

CO1 Demonstrate creativity in their day to day activities and academic output.

CO2 Solve personal, social and professional problems with a positive and an objective mind-set.

CO3 Think creatively and work towards problem solving in a strategic way.

CO4 Initiate new and innovative practices in their chosen field of profession.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-
CO2	1	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. Recommended Study Materials:

Text Books

1. R Keith Sawyer, Zig Zag, The Surprising Path to Greater Creativity, Jossy-Bass Publication 2013
2. Michael Michalko, Crackling Creativity, The Secrets of Creative Genus, Ten Speed Press 2001

Reference Books

1. Michael Michalko, Thinker Toys, Second Edition, Random House Publication 2006
2. Edward De Beno, De Beno's Thinking Course, Revised Edition, Pearson Publication 1994
3. Edward De Beno, Six Thinking Hats, Revised and Update Edition, Penguin Publication 1999
4. Tony Buzan, How to Mind Map, Thorsons Publication 2002
5. Scott Berkum, The Myths of Innovation, Expended and revised edition, Berkun Publication 2010
6. Tom Kelly and David Kelly, Creative confidence: Unleashing the creative Potential within Us all, William Collins Publication 2013
7. Ira Flatow, The all Laughed, Harper Publication 1992
8. Paul Sloane, Des MacHale & M.A. DiSpezio, The Ultimate Lateral & Critical Thinking Puzzle book, Sterling Publication 2002

Additional Readings

1. Keith Sawer, Group Genius, The Creative Power of Collaboration, Basic Books Publication 2007
2. Edward De Beno, Lateral Thinking, Creativity Step by Step, Penguin Publication 1973
3. Nancy Margulies with Nusa Mall, Mapping Inner Space, Crown House Publication 2002
4. Tom Kelly with Jonathan Littman, The Art of Innovation, Profile Publication 2001
5. Roger Von Oech, A Whack on the Side of the Head. Revised edition, Hachette Publication 1998
6. Roger Von Oech, A Kick in the Seat of the Head, William Morrow 1986
7. Jonah Lehrer, Imagine How Creativity Works, Canongate Books Publication 2012

8. James M Higgins, 101 Creative Problem Solving Techniques, New Management Publication 1994
9. Soctt G Isaksen, K Brain Doval, Donald J Treffinger, Creative Approach to Problem Solving, Sage Publication 2000
10. Donald J Treffinger, scott G Isaksen, K Brain stead Dorval Creative Problem Solving An Introduction, Prufrock Press 2006
11. H Scott Fogler & Steven E. LeBlance, Strategies for Creative Problem Solving, Prentice Hall Publication 2008
12. Dave Gray, Sunni Brown and James Macanufo, Game Storming, O'reilly Publication 2010.
13. Howard Gardner, Creating minds, Basic Books Publication 1993
14. Mihaly Csikzentmihalyi, Creativity–Flow and Psychology of Discovery and Invention, Harper Publication 1996
15. Martin Gerdner, W. H., Ahal Insight, Freeman Publication 1978
16. Paul Sloane, Test Your Lateral Thinking IQ, Sterling Publication1994
17. Paul Sloane & Des Machale Intriguing, Lateral Thinking Puzzles, Sterling Publication 1996

Articles / Videos / Other Suggested Materials

1. Internet Search based May TED talks and other sources for videos, slide shares, problems, etc

MA 246: NUMERICAL ANALYSIS

B TECH 4TH SEMESTER (MATHS ELECTIVE)

Credit and Hours:

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

A. 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): 30

Total Hours: 75

B. 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 **07Hours** **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**	**08Hours**	**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**	**08Hours**	**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**	**10Hours**	**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		

C. Course Outcome:

After learning the course, students will able to

CO1 Employ the knowledge of various types of numerical methods to Engineering and real world problems.

CO2 Determine approximate solution of non-linear equations and system of linear equations and examine the error using numerical methods.

CO3 Use numerical techniques for differentiation and definite integration.

CO4 Interpolate or extrapolate approximate value of dependent variable for any value of independent variable, employing only finitely many tabulated values.

CO5 Interpret the solution of ordinary and partial differential equation numerically.

CO6 Construct the algorithm and perform the various commands in programming language.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	2	-	-	-	-	-	-	-	1	1	1	-
CO2	3	3	1	2	-	-	-	-	-	-	-	-	1	-	-
CO3	3	3	1	2	-	-	-	-	-	-	-	-	1	-	-
CO4	3	3	1	2	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	1	2	-	-	-	-	-	-	-	-	1	-	-
CO6	2	3	-	2	1	-	-	-	-	-	-	1	1	2	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation "-"

D. Recommended Study Material:

Text Books:

1. S. S. Sastry; Introductory methods of numerical analysis. PHI Learning Pvt. Ltd., 2012.
2. Indrajit Chowdhury 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. Steven C. Chapra and Raymond P. Canale; Numerical methods for engineers. Vol. 2. New York: McGraw-Hill, 2012.

Reference Books:

1. V. Rajaraman; Computer oriented numerical methods. PHI Learning Pvt. Ltd., 1993.
2. B. S. Grewal and J. S. Grewal; 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. Amos Gilat;.MATLAB: An introduction with Applications. John Wiley & Sons, 2009.
5. L. V. Fausett; Applied numerical analysis using MATLAB. Pearson; 2008.

Web Materials:

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

MA 247: PROBABILITY & STATISTICS

B TECH 4TH SEMESTER (MATHS ELECTIVE)

Credit and Hours:

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

A 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): 30

Total Hours: 75

B 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

C. Course Outcome:

At the end of the course, the students would be able to

CO1 Solve the problems related Probability and Properties of Probability.

CO2 Evaluate Probabilities from probability distribution of random variable.

CO3 Compute summary statistics and apply the methods of Estimation and Tests of Statistical Hypothesis in Civil Engineering.

CO4 Analyze the nature of relationship between two variables and compute correlation coefficient, regression coefficients.

CO5 Describe the different types of Time Series Models and evaluate the autocorrelation, Spectrum and related concepts for forecasting. in Civil Engineering

CO6 Construct and practice the algorithms of statistical techniques using MATLAB software.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	-	2	2	-	-	-	-	-	-	-	2	1	-
CO2	3	2	-	2	2	-	-	-	-	-	-	-	2	1	-
CO3	3	2	-	2	2	-	-	-	-	-	-	-	2	1	-
CO4	3	2	-	2	2	-	-	-	-	-	-	-	2	1	-
CO5	3	2	-	2	2	-	-	-	-	-	-	-	2	1	-
CO6	3	2	-	3	3	-	-	-	-	-	-	-	2	1	-

D. 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/

B. Tech. (Civil Engineering) Programme

ANNEXURE II - UNIVERSITY ELECTIVE SYLLABI

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY